Draft
Environmental Assessment
Combat Air Forces Adversary Air
Joint Base Pearl Harbor-Hickam, Hawaii

October 2019

199th Fighter Squadron, 154th Wing, Hawaii Air National Guard
19th Fighter Squadron, 15th Wing, Pacific Air Forces

Joint Base Pearl Harbor-Hickam, Hawaii

This page intentionally left blank

Privacy Advisory

This Environmental Assessment (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 Parts 1500 to 1508), and 32 CFR Part 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 Personal home addresses and phone numbers will not be published in the EA.

This page intentionally left blank

COVER SHEET

DRAFT ENVIRONMENTAL ASSESSMENT (EA) FOR COMBAT AIR FORCES ADVERSARY AIR, JOINT BASE PEARL HARBOR-HICKAM, HAWAII

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 (ADAIR) sorties for Combat Air Forces training at Joint Base Pearl Harbor-Hickam (JBPHH). The Proposed Action would include the addition of an estimated 91 contracted maintainers and 18 contracted pilots. Of the approximately 3,100 annual contractor sorties, 3,072 sorties would occur in Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194. The proposed facilities at JBPHH 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. Two alternatives in addition to the No Action Alternative were evaluated in the EA.

d. *For Additional Information*: Mr. Glen Bailey, 800 Scott Circle, JBPHH, HI 96853-5328 or by e-mail at glen.bailey@us.af.mil.

e. *Designation*: Draft EA

f. *Abstract*: This EA 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) Parts 1500 to 1508, and 32 CFR Part 989, *Environmental Impact Analysis Process (EIAP)*. Potentially affected environmental resources were identified in coordination with state and federal agencies. Specific environmental resources with the potential for environmental consequences include airspace management and use; noise; safety; air quality; biological resources; land use; socioeconomics – income and employment; environmental justice and protection of children; cultural resources; and hazardous materials and waste, contaminated sites, and toxic substances.

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 154th Wing, 15th Wing, and other units supported by JBPHH. By providing a dedicated contract ADAIR capability, F-22 pilots would gain more realistic air-to-air training during their training syllabus tasks. Dedicated contract 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 units that are tasked to provide ADAIR training support at JBPHH could recapitalize valuable flying hours to focus on increasing their own levels of proficiency and readiness.

Contract 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 JBPHH include contract ADAIR aircraft, facilities, maintenance, personnel, and sorties. Elements affecting the airspace include airspace use and defensive countermeasures. The Proposed Action at JBPHH would include the establishment of an estimated 91 contracted maintainers and 18 contracted pilots who would operate an estimated 14 aircraft. Six aircraft types (MiG-29, F-5, Dassault Mirage, F-16, Eurofighter Typhoon, and JAS-39 Gripen) have been identified as capable of providing contract ADAIR support to JBPHH 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 JBPHH; 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 facilities proposed for use at JBPHH are available 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 environment 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 contract ADAIR operations at JBPHH or in the special use airspace on the following resources: airspace management and use; noise; safety; air quality; biological resources; land use; socioeconomics – income and employment; environmental justice and protection of children; and hazardous materials and wastes, contaminated sites, and toxic substances. JBPHH is an active installation with demolition and new construction actions currently underway as well as future development currently in the planning phase; however, potential impacts on air quality, noise, and socioeconomics – income and employment 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.

This page intentionally left blank

FINDING OF NO SIGNIFICANT IMPACT (FONSI)

COMBAT AIR FORCES ADVERSARY AIR
JOINT BASE PEARL HARBOR-HICKAM, HAWAII

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) Parts 1500 to 1508; and 32 CFR Part 989, *Environmental Impact Analysis Process (EIAP),* the United States (US) 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 Pearl Harbor-Hickam (JBPHH), Hawaii.

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 pilots of the 154th Wing (154 WG), 15th Wing (15 WG), and other units supported by JBPHH. 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-22 pilots would gain more realistic air-to-air training during their training syllabus tasks. Dedicated contract 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 tasked to provide ADAIR training support at JBPHH could recapitalize valuable flying hours to focus on increasing their own levels of proficiency and readiness.

The need for the action is to provide better and more realistic training for the F-22 flight training program at JBPHH. 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. Contract 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 JBPHH to address shortfalls in F-22 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 JBPHH include contract ADAIR aircraft, facilities, maintenance, personnel, and sorties. The elements affecting the special use airspace include airspace use and defensive countermeasures.

The Proposed Action at JBPHH would include the establishment of an estimated 91 contracted maintainers and 18 contracted pilots who would operate an estimated 14 aircraft. Six aircraft types (MiG-29, F-5, Dassault Mirage, F-16, Eurofighter Typhoon, and JAS-39 Gripen) have been identified as capable of providing contract ADAIR support to F-22 aircrews stationed at JBPHH. One or a combination of these aircraft types may be operated by a contractor at JBPHH in support of ADAIR training and contract ADAIR aircraft selection would be based on performance capabilities of the aircraft and how those capabilities best meet mission training requirements at the installation. The facilities proposed for use at JBPHH are available 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 3,072 sorties annually would support training activities within nearby special use airspace (Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194). Contract ADAIR aircraft would employ defensive countermeasures (e.g., chaff and flares) in all Warning Areas.

In addition to the No Action Alternative, two 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 JBPHH.

Alternative 1

Contract ADAIR capabilities would be established using an estimated 14 aircraft providing 3,100 annual sorties at JBPHH. Of the 3,100 annual sorties, 3,072 training sorties would occur in Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194. The remaining sorties are expected for aircraft leaving for or returning from either maintenance or other deployments. Operations and maintenance activities and aircrew briefings would be consolidated in Building 2030 with aircraft parking space provided on 7 Row under operational control of the 15 WG.

Alternative 2

Alternative 2 would be the same as described in Alternative 1 except that operations and maintenance activities would be consolidated in Building 3220 with aircraft parking space provided on 7 Row under operational control of the 15 WG.

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 JBPHH 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; land use; socioeconomics – income and employment; environmental justice and protection of children; cultural resources; and hazardous materials and wastes, contaminated sites, and toxic substances.

Under the Proposed Action, the annual number of operations on JBPHH would increase by 2 percent and would not impact the operational capacity or necessitate changes to the locations or dimensions of the airspace around JBPHH. Potential impacts on the airspace around the airfield for Alternatives 1 and 2 would be negligible. Likewise, proposed operations in the Warning Areas would increase by an estimated 69 percent and have the capacity and the dimensions necessary to support additional sorties; therefore, potential negligible impacts on airspace are anticipated for Alternatives 1 and 2.

Proposed contract ADAIR operations would potentially increase noise impacts; however, that increase would potentially result in negligible impacts for Alternatives 1 and 2. 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 the 65-A-weighted decibel (dBA) day-night sound level (DNL) by approximately 2,409 acres. JBPHH-based aircraft do not dominate the noise environment of the Warning Areas due to the large number of operations from aircraft based at other installations and the low number of JBPHH aircraft operations. Due to the low number of airspace operations from the Proposed Action, there are no significant impacts expected to the noise environments in any of the Warning Areas.

Safety zones around the airfield are not expected to change. 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 on 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 JBPHH are not considered significant under Alternatives 1 and 2. The proposed project would not interfere with the region’s ability to maintain compliance with National Ambient Air Quality Standards for attainment area pollutants. Warning Areas W-188C, W-189, W-190, W-192, W-193 and W-194 are not in regulatory control areas and are beyond state jurisdictional boundaries; moreover, criteria pollutants are below thresholds and as such, pollutants would not be expected to impact air quality in any of the Warning Areas.

Changes in the noise environment from increased operations at JBPHH would have a potential negligible, short- and long-term effect on wildlife. Risk reduction implementation measures associated with the BASH program would continue to reduce BASH, potentially resulting in a minor impact on birds and other wildlife. Five federally listed bird species have been previously observed on JBPHH, Hawaiian monk seals occur on JBPHH beaches, and green turtles are present in nearshore waters; however, no impacts are anticipated to any listed species from aircraft operations at the airfield as noise and aircraft movement would not change substantially compared to baseline conditions. Noise from contract ADAIR aircraft would not increase substantially (including from sonic booms) in the Warning Areas and would therefore have no effect on the listed marine mammal species and sea turtles. The use of chaff and flares would have no direct impact on wildlife; however, small plastic caps and pistons associated with the use of defensive countermeasures could make it to the surface of the Pacific Ocean. The Air Force has found that these small residual plastic components could be consumed by birds, marine mammals, and sea turtles. As such, the use of defensive countermeasures during training activities in the Warning Areas may affect but is not likely to adversely affect Newell's Townsend's shearwater, short-tailed albatross, federally listed marine mammals, federally listed sea turtles, giant manta ray, oceanic whitetip shark, and scalloped hammerhead shark. There is no designated critical habitat on or immediately adjacent to JBPHH or in the Warning Areas. A may affect but not likely to adversely affect determination for federally listed species has been forwarded to the US Fish and Wildlife Service, Hawaii Field Office, and National Marine Fisheries Service for concurrence.

No long-term changes to the existing land use are expected from contract ADAIR operations. Since there is no construction as part of the Proposed Action and alternatives, interference with the Hawaii's Coastal Zone Management Act program for protection of coastal communities and resources would not occur. As such, no impacts on coastal zones are expected.

No ground disturbance would take place as part of the Proposed Action at JBPHH; therefore, potential archaeological deposits would not be impacted. Under Alternative 1, the proposed Building 2030 is presently listed in the National Register of Historic Places as a contributing element of the Hickam Field National Historic Landmark (NHL). The character-defining features of Building 2030 are located on the exterior; therefore, potential interior modifications are not expected to affect any characteristics that contribute to the building's historic significance or its overall contribution to the NHL. Under Alternative 2, Building 3220 has been determined to be eligible for inclusion in the National Register of Historic Places as a contributing element of the Hickam Field NHL. The character-defining features of Building 3220 are located on the exterior, as such interior modifications are not expected to affect any characteristics that contribute to its historic significance or its overall contribution to the NHL and have no effect, and consequently no impact on historic properties. No impacts on historic properties would occur from contract ADAIR training in the Warning Areas.

Because there is no new construction proposed at JBPHH, 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 economic environment. The 109 contract ADAIR maintenance personnel and pilots would represent a small increase in the total persons permanently assigned to and working at JBPHH and in Honolulu County where there are over 900,000 residents; therefore, no adverse impacts on income and employment would occur under the Proposed Action. The Proposed Action would potentially increase annual expenditures in the local economy by approximately $46.5 million. This represents a potential long-term, minor, beneficial impact on the local economy.

No disproportionate impacts on minority populations or low-income communities surrounding JBPHH are expected because changes in the noise environment near the JBPHH airfield as a result of contract ADAIR would be minimal.

Hazardous wastes generated as a result of contract ADAIR operations would be properly handled, stored, and disposed of following the NAVFAC Hawaii *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 NAVFAC Hawaii *Asbestos Management and Operations Plan*. Lighting fixtures containing polychlorinated biphenyls would be disposed in accordance with federal, state, and local laws, which would potentially result in a long-term, minor, beneficial impact. There is a low potential for radon to pose a health hazard at JBPHH; however, no impacts from radon are anticipated. While Building 2030 and aircraft parking on 7 Row are adjacent to several Environmental Restoration Program sites, there is no indication that remedial activities at these sites would impact the use of Building 2030 or the aircraft parking on 7 Row. In addition, activities at Building 2030 and aircraft parking on 7 Row would not disturb adjacent Environmental Restoration Program sites. There would be no impacts on hazardous materials and wastes, contaminated sites, and toxic substances as a result of the Proposed Action.

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 JBPHH or the Warning Areas.

With the addition of ongoing construction projects at JBPHH, in addition to Hawaii Department of Transportation roadway work and the Kaka’ako Community Development construction off-base, emissions of particulates equal to or less than 10 microns in diameter would potentially increase; however, these increases would be short in duration and the potential incremental impact on air quality would be negligible. A potential negligible, short-term, incremental change associated with off-base construction to air quality is expected when adding the contract ADAIR operations to past, present, and reasonably foreseeable future actions. ADAIR training activities would occur at times below the mixing height in the Warning Areas; however, the duration would be brief (approximately 1.38 minutes per sortie); therefore, no cumulative impacts on air quality are expected in the Warning Areas.

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 of the EA. There are presently no actions considered to have the potential to create cumulative impacts on 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 recommended in the EA 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 Part 989, 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 154 WG, 15 WG, and other units supported by JBPHH, Hawaii, 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 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 PEARL HARBOR-HICKAM, HAWAII

PREPARED FOR:

Department of the Air Force

October 2019

TABLE OF CONTENTS

TABLE OF CONTENTS

Page

TABLE OF CONTENTS

Page

TABLE OF CONTENTS

LIST OF FIGURES

This page intentionally left blank

LIST OF TABLES

This page intentionally left blank

LIST OF ACRONYMS AND ABBREVIATIONS

$\mu g/m^3$	microgram(s) per cubic meter
°F	degree(s) Fahrenheit
15 MXS	15th Maintenance Squadron
15 WG	15th Wing
154 WG	154th Wing
ac	acre(s)
ACAM	Air Conformity Applicability Model
ACC	Air Combat Command
ACM	asbestos-containing materials
ADAIR	adversary air
AFB	Air Force Base
AFCEC	Air Force Civil Engineer Center
AFI	Air Force Instruction
AFMAN	Air Force Manual
AFOSH	Air Force Occupational 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
APE	Area of Potential Effects
AQCR	Air Quality Control Region
AST	aboveground storage tank
ATC	Air Traffic Control
BASH	bird/wildlife-aircraft strike hazard
BMP	Best Management Practice
CAA	Clean Air Act
CAB	Clean Air Branch
CAD/PAD	cartridge-actuated device(s)/propellant-actuated device(s)
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
CSAF	Chief of Staff Air Force
CSEL	C-Weighted Sound Exposure Level
CSF	Conforming Storage Facility
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
dB	decibel(s)
dBA	A-weighted decibel(s)
DLA	Defense Logistics Agencies
DNL	Day-Night Average Sound Level
DOD	Department of Defense
DOH	Department of Health
EA	Environmental Assessment
EHMP	Environmental Hazard Management Plan
EIAP	Environmental Impact Analysis Process
EIS	Environmental Impact Statement

LIST OF ACRONYMS AND ABBREVIATIONS

EO	Executive Order
ERN	Environmental Restoration, Navy
ERP	Environmental Restoration Program
ESA	Endangered Species Act
FAA	Federal Aviation Administration
Fed Fire	Federal Fire Department
FL	Flight Level
FONSI	Finding of No Significant Impact
ft	foot(feet)
ft^2	square foot(feet)
FTU	formal training unit
GHG	greenhouse gas
GWP	global warming potential
HAR	Hawaii Administrative Rules
HAZMAT	hazardous material(s)
HIANG	Hawaii Air National Guard
IAP	initial accumulation point
ICRMP	Integrated Cultural Resources Management Plan
IDP	Installation Development Plan
in.	inch(es)
IRP	Installation Restoration Program
IWTC	Industrial Waste Treatment Facility
JBPHH	Joint Base Pearl Harbor-Hickam
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
LFE	large force exercise
L_{max}	Maximum Sound Level
MBTA	Migratory Bird Treaty Act
mg/m^3	milligram(s) per cubic meter
mi	mile(s)
MMPA	Marine Mammal Protection Act
MOU	Memorandum of Understanding
MSL	mean sea level
NAAQS	National Ambient Air Quality Standards
NAVFAC	Naval Facilities Engineering Command
NEPA	National Environmental Policy Act
NH_3	ammonia
NHL	National Historic Landmark
NHO	Native Hawaiian Organization
NHPA	National Historic Preservation Act
NM	nautical mile(s)
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NO_x	nitrogen oxides
NRHP	National Register of Historic Places
O_3	ozone
OSHA	Occupational Safety and Health Administration
PA	Programmatic Agreement
Pb	lead
PCB	polychlorinated biphenyl
pCi/L	picocurie(s) per liter

LIST OF ACRONYMS AND ABBREVIATIONS

$PM_{2.5}$	particulate matter equal to or less than 2.5 microns in diameter
PM_{10}	particulate matter equal to or less than 10 microns in diameter
POI	point of interest
POL	petroleum, oil, and lubricant
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
RCRA	Resource Conservation and Recovery Act
ROI	Region of Influence
RPZ	Runway Protection Zone
SEL	Sound Exposure Level
SIP	State Implementation Plan
SO_2	sulfur dioxide
SO_x	sulfur oxides
TCP	traditional cultural property
TPH	total petroleum hydrocarbons
tpy	ton(s) per year
TSCA	Toxic Substances Control Act
U.S.C.	United States Code
US	United States
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UST	underground storage tank
UXO	unexploded ordnance
VFR	Visual Flight Rules
VOC	volatile organic compound
yd^2	square yard(s)

This page intentionally left blank

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, 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 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.

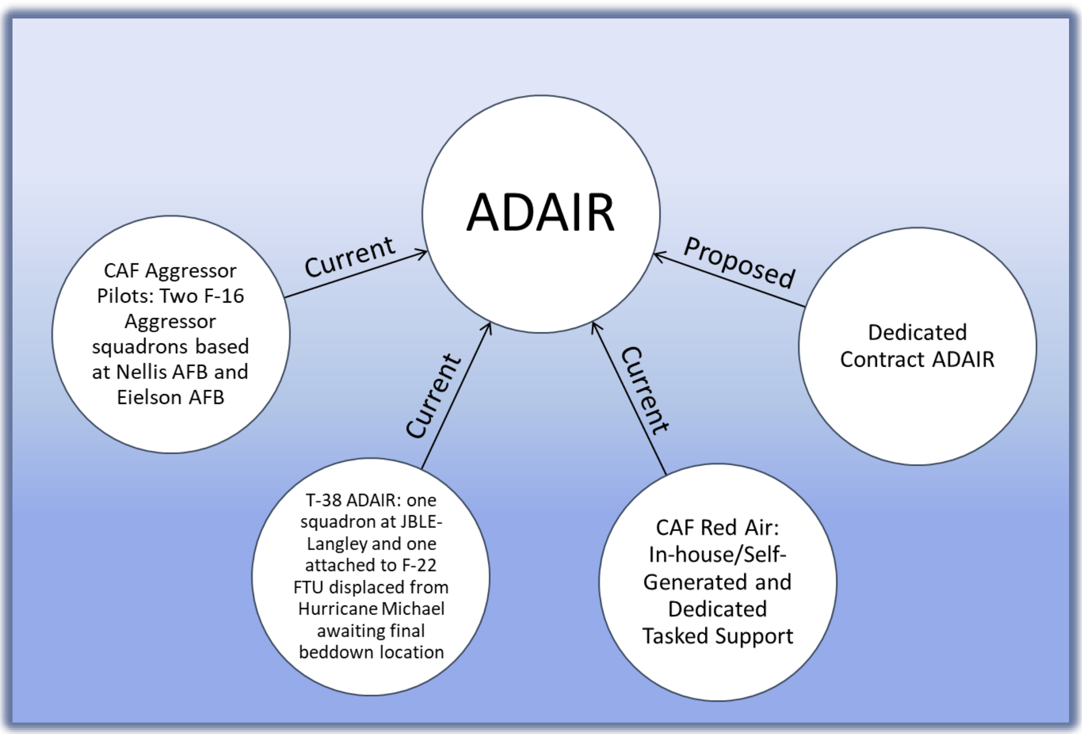


Figure 1-1. Current and Proposed Adversary Air Sortie Generation.

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 (JBPHH), Hawaii.

As discussed in **Section 1.3**, the scope of this analysis evaluates the proposal to implement contract ADAIR at JBPHH. Separate NEPA analyses will be completed at all locations identified by the Air Force that require contract ADAIR support and have sufficient existing facilities.

1.1.2 Location

As a result of the 2005 Base Realignment and Closure, Naval Station Pearl Harbor and Hickam Air Force Base (AFB) were merged into a single joint installation to support both Air Force and US Navy missions (**Figure 1-2**). At JBPHH, all buildings and land are US Navy real property and the Air Force manages the airfield. All supporting functions were transferred to the US Navy. Weapons and flight safety are the responsibility of the Air Force while ground safety is the responsibility of the US Navy.

JBPHH is located on the island of Oahu on the south coast near Honolulu and shares runways with Honolulu International Airport (**Figure 1-3**). JBPHH is the home to the 154th Wing (154 WG), 15th Wing (15 WG), and numerous tenant and associated units, as well as being the home of Commander, US Pacific Fleet and Headquarters Pacific Air Force. CAF units assigned to JBPHH include the 199th Fighter Squadron, a unit of the 154 WG (Hawaii Air National Guard [HIANG]) and the 19th Fighter Squadron, a unit of the 15 WG (Air Force Active Duty).

> FIFTH (5TH) GENERATION IS A TERM APPLIED TO 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. FOURTH (4TH) GENERATION AIRCRAFT ARE THE PREVIOUS SUITE OF FIGHTERS SUCH AS F-15, F-16, AND F/A-18.

JBPHH supports the training and operations of advanced 5th generation F-22 aircraft and hosts annual exercises with US allies to support pilot readiness.

CAF training activities utilize special use airspace proximate to JBPHH. Special use airspace includes Warning Areas, which provide offshore airspace for military aircraft training and serve to warn nonparticipating aircraft of potential danger. The US Navy manages and controls Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194 proposed for ADAIR use. These Warning Areas overlie the Pacific Ocean, north and south of the Island of Oahu (**Figure 1-4**).

> WARNING AREAS ARE AIRSPACE OF DEFINED DIMENSIONS THAT EXTENDS FROM 3 NAUTICAL MILES (NM) OUTWARD FROM THE COAST OF THE UNITED STATES (US) AND MAY BE OVER US WATERS, INTERNATIONAL WATERS, OR BOTH. THE PURPOSE OF WARNING AREAS IS TO WARN NONPARTICIPATING PILOTS OF POTENTIALLY HAZARDOUS ACTIVITY. WARNING AREAS MAY BE USED FOR OTHER PURPOSES IF THE AREA IS RELEASED TO THE FEDERAL AVIATION ADMINISTRATION (FAA) DURING PERIODS IT IS NOT REQUIRED FOR ITS INTENDED PURPOSE AND IS WITHIN AN AREA IN WHICH THE FAA HAS AIR TRAFFIC CONTROL AUTHORITY.

JBPHH and the surrounding military airspace provide a critical venue for training F-22 pilots.

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 154 WG, 15 WG, and other units supported by JBPHH. 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 JBPHH is to increase the quality of training for F-22 pilots by filling the “near peer” capacity and capability gap currently present in the 5th generation training enterprise. By providing dedicated contract ADAIR capability, F-22 pilots and instructor pilots would gain more realistic air-to-air training during their training syllabus tasks. Dedicated contract 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 4th generation units that may have been tasked to provide ADAIR training support at JBPHH may now recapitalize valuable flying hours to focus on increasing their own levels of proficiency and readiness.

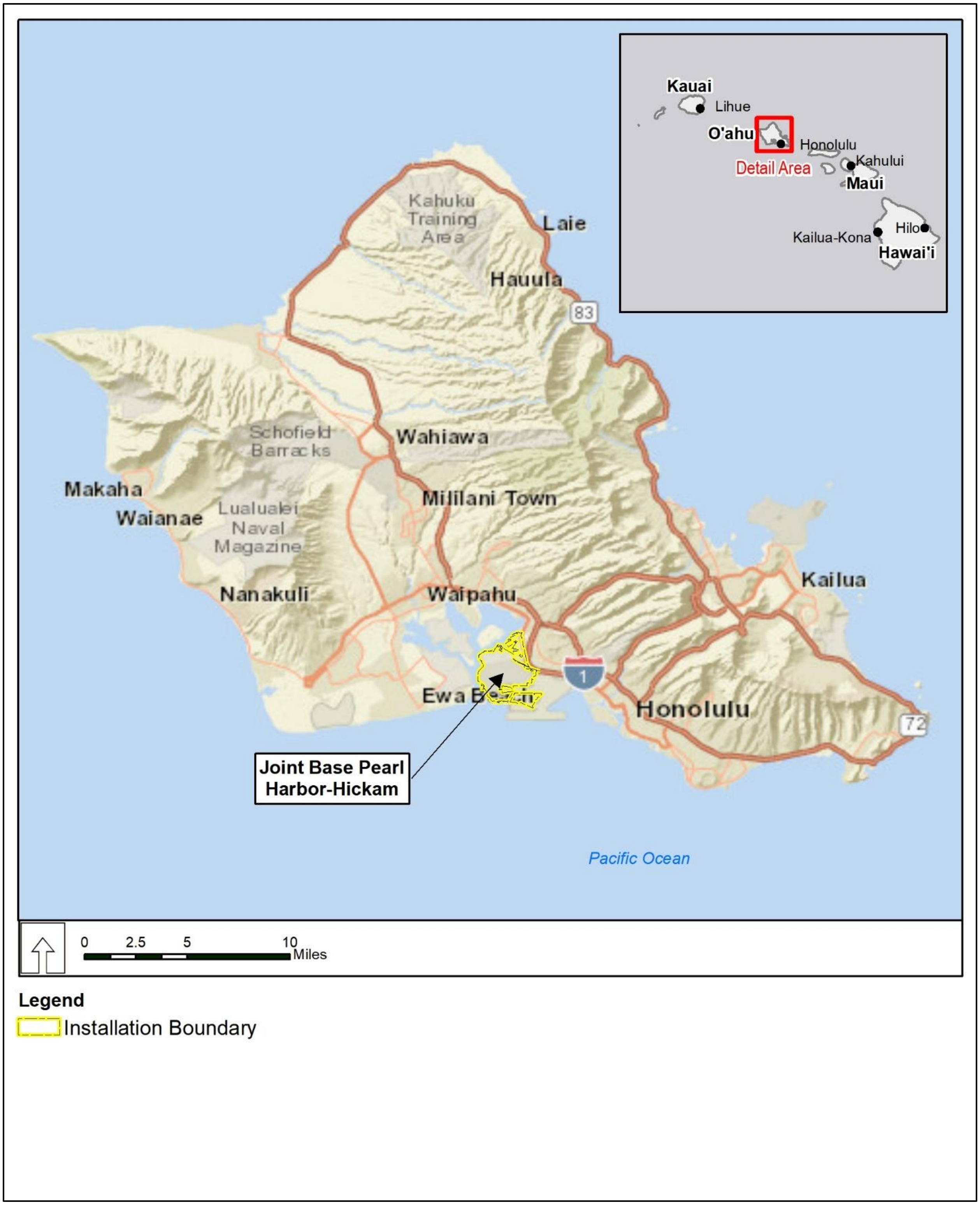


Figure 1-2. Location of Joint Base Pearl Harbor-Hickam (Regional View).

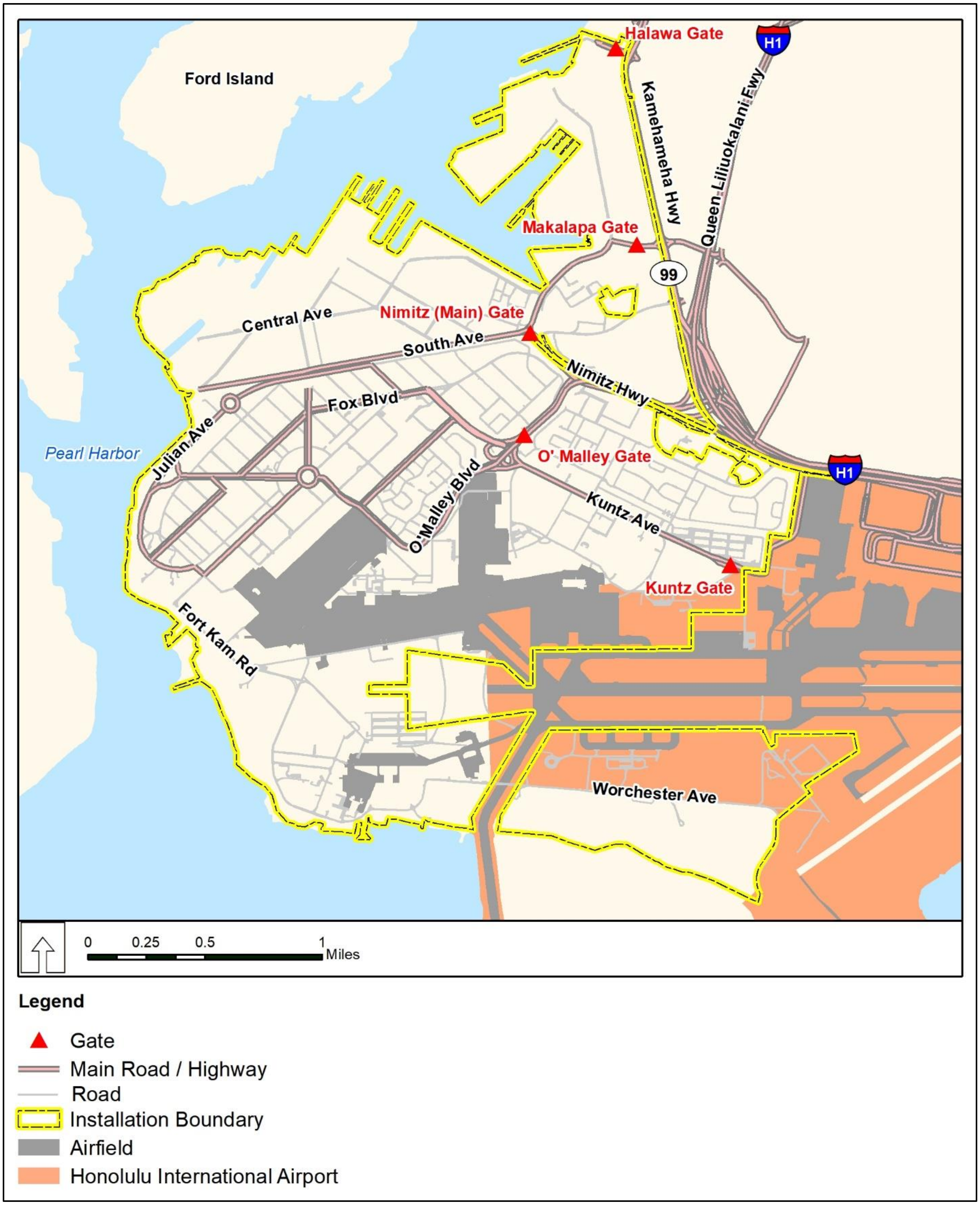


Figure 1-3. Location of Joint Base Pearl Harbor-Hickam (Local View).

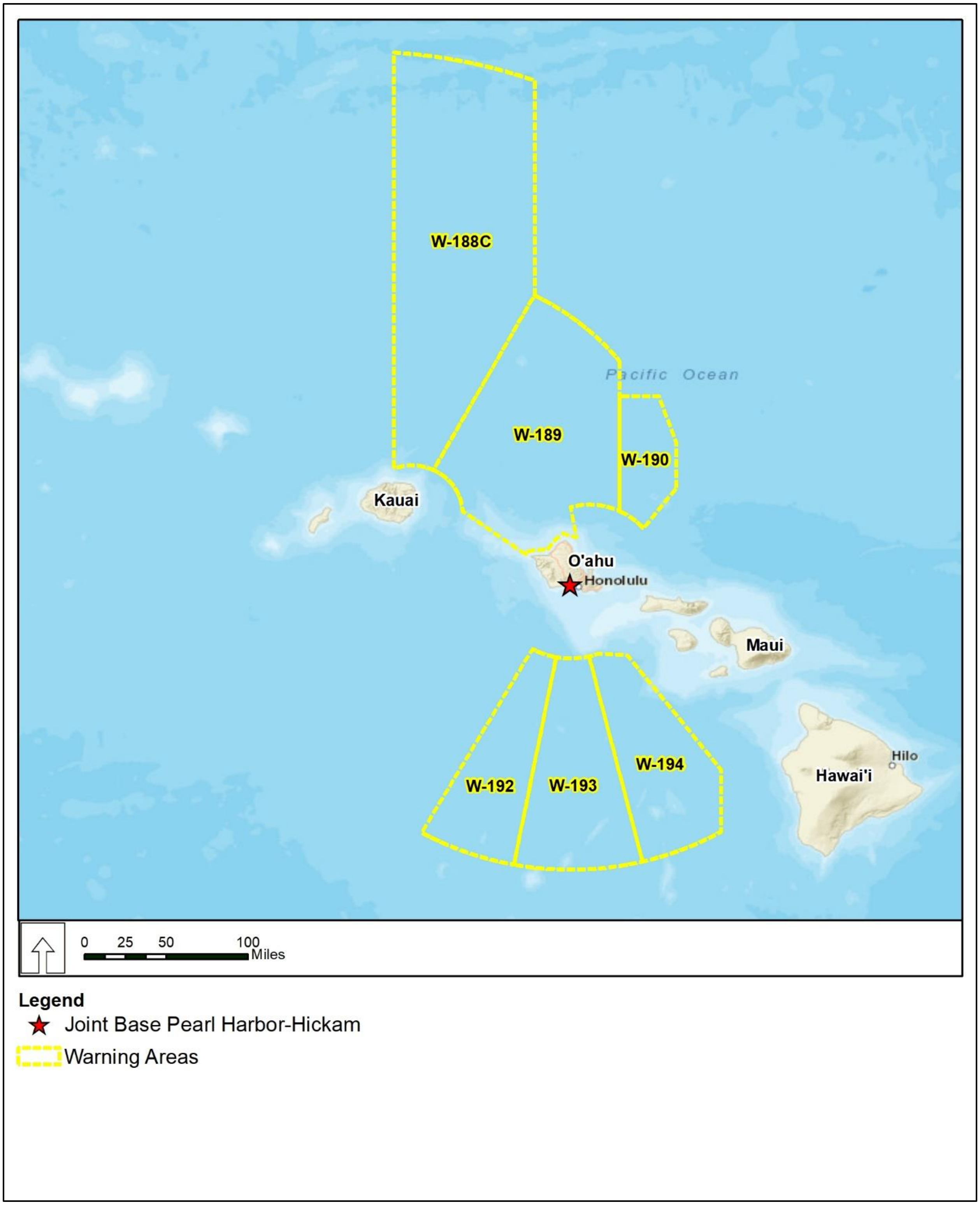


Figure 1-4. Warning Areas Proposed for Contract Adversary Air Sorties.

1.3 NEED FOR THE ACTION

The need for the action is to provide better and more realistic training for the F-22 flight training program at JBPHH. 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. Contract 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 JBPHH. 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-22 fighter pilots.

This EA has been prepared in accordance with the National Environmental Policy Act (NEPA) (42 U.S.C. §§ 4321 to 4347), the Council on Environmental Quality (CEQ) Regulations (40 Code of Federal Regulations [CFR] Parts 1500 to 1508), and 32 CFR Part 989 et seq., *Environmental Impact Analysis Process (EIAP)*. 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.
- Chapter 3, Affected Environment, includes a description of the natural and man-made environments within and surrounding JBPHH 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. **Appendix A** includes all interagency and intergovernmental coordination and consultations; **Appendix B** provides noise metrics and noise models; **Appendix C** outlines methodologies, emission factors, and assumptions used for air quality emission estimates for each scenario and related activities; and **Appendix D** summarizes the listed species potentially occurring in the action area.

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 are assessed in accordance with the Air Force EIAP (32 CFR Part 989), which requires that impacts on resources be analyzed in terms of their context, duration, and intensity. To help the public and decision-makers understand the implications of impacts, they are 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. JBPHH 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**, for the airspace ROI which overlies water, land use; socioeconomics – income and employment; environmental justice and protection of children; and hazardous materials and wastes, toxic substances, and contaminated sites are not described in baseline in **Chapter 3** or considered for detailed analysis in **Chapter 4.** These resources do not have the potential for impacts over water.

Table 1-1
Environmental Resources Analyzed in the Environmental Assessment

Resource	Region of Influence: JBPHH and Environs	Region of Influence: Warning Areas (W-188C, W-189, W-190, W-192, W-193, and W-194)
Airspace Management and Use	✓	✓
Noise	✓	✓
Safety	✓	✓
Air Quality	✓	✓
Biological Resources (T&E and marine resources)	✓	✓
Land Use (Coastal Zone Management Act)	✓	
Socioeconomics – Income and Employment	✓	
Environmental Justice and Protection of Children	✓	
Cultural Resources (archeological, architectural, traditional)	✓	✓
Hazardous Materials and Wastes, Toxic Substances, and Contaminated Sites	✓	

Notes:
JBPHH = Joint Base Pearl Harbor-Hickam; T&E = threatened and endangered

1.4.1 Resource Areas Eliminated from Analysis

1.4.1.1 Infrastructure, Transportation, and Utilities

During site selection, the support for contract ADAIR operations was determined to be very good for facilities and communication infrastructure at JBPHH. No new construction or infrastructure changes would occur under the Proposed Action. The level of service for utilities would be adequate to support the Proposed Action. Because there would only be an additional 109 contract personnel working at JBPHH to support the contract ADAIR operations and an adequate base transportation network and base access gates capacities exist to support these personnel and contract ADAIR aircraft operations, there would be no impacts on infrastructure, transportation, and utilities at JBPHH; therefore, these resources are not carried forward for further detailed analysis in this EA.

1.4.1.2 Socioeconomics – Housing, Population, and Schools

The requirement for an estimated 109 contract personnel and their families supporting the contract ADAIR sorties in the Honolulu, Hawaii, region was considered; however, the additional personnel would have no impact on the region's population. Even assuming all 109 contract personnel relocated with family members to Honolulu County, this would be a negligible increase in the County's population of approximately 980,000 people. The cost of housing in the region is high (single-family housing units in Honolulu County are approximately three times the national median home value), but housing availability is not limited. There are adequate public and private schools in the region to support 109 contract personnel and their families;

therefore, there would be no impacts of the Proposed Action on the local or regional population, housing, or schools.

1.4.1.3 Soil Resources

Protection of soils was considered when evaluating potential impacts of the Proposed Action in terms of alteration of soil composition, structure, or function and any accumulation of chaff material. Effects on soils would be adverse if they alter the soil composition, structure, or function within the environment or accumulate in the soil. Under the Proposed Action, there would be no ground-disturbing activities to affect soil resources and all contract ADAIR training would occur over the Pacific Ocean; therefore, soil resources are not carried forward for detailed analysis.

1.4.1.4 Visual Resources

There would be no potential impacts on visual resources from the proposed contract ADAIR activities because no new construction would occur, and aircraft would utilize the existing airfield. Proposed contract ADAIR activities in the areas adjacent to the proposed facilities and aircraft parking ramp would not change the existing visual setting. Likewise, the Proposed Action would not affect the aesthetic qualities of the Pacific Ocean beneath the Warning Areas. As such, visual resources are not carried forward for further detailed analysis in this EA.

1.4.1.5 Water Resources

Under the Proposed Action, there would be no ground-disturbing activities, including no dredging or filling of wetlands. The proposed contract ADAIR aircraft and personnel and associated operational and maintenance activities would not affect water quality or quantity, or wetlands. Under the airspace, the use of defensive countermeasures has been found to be nontoxic. Due to the rare and infrequent nature of fuel dumps as well as in-place safety precautions such as altitude restrictions, these emergency procedures are not likely to adversely affect water resources, including wetlands; therefore, water resources are not carried forward for detailed analysis.

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 JBPHH to improve the readiness and proficiency of pilots of the 154 WG, 15 WG, other supported units, and CAF at large. Based on the analysis in this EA, the CAF 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 Executive Order (EO) 12372, *Intergovernmental Review of Federal Programs*, federal, state, and local agencies with jurisdiction that could potentially be affected by the Proposed Action and alternatives 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. The Hawaii Office of Environmental Quality Control is the focal point for the coordination of staff review and comment, as well as the announcement of availability of environmental documents for public review and comment.

Compliance with Section 7 of the Endangered Species Act (ESA), and implementing regulations (50 CFR Part 402), requires communication with the US Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries Service (NMFS) 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 consultation 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 would be 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 and NMFS offices as well as the State of Hawaii Department of Lands informing them of the proposal and requesting data regarding applicable protected species. Subsequently, compliance with Section 7 of the ESA through consultation with USFWS and NMFS is ongoing. In addition, the Marine Mammal Protection Act (MMPA; 16 U.S.C. § 1371 et seq.) makes it illegal for a person to take a marine mammal, which includes significantly disturbing the habitat, unless it is done in accordance with regulations or a permit. The Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. § 1801) requires federal agencies to consult with the NMFS when activities may have adverse impacts on designated Essential Fish Habitat.

As per the Programmatic Agreement (PA) among the Commander, Navy Region Hawaii, the Advisory Council on Historic Preservation, and the Hawaii State Historic Preservation Officer Regarding Navy Undertakings in Hawaii, “When a proposed undertaking is limited to the maintenance, repair, or rehabilitation of a listed, eligible, or contributing building’s interior, the Area of Potential Effect (APE) is the individual building (US Navy, 2012).” This PA further stipulates, “If Navy personnel…determine that an undertaking does not have the potential to cause effects on listed, contributing, or eligible properties… No further review under this PA and the NHPA is required (US Navy, 2012).” As terms in this PA supersede standard consultation procedures outlined in Section 106 of the NHPA and implementing regulations (36 CFR Part 800), consultation with the Hawaii State Historic Preservation Office was neither required nor pursued as part of this EA.

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

1.6.3 Government to Government Consultation

The NHPA and its regulations at 36 CFR Part 800 direct federal agencies to consult with Native Hawaiian Organizations (NHOs) when a proposed or alternative action may have an effect on properties of religious and cultural significance. Consistent with the NHPA, Department of Defense (DOD) Instruction 4710.03, *Consultation with Native Hawaiian Organizations*, NHOs are organizations that serve and represent the interests of Native Hawaiians with a primary and stated purpose of providing services to Native Hawaiians and have expertise in Native Hawaiian affairs. The JBPHH point of contact for NHOs is the Joint Base Commander for JBPHH. The point of contact for consultation with the State Historic Preservation Officer is the JBPHH Cultural Resources Management team. Per the above-referenced PA among the Commander, Navy Region Hawaii; the Advisory Council on Historic Preservation; and the Hawaii State Historic Preservation Officer regarding US Navy undertakings in Hawaii, consultation was neither required nor pursued as part of this EA (US Navy, 2012).

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 where applicable 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 Parts 1500 to 1508). 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 Part 989), including NEPA, which is primary legislation affecting the agency's decision-making process.

1.8 Public and Agency Review of Environmental Assessment

The Notice of Availability was included in the State of Hawaii Office of Environmental Quality Control semimonthly publication of *The Environmental Notice* and published in *The Honolulu Star-Advertiser*, Honolulu, Hawaii, for public review on ***DATE TBD***. The Notice of Availability invited the public to review and comment on the Draft EA. The public and agency review period ended on ***DATE TBD***. The public and agency comments are provided in **Appendix A**.

Copies of the Draft EA and FONSI were also made available for review at the following locations and on the JBPHH website at https://www.afcec.af.mil/Home/Environment/:

- Joint Base Pearl Harbor – Hickam Library, 990 Mills Boulevard, JBPHH, Hawaii 96853
- Hawaii State Library, 478 South King Street, Honolulu, Hawaii 96813
- Salt Lake-Moanalua Public Library, 3225 Salt Lake Boulevard, Honolulu, Hawaii 96818
- Aiea Public Library, 99-374 Pohai Place, Aiea, Hawaii 96701

This page intentionally left blank

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 JBPHH, Hawaii, to address shortfalls in F-22 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 JBPHH include contract ADAIR aircraft, facilities, maintenance, personnel, and sorties. The elements affecting the airspace include airspace use and defensive countermeasures.

Numbers of contract 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-22 CAF aircrews stationed at JBPHH. One or a combination of these aircraft types may be operated by a contractor at JBPHH in support of contract ADAIR training. The Proposed Action at JBPHH would include the establishment of an estimated 91 contracted maintainers and 18 contracted pilots who would operate an estimated 14 aircraft.

Table 2-1
Contract Adversary Air Potential Aircraft Specifications

Aircraft	Wingspan (feet)	Length (feet)	Height (feet)	Number of Engines
MiG-29	38	57	16	2
F-5	27	48	14	2
Dassault Mirage	27	51	15	1
F-16	33	50	17	1
Eurofighter Typhoon	35	48	13	2
JAS-39 Gripen	27	47	16	1

2.1.2 Facilities

JBPHH 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 lubricant (POL) 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
Joint Base Pearl Harbor-Hickam 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)
9,800	91	18	3,400	2,100	1,300

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

JBPHH has two options for providing proposed operations facilities which includes operations and aircraft maintenance functions. Under Option 1, contractor Operations and Aircraft Maintenance Unit (AMU) activities, including hangar space for aircraft maintenance, are proposed to be consolidated in Building 2030 with aircraft parking space provided on 7 Row under operational control of the 15 WG (**Figure 2-1**). Under Option 2, contractor Operations and AMU activities, including hangar space for aircraft maintenance, are proposed to be consolidated in Building 3220 with aircraft parking space provided on 7 Row under operational control of the 15 WG (**Figure 2-1**).

These facilities would provide adequate office space for contractor Operations and AMU personnel and covered aircraft maintenance space, if required. At least 27,000 square yards of aircraft parking space are available on 7 Row.

> 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 contract adversary air (ADAIR) AMU is intended, for accountability purposes, to remain physically separated from any Air Force 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 Air Force 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.

Following training sorties, contract ADAIR pilots would land and park their aircraft at JBPHH on the ramp area on 7 Row (**Figure 2-1**). Contract pilots would then participate in debriefs with pilots of the 154 WG, 15 WG, and other units as required. Debriefs would occur at facilities on JBPHH.

Contract ADAIR aircraft would use Defense Logistics Agency's (DLA's) Jet A aircraft fuel that would be delivered in fuel trucks owned and operated by Navy Fuels under JBPHH. Contract ADAIR personnel would be responsible for all aircraft fuel and defuel operations. An additional two to three personnel would be required in the Navy Fuels to meet the increased workload.

Contract ADAIR aircraft would also use chaff and flares (also refer to **Section 2.1.7** for additional information on defensive countermeasures). The contract ADAIR aircraft may employ chaff and flares that are in the Air Force inventory or chaff and flares that are contractor-provided external to the Air Force inventory. For the purpose of this EA, all aircraft are modeled with Air Force-provided RR-188 chaff and M206 flares. The ADAIR contractor would receive an allocation for government-provided chaff and flares through the 15th Maintenance Squadron (15 MXS), Munitions Flight. Munitions personnel would store, account for, inspect, maintain, assemble, and deliver chaff and flares to contract ADAIR aircraft; contract personnel would be responsible for loading, unloading, and accountability of chaff and flares provided to their aircraft.

If contract ADAIR aircraft utilize chaff and flares not in the government's inventory, then additional NEPA compliance review would be required. All work to account for, inspect, maintain, assemble, deliver, load and unload chaff/flares to contract ADAIR aircraft would be the responsibility of the contractor. Government storage of contractor-provided chaff and flares may be considered after appropriate authority is granted.

Figure 2-1. Proposed Location for Combined Aircraft Maintenance Unit, Operations, and Maintenance Space in Building 2030 or in Building 3220 and Aircraft Parking on 7 Row.

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). The ejector cartridges required for external stores would be considered contractor-furnished equipment. Some minor support from 15 MXS for egress system munitions (i.e., cartridge-actuated devices/propellant-actuated devices [CAD/PAD]) may be necessary; however, the level of support is expected to be extremely minor and very infrequent. All required Aerospace Ground Equipment (AGE) would be owned and maintained by the contractor. Fuel for AGE would be obtained by contract ADAIR personnel from the base DLA fuel station through an account established with 15 MXS.

AEROSPACE GROUND EQUIPMENT 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 Building 2030 or Building 3220 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 transported to the contractor's repair facility. For the rare occasions when an aircraft is not flyable, the contractor would dispatch a temporary field repair team to JBPHH to repair the aircraft. Any additional maintenance support requirements (e.g., aircraft fuel cell, defueling, aircraft structural assets, nondestructive inspection Joint Oil Analysis Program tests) would be coordinated with 15 MXS or 154 Maintenance Squadron, as appropriate on a noninterference basis.

2.1.4 Personnel

Contract ADAIR at JBPHH would be staffed by an estimated 91 additional contracted maintenance personnel who would primarily operate out of Building 2030 or Building 3220. Implementation of the Proposed Action would also employ an estimated 18 contracted pilots to primarily operate out of the same facilities as the maintenance personnel. It is expected that the initial personnel would arrive about 3 months after a contractor is selected, and the estimated arrival on JBPHH is between February 2020 and January 2021.

2.1.5 Sorties

The Proposed Action includes contracting for the support of an estimated 14 contractor aircraft to fly an estimated 3,100 contract ADAIR sorties annually in support of the 154 WG and 15 WG at JBPHH. This number of sorties includes sorties expected for contractor 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 JBPHH, by contract ADAIR support, would be an 8 x 6.

A TURN PATTERN OF 8 X 6 DOES NOT REQUIRE 14 AIRCRAFT TO EXECUTE BUT RATHER COULD BE FILLED WITH ONLY EIGHT 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. AN 8 X 6 REPRESENTS 14 TOTAL SORTIES FOR THE DAY EVEN THOUGH THOSE SORTIES MAY HAVE BEEN FLOWN WITH ONLY EIGHT TOTAL AIRCRAFT.

Implementation of the Proposed Action would result in an increase of 2 percent in the number of operations at JBPHH. Refer to **Section 2.1.6** for more information on training operations. Contract ADAIR would fly up to a projected 3 percent of the estimated 3,100 sorties during environmental night hours when the effects of aircraft noise are accentuated (10:00 p.m. to 7:00 a.m. local time; refer to Air Force Handbook 32-7084, *AICUZ Program Manager's Guide*). This would increase JBPHH flights at night by approximately 93 sorties per year. The local squadron does not depart the airport after 10:00 p.m., but 2 to 3 percent of the sorties do return after 10:00 p.m. Contractor night sorties would be flown during the 154 WG and 15 WG 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 contract ADAIR annual training activities in the airspace are estimated to be 3,072 sorties and are summarized in **Table 2-3**. Proposed contract ADAIR sorties would generally consist of the following five steps: depart from JBPHH runway, transit from JBPHH airfield to airspace, perform ADAIR training, transit back to JBPHH, and land at JBPHH. Contract ADAIR aircraft would spend 5 to 20 minutes in transit each way between the airfield and airspace. Time spent within the airspace (W-188C, W-189, W-190, W-192, W-193, and W-194) would depend upon the specific training mission performed but would typically last 45 to 60 minutes. Contractor operations would occur in these Warning Areas concurrent to the 154 WG and 15 WG or other supported Air Force units. No airspace modifications would be required for contract ADAIR as part of the Proposed Action.

Table 2-3
Current and Projected Annual Training Activities by Joint Base Pearl Harbor-Hickam

Airspace	Current Altitude[1]	Baseline Training Sorties[2]	Projected Contract ADAIR Training Sorties[3]	Projected Total Sorties
Warning Areas W-188C, W-189, W-190	Surface to FL600	4,015	2,765	6,780
Warning Areas W-192, W-193, W-194	Surface to FL600	446	307	753
Total Proposed Airspace Sorties		**4,461**	**3,072**	**7,533**

Notes:
[1] No change to current minimum flight altitude is proposed.
[2] Based on F-22 operations plus four Sentry Aloha exercises per year.
[3] Distribution of the proposed ADAIR aircraft in the airspace is 90 and 10 percent.
ADAIR = adversary air; FL = flight level (vertical altitude expressed in hundreds of feet)

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 (RR-188 chaff and M206 flares or similar) during 100 percent of their training sortie operations. 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 consist of millions of nonhazardous 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 flares use are presented in **Table 2-4**. 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 contract 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]	Total Estimated Future Use[2]
Warning Areas W-188C, W-189, W-190	Chaff Bundles	13,047	28,881
	Flares	15,139	33,713
Warning Areas W-192, W-193, W-194	Chaff Bundles	1,449	3,208
	Flares	1,683	3,747

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] This reflects Contract ADAIR estimated countermeasure use added to the baseline use. With the addition of Contract ADAIR, there would be an estimated 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 JBPHH, 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 contract 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 contract 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: Contract ADAIR locations would need to support costs of facilities renovations from within their existing Operations and Maintenance 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 14 aircraft) providing 3,100 annual training sorties at JBPHH for support in W-188C, W-189, W-190, W-192, W-193, and W-194 and operations and maintenance activities consolidated in Building 2030 and aircraft parking located on 7 Row.
- Alternative 2 – Establish contract ADAIR capabilities (an estimated 14 aircraft) providing 3,100 annual training sorties at JBPHH for support in in W-188C, W-189, W-190, W-192, W-193, and W-194 and operations and maintenance activities consolidated in Building 3220 and aircraft parking located on 7 Row.
- Alternative 3 – Establish an additional Air Force AGRS of military pilots to fly CAF ADAIR aircraft (an estimated 14 aircraft) providing 3,100 annual training sorties at JBPHH for support in W-188C, W-189, W-190, W-192, W-193, and W-194.
- Alternative 4 – Establish contract ADAIR capabilities (an estimated 14 aircraft) providing 3,100 annual training sorties at JBPHH for support in W-188C, W-189, W-190, W-192, W-193, and W-194 and constructing new hangars and operations and maintenance facilities.
- Alternative 5 – 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 five 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	No	Yes	Yes	No	**NO**
Alternative 4	Yes	Yes	No	No	**NO**
Alternative 5	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 3: Establish a new Air Force AGRS of military pilots to fly CAF ADAIR aircraft (an estimated 14 aircraft) providing an estimated 3,100 annual training sorties at JBPHH. 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 4: Establish contract ADAIR capabilities (an estimated 14 aircraft) providing an estimated 3,100 annual training sorties at JBPHH and constructing new hangars and operations and maintenance facilities. Establishing the contract ADAIR mission with new facilities construction was considered but not carried forward as the alternative 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 5: Establish dedicated CAF ADAIR by tasking organic CAF units to provide the capability. Tasking organic 4th generation assets to provide dedicated ADAIR support to JBPHH 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. Alternatives 1 and 2 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 **2.5.3**.

2.5.1 Alternative 1: Contract Adversary Air Operating Out of Building 2030

Under Alternative 1, the CAF would establish contract ADAIR capabilities (an estimated 14 aircraft) providing an estimated 3,100 annual sorties at JBPHH. Operations would be located in a consolidated facility in Building 2030 with aircraft parking on 7 Row (refer to **Figure 2-1**). The contract ADAIR aircraft, maintenance, personnel, sorties, airspace use, and defensive countermeasures would be as described under the Proposed Action.

2.5.2 Alternative 2: Contract Adversary Air Operating Out of Building 3220

Under Alternative 2, the CAF would establish contract ADAIR capabilities (an estimated 14 aircraft) providing an estimated 3,100 annual sorties at JBPHH. Operations would be located in a consolidated facility in Building 3220 with aircraft parking on 7 Row (refer to **Figure 2-1**). The contract ADAIR aircraft, maintenance, personnel, sorties, airspace use, and defensive countermeasures would be as described under the Proposed Action.

2.5.3 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 contract ADAIR assets would be established at JBPHH. Organic JBPHH ADAIR support would result in further declines in fielded pilot proficiency or combat operations. JBPHH 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 the 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 and 2 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.

This page intentionally left blank

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

Alternative	Resource									
	Airspace Management and Use	**Noise**	**Safety**	**Air Quality**	**Biological Resources**	**Land Use**	**Cultural Resources**	**Socioeconomics – Income and Employment**	**Environmental Justice and Protection of Children**	**Hazardous Materials and Wastes, Contaminated Sites, and Toxic Substances**
Alternative 1: **Contract ADAIR operations with 3,100 contracted sorties at JBPHH** **Operations and maintenance and aircrew briefings would be consolidated in Building 2030; aircraft parking on 7 Row.**	**JBPHH** Negligible impacts **Special Use Airspace** Negligible impacts	**JBPHH** Overall, noise levels would increase; however, the increase would be negligible. **Special Use Airspace** Negligible changes in the subsonic noise environment. Impacts associated with sonic booms would be negligible	**JBPHH** No impacts on ground, explosive, or flight safety **Special Use Airspace** No impacts on ground, explosive, or flight safety	**JBPHH** Not a significant increase in criteria pollutant emissions No impacts on the region's ability to comply with the NAAQS for regulated pollutants Would not hamper efforts to achieve compliance with ozone NAAQS **Special Use Airspace** No impacts from criteria pollutant emissions No impacts on the region's ability to meet NAAQS for all regulated pollutants	**JBPHH** No impacts on vegetation communities or habitat. Negligible, short- and long-term impacts on wildlife, including birds Minor impacts on birds from potential aircraft/bird collisions No impacts on federally listed species **Special Use Airspace** No impacts on marine wildlife May affect but not likely to adversely affect federally listed Newell's Townsend's shearwater, short-tailed albatross, federally listed sea turtles, marine mammals, giant manta ray, oceanic whitetip shark, and scalloped hammerhead shark. No impacts on Essential Fish Habitat No impacts from noise, including sonic booms	**JBPHH** No changes to existing land use No impacts on the coastal zone **Special Use Airspace** N/A	**JBPHH** No impacts on archaeological resources No impacts on NRHP-eligible Building 2030 **Special Use Airspace** N/A	**JBPHH** No impacts on income or employment Minor, long-term, beneficial impacts from expenditures in the region from contract ADAIR. **Special Use Airspace** N/A	**JBPHH** No disproportionate impacts on minority or low-income populations No disproportionate impacts on children **Special Use Airspace** N/A	**JBPHH** No impacts on hazardous waste management No impacts on asbestos-containing materials and lead-based paint management Long-term, minor, beneficial impacts on managing and disposal of polychlorinated biphenyls No impacts from radon No environmental contamination **Special Use Airspace** 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**	**Land Use**	**Cultural Resources**	**Socioeconomics – Income and Employment**	**Environmental Justice and Protection of Children**	**Hazardous Materials and Wastes, Contaminated Sites, and Toxic Substances**
Alternative 2: **Contract ADAIR operations with 3,100 contracted sorties at JBPHH** **Operations and maintenance and aircrew briefings would be consolidated in Building 3220; aircraft parking on 7 Row.**	● **JBPHH** Same as Alternative 1 **Special Use Airspace** Same as Alternative 1	● **JBPHH** Same as Alternative 1 **Special Use Airspace** Same as Alternative 1	● **JBPHH** Same as Alternative 1 **Special Use Airspace** Same as Alternative 1	● **JBPHH** Same as Alternative 1 **Special Use Airspace** Same as Alternative 1	● **JBPHH** Same as Alternative 1 **Special Use Airspace** Same as Alternative 1	● **JBPHH** Same as Alternative 1 **Special Use Airspace** Same as Alternative 1	● **JBPHH** No impacts on archaeological resources No impacts on NRHP-eligible Building 3220 **Special Use Airspace** Same as Alternative 1	● **JBPHH** Same as Alternative 1 **Special Use Airspace** Same as Alternative 1	● **JBPHH** Same as Alternative 1 **Special Use Airspace** Same as Alternative 1	● **JBPHH** Same as Alternative 1 **Special Use Airspace** Same as Alternative 1
No Action Alternative	● No change to airspace management and use at JBPHH or in the special use airspace	● No change to noise setting at JBPHH or in the special use airspace	● No change to ground, flight, or explosive safety at JBPHH or in the special use airspace	● No change to air quality at JBPHH or in the special use airspace	● No change to biological resources at JBPHH or in the special use airspace	● No change to land use at JBPHH	● No change to cultural resources at JBPHH or in the special use airspace	● No change to income and employment at JBPHH	● No disproportionate impacts on minority, low-income, or children in the community at JBPHH	● No change to hazardous materials and wastes, contaminated sites, and toxic substances at JBPHH

Notes:

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

ADAIR = adversary air; JBPHH = Joint Base Pearl Harbor-Hickam; N/A = not applicable; NAAQS = National Ambient Air Quality Standards; NRHP = National Register of Historic Places

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 and 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 vary depending on the nature of each resource. For example, the ROI for some resources, such as socioeconomics – income and employment 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 (Warning Areas), in the same section and some discuss these elements separately, depending on the complexity of the ROI.

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 would be six Warning Areas (W-188C, W-189, W-190, W-192, W-193, and W-194). A Warning Area is airspace of defined dimensions that extends from 3 nautical miles (NM) outward from the coast of the United States and may be over US waters, international waters, or both. The purpose of Warning Areas is to warn nonparticipating pilots of potentially hazardous activity. Warning Areas may be used for other purposes if released to the FAA during periods when not required for their intended purpose and are within areas in which the FAA has Air Traffic Control (ATC) authority.

Each military organization responsible for a Warning Area develops a daily use schedule. Although the FAA designates Warning Areas for military use, other pilots may transit the airspace under Visual Flight Rules (VFR). Warning Areas exist to notify civil pilots under VFR where heavy volumes of military training exist which increases the chance of conflict and are generally avoided by VFR traffic. Warning Areas in the vicinity of busy airports may have specific avoidance procedures that also apply to small private and municipal airfields. Avoidance procedures are maintained for each Warning Area, and both civil and military aircrews build them into daily flight plans.

The ROI for airspace use and management includes the JBPHH airfield and environs as well as the Warning Areas depicted on **Figure 1-4**.

3.1.2 Existing Conditions – Joint Base Pearl Harbor-Hickam

The JBPHH airfield is operated by the 15 WG supporting military operations conducted by units stationed at the base. Military training has occurred at JBPHH since the construction of the first runway began in 1917. With a large complement of F-22s, JBPHH airfield is shared with the Honolulu International Airport civilian aviation activities. The majority of operations on the shared airfield are performed by Honolulu International Airport.

ATC for JBPHH is provided by Honolulu Approach (FAA). Controlled Class D airspace, which is airspace that extends upward from the surface up to and including 3,200 feet (ft) mean sea level (MSL) within a

4.5-NM radius of JBPHH, has been established around the airfield to support managing air traffic controlled by JBPHH 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 civilian aircraft, with a smaller amount of military aircraft traffic. Military aircraft use makes up 6.2 percent of the airfield use, with the remaining 93.8 percent used by civilian flights (**Table 3-1**).

Table 3-1
Annual Operations at Joint Base Pearl Harbor-Hickam

Use	Annual Operations	Percentage of Use
Military		
154th Wing	6,922	2.2
Other Military	3,600	1.2
Transient	8,814	2.8
Civilian		
General Aviation	292,530	93.8
Total	**311,866**	**100.0**

3.1.3 Existing Conditions – Airspace

The affected environment for airspace management includes Warning Areas where aircraft based at JBPHH perform training operations. F-22 aircraft assigned to JBPHH primarily train in Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194 (see **Figure 1-4** and **Table 2-3**). These Warning Areas are controlled by the US Navy.

3.2 NOISE

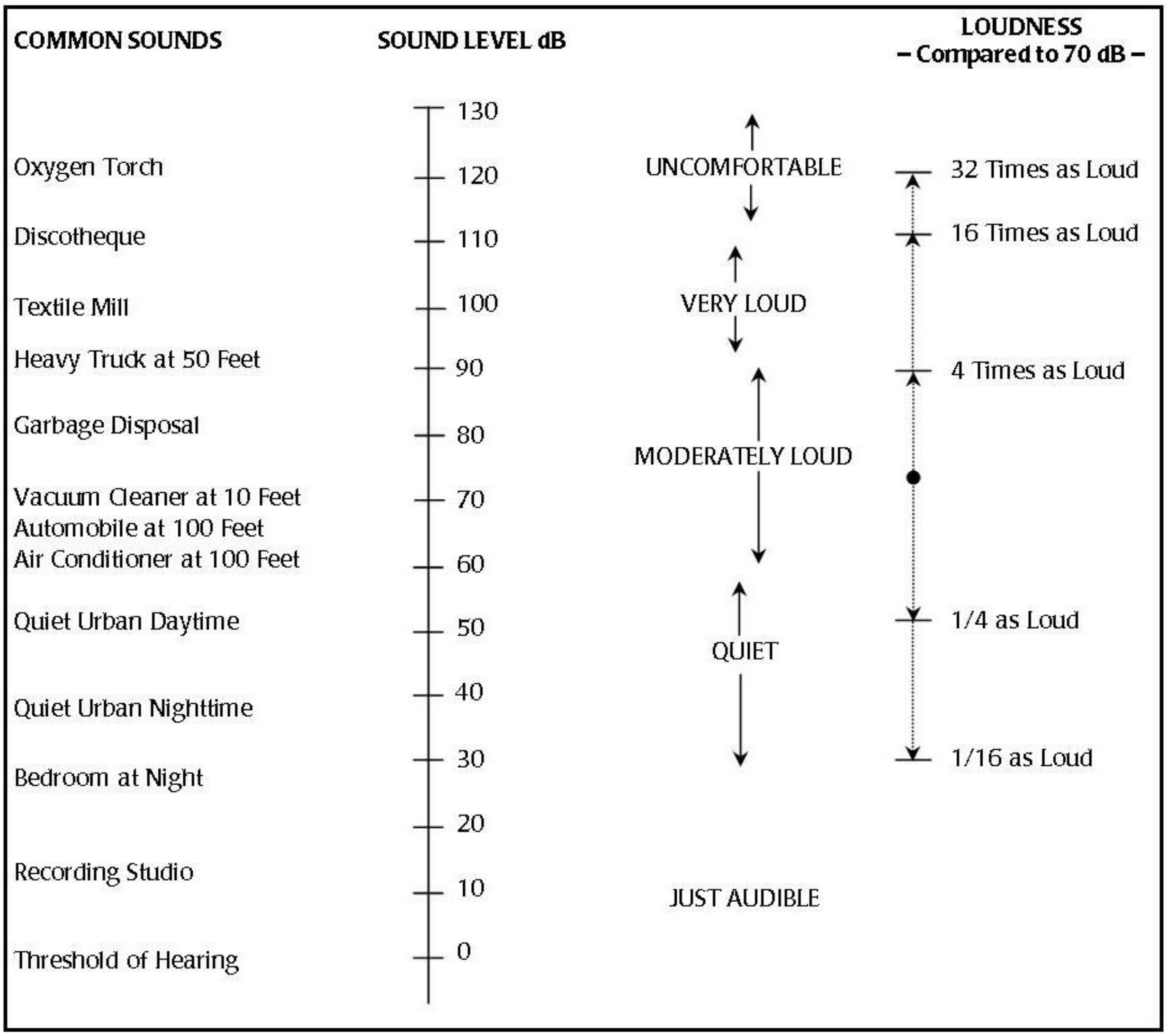
3.2.1 Definition of the Resource

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 nonlinear 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.



Source: Harris, 1979.

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

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.

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 describes the metrics relevant to environmental noise 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 in **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 (American National Standards Institute, 1988). Slowly varying or steady sounds are generally measured over 1 second, denoted as “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.

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.

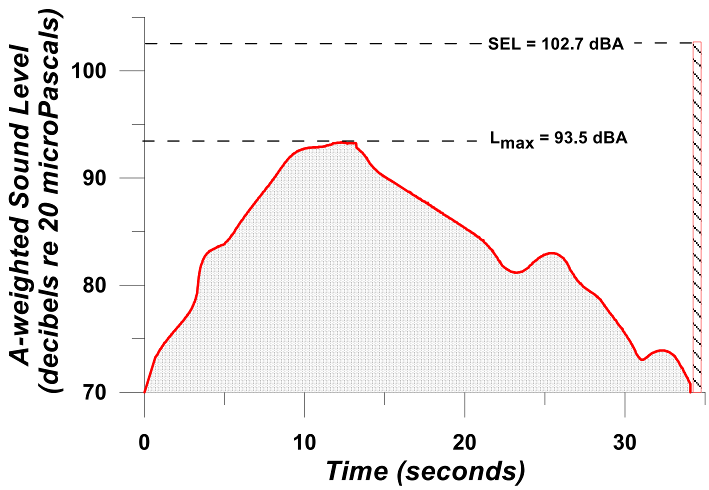


Figure 3-2. Example of Maximum Sound Level and Sound Exposure Level from an Individual Event.

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 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 7:00 a.m. to 3:00 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.

Day-Night Average Sound Level

Day-Night Average Sound Level (DNL or L_{dn}) 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 10:00 p.m. and 7:00 a.m. (i.e., environmental night) 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).

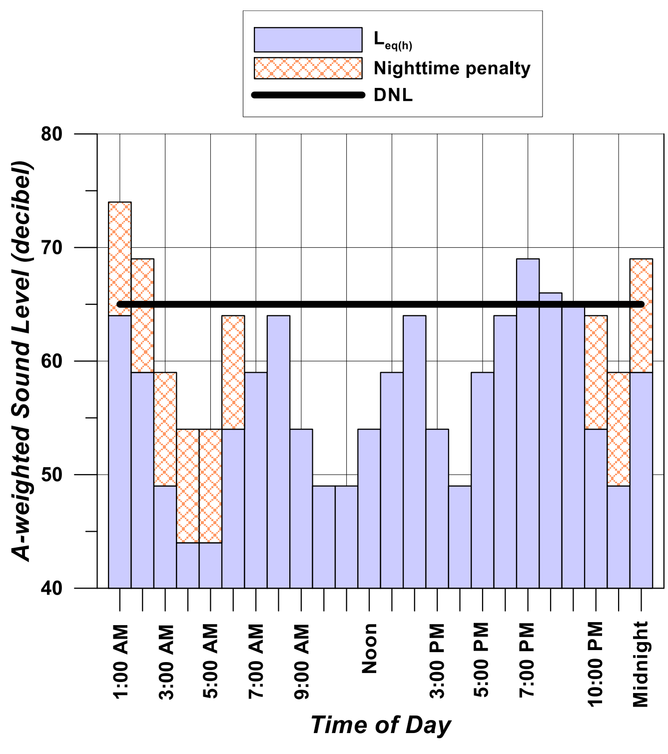


Figure 3-3. Example of Day-Night Average Sound Level Computed from Hourly Average Sound Levels.

Onset-Rate Adjusted Monthly Day-Night Average Sound Level

Military aircraft using special use airspace such as Military Training Routes, Military Operations Areas, Warning Areas, 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 airspace 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 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 Warning Areas, 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 JBPHH airfield and environs as well as the Warning Areas depicted on **Figure 1-4**. Noise analysis at JBPHH was conducted to update the airfield noise contours and the Warning Areas 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 – Joint Base Pearl Harbor-Hickam

As is normal for military installations with a flying mission, the primary driver of noise at JBPHH is aircraft operations. Standard aircraft operations include take-offs, landings, and static run-ups. Closed pattern operations are not flown by aircraft at JBPHH.

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 Honolulu International Airport and JBPHH airfield consist of based military aircraft, civilian aircraft, and a variety of transient aircraft. Existing annual aircraft operations at JBPHH total 311,866 operations, as summarized in **Table 3-2**. An operation is defined as a single takeoff or landing. JBPHH's Runway 08 is used for the majority of military aircraft operations while civilian aircraft operations are primarily distributed between Runways 04 and 08. The majority of aircraft operations at JBPHH are performed by the civilian 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 Joint Base Pearl Harbor-Hickam

Aircraft	Departures		Arrivals		Total Operations		
	Day	Night	Day	Night	Day	Night	Total
F-22	3,461	-	3,451	10	6,912	10	6,922
Other Military	1,252	548	1,195	605	2,447	1,153	3,600
Civilian	131,454	14,811	135,280	10,985	266,734	25,796	292,530
Transients	4,407	-	4,377	30	8,784	30	8,814
Grand Total	**140,574**	**15,359**	**144,303**	**11,630**	**284,877**	**26,989**	**311,866**

Source: AFCEC, 2017

The resultant 65- to 85-dBA DNL contours in 5-dBA increments for the existing daily flight events at JBPHH are shown on **Figure 3-4**. In accordance with Air Force Handbook 32-7084, 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/postflight run-ups, were also modeled. A more detailed discussion of static operations at JBPHH can be found in **Appendix B-2**.

The majority of the DNL contours are over water and extend from the centerline of Runway 15/33 (see **Figure 3-4**). The 65-dBA contour extends beyond the base boundary, approximately 4.5 miles (mi) to the west and approximately 2.5 mi to the east from the end of Runway 08/26. The 70-dBA DNL contour extends approximately 2.2 mi to the west and 1.9 mi to the east from the end of the runway. The 75-dBA DNL contour extends approximately 1.3 mi to the west and 1.3 mi to the east from the end of the runway. The area within each DNL noise contour, including area over water, for the existing conditions as shown on **Figure 3-4** are summarized in **Table 3-3**.

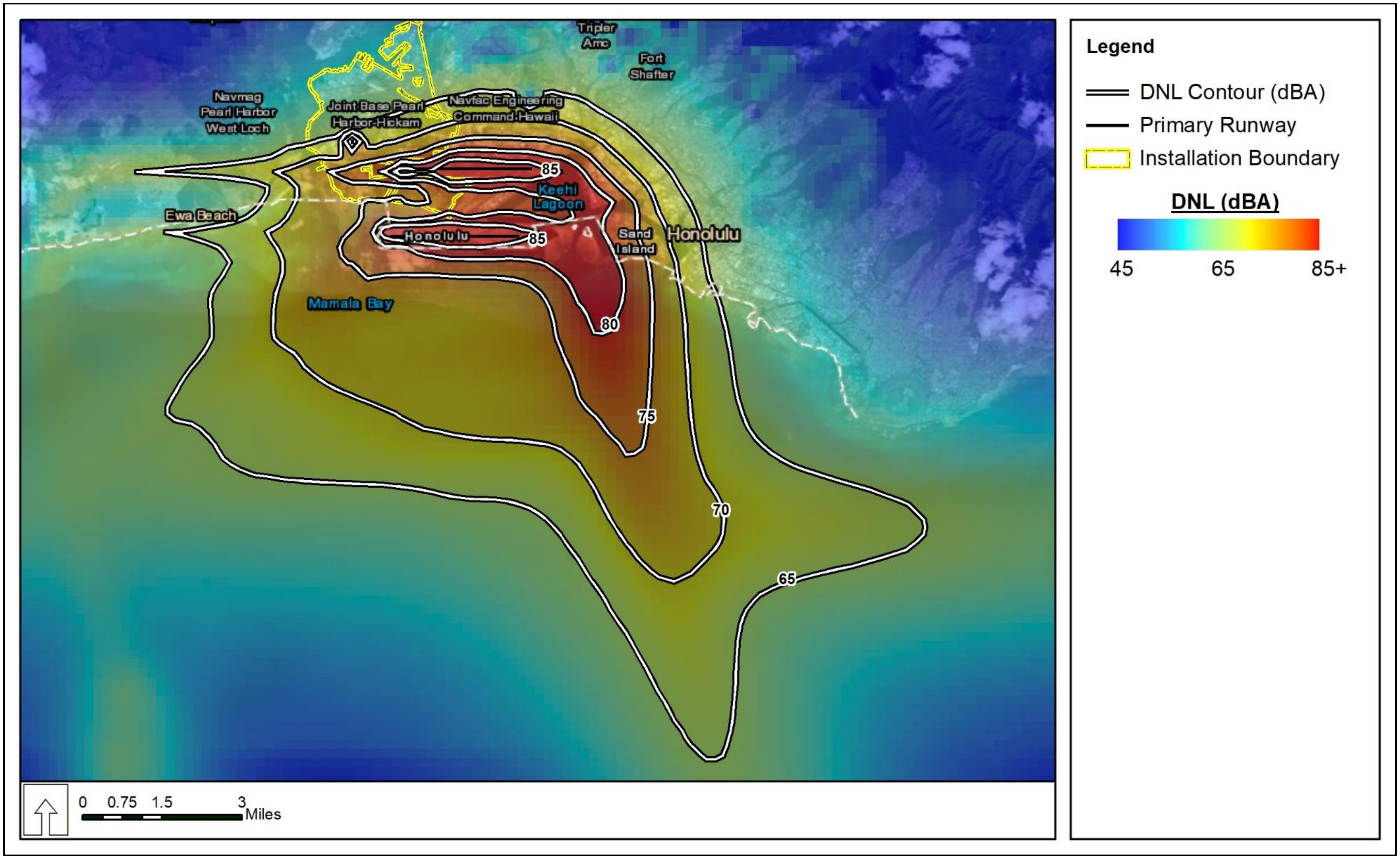


Figure 3-4. Existing Day-Night Average Sound Level Contours at Joint Base Pearl Harbor-Hickam.

Table 3-3
Existing Day-Night Average Sound Level Area Affected at Joint Base Pearl Harbor-Hickam

Noise Level (dBA DNL)	Area Within Noise Contour (acres)[1]
>65	49,613
>70	26,798
>75	10,365
>80	4,292
>85	1,060

Notes:
[1] The on- and off-base area within noise contours was calculated from NOISEMAP modeling results. 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 JBPHH (**Figure 3-5**). 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 JBPHH at the 14 POIs for the existing conditions. Of the 14 POIs, five are currently exposed to a DNL between 60 and 65 dBA and eight of the POIs are exposed to a DNL higher than 65 dBA.

THE FIRST STEP IN IDENTIFYING NOISE SENSITIVE RECEPTORS, ALSO REFERRED TO AS POINTS OF INTEREST (POIS) AROUND MILITARY AIRFIELDS IS TO REVIEW PUBLISHED NATIONAL ENVIRONMENTAL POLICY ACT AND/OR AIR INSTALLATION COMPATIBLE USE ZONE REPORTS TO DETERMINE PREVIOUSLY IDENTIFIED POIS. THESE TYPICALLY INCLUDE SCHOOLS, PLACES OF WORSHIP, AND RESIDENTIAL AREAS AROUND THE AIRFIELD. IN ADDITION, INSTALLATION PERSONNEL WORK WITH THE COMMUNITY TO IDENTIFY AREAS AROUND THE AIRFIELD THAT SHOULD BE CONSIDERED FOR NOISE ANALYSIS.

Table 3-4
Existing Day-Night Average Sound Level at Points of Interest in the Vicinity of Joint Base Pearl Harbor-Hickam

POI		DNL (dBA)
ID	Description	
C01	St. John The Baptist Church / School	64
C02	Kaumakapili United Church of Christ	66
H01	Lanakila Health Center	62
H02	Pauahi Wing Queens Medical Center	62
R01	Residential (108 Street)	70
R02	Residential (Iroquois Drive)	71
S01	Pearl Harbor Elementary School	62
S02	Kalakaua Middle School	67
S03	Iroquois Point Elementary School	66
S04	McKinley High School	62
S05	Aliamanu School	67
S06	Nimitz Elementary School	67
S07	Holy Family Catholic Academy	69
S08	Campbell High School	57

Notes:
Potentially affected POIs were derived from NOISEMAP-modeled noise contours.

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

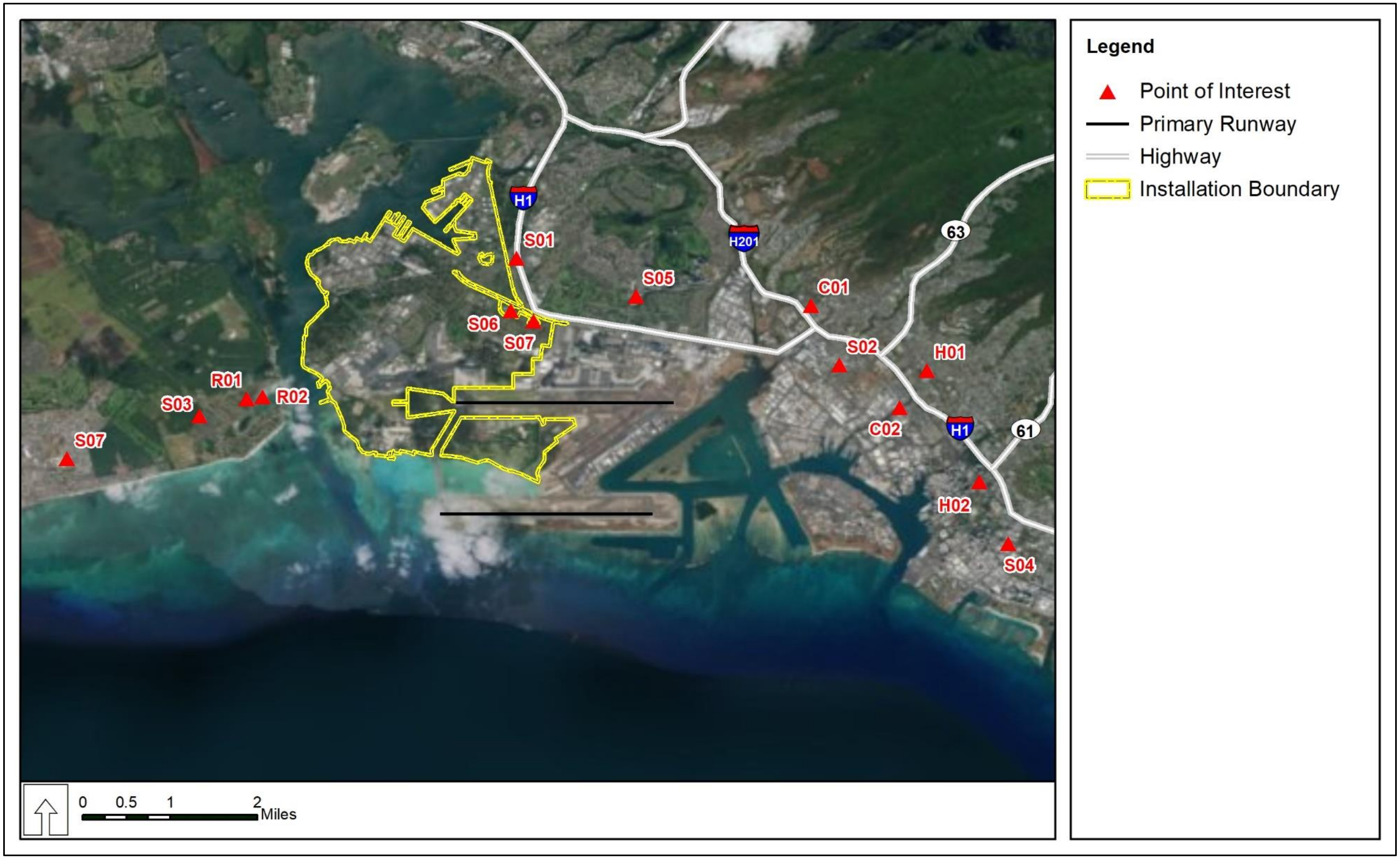


Figure 3-5. Representative Points of Interest on and near Joint Base Pearl Harbor-Hickam.

3.2.3 Existing Conditions – Airspace

The primary Warning Areas used by JBPHH-based aircraft are Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194. The northern Warning Areas (W-188C, W-189, W-190) receive approximately 90 percent of all airspace operations originating from JBPHH while the southern Warning Areas (W-192, W-193, W-194) receive 10 percent. As described in **Section 3.1**, all Warning Areas are over water. A summary of JBPHH's annual airspace operations, including the Sentry Aloha large force exercise, is presented in **Table 3-5**.

Table 3-5
Existing Annual Airspace Operations Summary at Joint Base Pearl Harbor-Hickam

Aircraft	North (W-188C, W-189, W-190)		South (W-192, W-193, W-194)		Total Operations		
	Day	Night	Day	Night	Day	Night	Total
F-22	3,014	101	336	11	3,350	112	3,462
Large Force Exercise	873	27	96	3	969	30	999
Grand Total	**3,887**	**128**	**432**	**14**	**4,319**	**142**	**4,461**

US Navy aircraft operations contribute the vast majority of airspace flight operations in Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194. Noise levels generated by the Air Force are not a major contributor to the overall noise environment of these Warning Areas[1].

Supersonic operations are allowed in Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194 above 30,000 ft if between 15 to 30 NM from land and above 10,000 ft if beyond 30 NM from land. All of these Warning Areas are over water and most of the airspace comprising these Warning Areas is located more than 30 NM from land. Airspace sorties require aircraft to exceed Mach 1.0 (supersonic) for brief periods of time, totaling an estimated 10 percent of total flight time. This is equivalent to less than 5 minutes of supersonic flight activity per sortie.

The BooMap program was used to compute cumulative sonic boom exposure under supersonic air combat training arenas. Under the existing conditions, the cumulative CDNL exposure in the various Warning Areas used by based JBPHH aircraft do not exceed 45 dB CDNL under any airspace.

Single event sonic boom levels estimated for supersonic flights in Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194 are shown in **Table 3-6**. Overpressure (psf) and CSEL (decibels) were estimated directly under the flight path for the based F-22 aircraft at various altitudes and Mach numbers. Overpressure levels estimated for these airspaces range from 6.2 to 1.2 psf depending on the flight conditions.

When sonic booms reach the surface, 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 **Table 3-6** 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 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. Public reaction (limited to vessels 15 NM from shore) 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

[1] William Reabe, Air Warfare Division (OPNAV N98), Naval Airspace and ATC Standards and Evaluation Agency, JBLE, Virginia, e-mail to John Saghera, ACC/A3TO, 27 January 2018.

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 postboom rumbling sounds may be heard.

Table 3-6
Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194: Sonic Boom Levels Undertrack for Aircraft in Level Flight at Mach 1.2 and 1.5

Aircraft	Altitude (feet above mean sea level)			
	10,000	20,000	30,000[1]	50,000
Mach 1.2				
Overpressure (psf)				
F-22	5.4	2.8	1.9	1.2
C-Weighted Sound Exposure Level (decibels)[2]				
F-22	116	111	107	103
Mach 1.5				
Overpressure (psf)				
F-22	6.2	3.2	2.1	1.2
C-Weighted Sound Exposure Level (decibels)[2]				
F-22	117	112	108	103

Note:
[1] Supersonic operations are allowed in Warning Areas above 30,000 feet if between 15 to 30 nautical miles from land and above 10,000 feet if beyond 30 nautical miles from land.
[2] C-weighted Sound Exposure Level – Sound Exposure Level 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 operations and maintenance 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. Safety zones, which include Runway Protection Zones (RPZ) and Quantity-Distance (Q-D) arcs, 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 ADAIR 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 Air Force Instruction (AFI) 11-202 (Volume 3), *General Flight Rules*, 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 JBPHH 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 – Joint Base Pearl Harbor-Hickam 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 operations and maintenance activities conducted by the 154 WG and 15 WG 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 (AFOSH) requirements identified within AFI 91-202 (2019), *The US Air Force Mishap Prevention Program*, and AFMAN 91-203 (2018), *Air Force Occupational Safety, Fire, and Health Standards*..

Emergency Response

For emergency response, Naval Facilities Engineering Command (NAVFAC) Hawaii Federal Fire Department (Fed Fire) provides emergency responders trained on the applicable mission-design series. Should NAVFAC Hawaii Fed Fire request assistance then they would call the Honolulu International Fire Rescue for back-up who are also trained. For crash response, JBPHH is manned with an Aircraft Crash Damaged or Disabled Aircraft Recovery (CDDAR) Team. For events occurring off the airfield civilian authorizes would be first on scene with follow on assistance from NAVFAC Hawaii.

Safety Zones

JBPHH is a joint-use airfield with the Daniel K. Inouye International Airport and therefore must comply with Unified Facilities Criteria 3-260-01 (4 February 2019), *Airfield and Heliport Planning and Design,* which specifies that FAA criteria for land areas underneath aircraft approach paths outlined in FAA Advisory Circular 150/5300-13 are applicable. The FAA RPZs preclude any obstructions and development in these areas must adhere to Unified Facilities Criteria 3-260-01 (**Figure 3-6**).

Q-D arcs are an additional safety zone, described in **Section 3.3.2.2** (**Explosive Safety**) and also shown on **Figure 3-6**.

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. JBPHH is equipped with BAK-14 and BAK-12B arresting systems on Runways 04R and 08R and a MB60 hook cable arresting system on Runway 08L.

3.3.2.2 Explosive Safety

The 15 WG's Munitions Flight is assigned to the 15 MXS located at JBPHH. The Munitions Flight's support to the 15 WG and 154 WG flying missions includes munitions storage, inspection, maintenance, accountability, and line delivery/pick-up.

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.

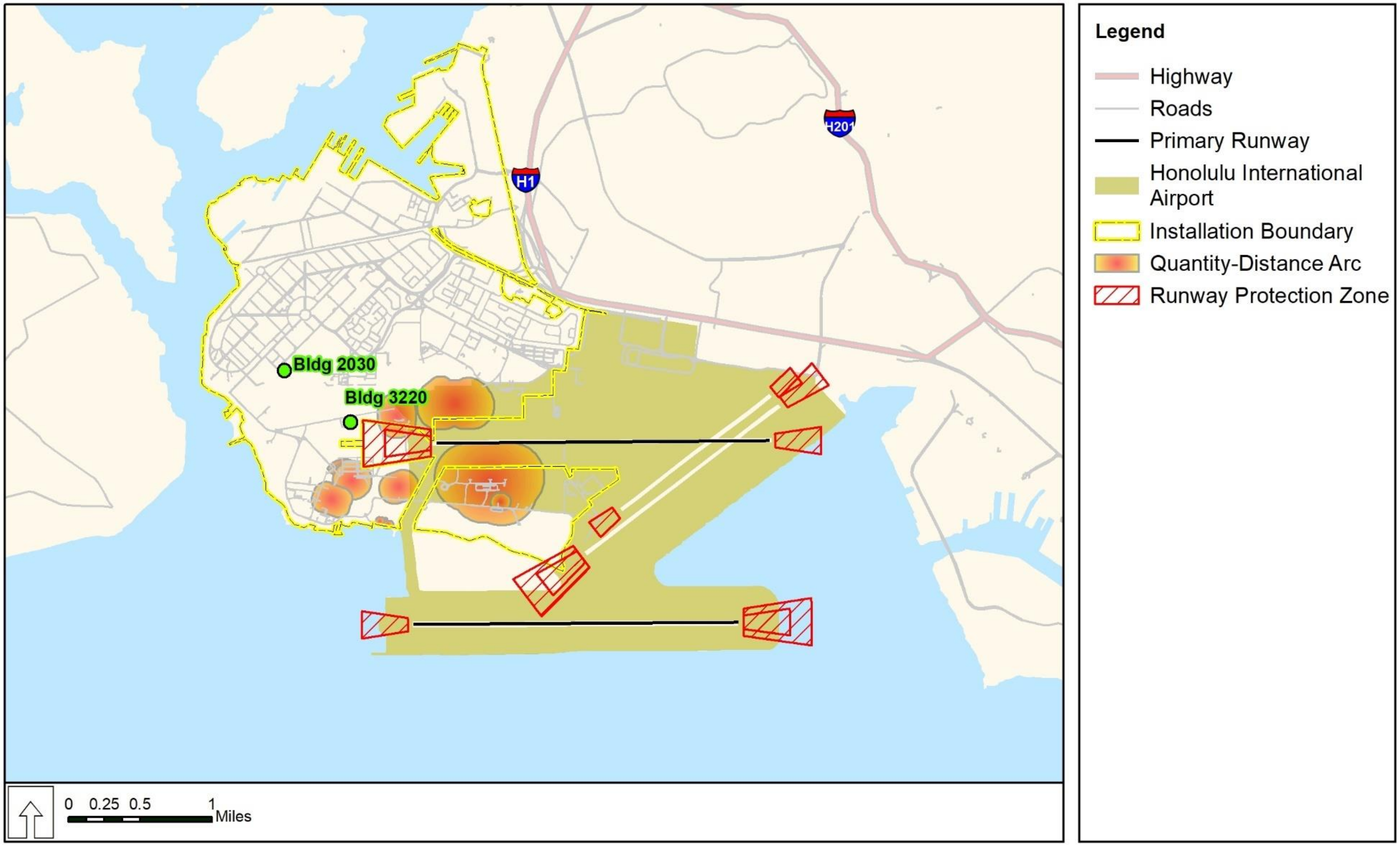


Figure 3-6. Joint Base Pearl Harbor-Hickam Runway Protection Zones and Quantity-Distance Arcs.

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 munitions systems 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 (**Figure 3-6**), 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 is authorized for chaff and flare operations (Hazard Class 1.3).

3.3.2.3 Flight Safety

The ATC Tower is Honolulu Tower, an FAA facility, which is located near the center of the airfield between Runway 08L south of Taxiway G and the approach end of Runway 04L. In addition to supporting the 154 WG and 15 WG training missions, the tower handles a large amount of Instrument Flight Rules and VFR traffic, ranging from airlines to small general aviation aircraft. When aircraft fly beyond its designated Class B airspace, control is transferred to the Honolulu Center Radar Approach Control, a Terminal Radar Control Facility-area control center covering the Pacific Ocean surrounding the Hawaiian Islands.

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) 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 above ground level (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, 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. The Daniel K. Inouye International Airport provides a monthly report to 15 WG Flight Safety. Current data reported an average bird strike rate of 3 per 10,000 operations at Daniel K. Inouye International Airport between January and June 2018. The period of August through April is when the majority of strikes occur due to the large populations of migratory sea birds that winter in the islands. The most common species hit during these months is the Pacific golden plover (*Pluvialis fulva*), a bird roughly the size of an American robin (*Turdus migratorius*). These birds are frequently seen in large numbers (200 to 500 in some cases) on the JBPHH ramp during the hours of darkness. Bird strikes are reported to 15 WG Flight Safety for data collection purposes.

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). JBPHH is located on the island of Oahu, on the south coast near Honolulu. Honolulu County (island of Oahu) is in the State of Hawaii AQCR (40 CFR § 81.76) which also includes the following four counties: Hawaii, Kalawao, Kauai, and Maui. The entire State of Hawaii is included within this one AQCR.

For air quality there are two ROIs, one coinciding with the State of Hawaii AQCR and another coinciding with the airspace within the six Warning Areas (W-188C, W-189, W-190, W-192, W-193, and W-194). 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 in this section. 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. 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. 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]).

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 (μg/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 3-7.**

Table 3-7
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. 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 & 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 parts per billion, 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; ppm = part(s) per million; USEPA = United States Environmental Protection Agency

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 “non-attainment” 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.

The CAA required the USEPA draft general conformity regulations that are applicable in nonattainment areas, or in designated maintenance areas (i.e., attainment areas that were reclassified from a previous nonattainment status, which 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 Part 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 I of the CAA Amendments of 1990 requires the federal government to reduce emissions from cars, trucks, and buses; from consumer products such as hair spray and window-washing compounds; and from ships and barges during the loading and unloading of petroleum products to address urban air pollution problems of ozone, CO, and PM_{10}. Under Title I, the federal government develops the technical guidance that states need to control stationary sources of pollutants. Title I also allows the USEPA to define boundaries of nonattainment areas. 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 in an attainment area.

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 mi of any Class I area (wilderness area greater than 5,000 acres (ac) or national park greater than 6,000 ac).

Although Titles I and V of the CAA Amendments of 1990 apply to JBPHH, compliance requirements under the relevant regulations would not apply. This is because virtually all of the emissions increase from the Proposed Action would occur from mobile sources which are not governed by Titles I and V; therefore, the requirements originating from Titles I and V are not considered.

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_2e 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 4.4**.

In Hawaii, the USEPA regulates GHG primarily through a permitting program known as the GHG Tailoring Rule. This rule applies to GHG emissions from stationary sources. As virtually all of the emissions increase from the Proposed Action would occur from mobile sources, this rule would not apply here. As such, this rule is not discussed further.

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]). Again, this only applies to stationary sources of emissions.

3.4.2 Existing Conditions – Joint Base Pearl Harbor-Hickam

3.4.2.1 Regional Climate

The regional climate of northeast Hawaii (in the island of Oahu, Honolulu city), where JBPHH is located, is classified as a tropical savannah climate. Typically, tropical savannah climates have mean temperatures that are above 64 degrees Fahrenheit (°F) every month of the year and a pronounced dry season (Weatherbase, 2018). The warmest month is August, with average high and low temperatures of 89°F and 75°F, respectively. January and February are the coolest months with an average high temperature of 80°F and an average low temperature of 66°F (US Climate Data, 2018). The regional climate typically includes mild, constant temperatures, with only minor changes in temperature throughout the year. It typically does not have extremes of cold winters and summer heat waves. The constant temperatures can be attributed to the location of the region in the tropical latitude and the influence of the surrounding Pacific Ocean. Average annual precipitation for Honolulu is 17.13 inches (in.). The region is characterized by peak rain fall during winter months, that typically run between October and April. The wettest month by average precipitation is in December with an average of 3.23 in. of rain. The driest month is June with an average of 0.28 in. of precipitation (US Climate Data, 2018). The Hawaiian Islands, including the island of Oahu on which JBPHH is located, is subject to persistent northeasterly trade winds. Average wind speeds are highest during the summer trade-wind period. The winds are typically from the east or northeast and remain mostly uniform throughout the year, except during periods of localized weather events, such as storms or hurricanes when wind conditions may vary (Western Regional Climate Center, 2018).

3.4.2.2 Baseline Air Emissions

The State of Hawaii Department of Health (DOH), Clean Air Branch (CAB) has adopted standards that are the same as NAAQS, except for CO and NO_2, that are more stringent than the NAAQS. The Hawaii DOH has also established standards for hydrogen sulfide for which there are no NAAQS (Hawaii Administrative Rules [HAR] Title 11, Chapter 59).

JBPHH is located on the State of Hawaii 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. Currently, the entire Hawaii AQCR is designated as an unclassifiable/attainment area for all criteria pollutants (40 CFR § 81.312). Unclassifiable areas are those areas that have not had ambient air monitoring and are assumed to be in attainment with NAAQS. The region is also in attainment of the 2015 8-hour, 70 parts per billion of ground level zone O_3 NAAQS (82 Federal Register 54232).

JBPHH operates under a Covered Source Permit, which is equivalent to the CAA Title V permit. JBPHH 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. Stationary air emission sources listed in the Covered Source Permit includes boilers, internal combustion engines, aircraft engine test facilities, incinerators and fuel loading activities. Mobile sources, such as vehicle and aircraft emissions are generally not regulated and are not covered under existing stationary source permitting requirements. An annual air emissions inventory assessment for JBPHH was not available. Boilers, heaters, generators, and engine test facilities would be the largest source of NO_x and CO emissions at JBPHH. Fuel storage, fuel loading and miscellaneous chemical use would contribute to the facility's VOC emissions.

An Air Conformity Applicability Analysis is discussed in **Section 4.4**. **Appendix C** provides an overview of the CAA and the State of Hawaii air quality regulations as well as assumptions used for the air quality analysis and a Draft Record of Nonapplicability, General Conformity Record of Nonapplicability. The Record of Nonapplicability documents that an air conformity applicability analysis is not required for this project at this time.

3.4.3 Existing Conditions – Airspace

3.4.3.1 Regional Climate

The airspace ROI, comprised of Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194, is affected by many of the same features that affect the nearby land areas. Because of the influence of the ocean, the diurnal temperature range in the airspace is less than that found over nearby land areas. Average high temperatures are lower and average low temperatures are higher. Many of the same weather features that affect the land areas impact the airspace, including tradewinds, thunderstorms, and hurricanes.

3.4.3.2 Baseline Emissions

There are no Class I areas within 10 mi of the Warning Areas. State jurisdiction with respect to meeting NAAQS extends to the state seaward boundary (3 mi). The Warning Areas fall outside state jurisdiction; therefore, NAAQS does not apply.

Under 40 CFR Part 55, permitting and other air quality requirements apply to facilities beyond state seaward boundaries. Within 25 NM of the state seaward boundary, facilities must comply with the air quality regulations of the nearest onshore area. Beyond 25 NM from the state seaward boundary, facilities are subject to federal requirements including the PSD preconstruction permit program and the Title V operating permit program; however, these programs apply only to stationary sources and thus would not be applicable to the proposed contract ADAIR operations in the Warning Areas.

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. 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 outcompete native species. 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 JBPHH includes the land surrounding the facilities proposed for use, the land within the airfield noise contours and RPZs (see **Figures 3-4** and **3-6**), and the ocean beneath the special use airspace (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 NMFS. 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. Section 9 of the ESA prohibits the take of federally listed species. “Take” as defined under the ESA means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.”

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 to “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 (US Department of Interior, 2017) 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 to 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 (*Haliaeetus leucocephalus*) or golden eagle (*Aquila chrysaetos*), 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 Marine Mammal Protection Act

The MMPA of 1972 (16 U.S.C Chapter 31) protects all marine mammals: dugongs (*Dugong dugon*) and manatees (*Trichechus* spp.), cetaceans (dolphins, porpoises, and whales), pinnipeds (seals, sea lions, and walruses), polar bears (*Ursus maritimus*), marine otters (*Lutra felina*), and sea otters (*Enhydra lutris*). The MMPA prohibits the "take" of marine mammals in US waters and by US citizens on the high seas, as well as the importation of marine mammals and marine mammal products into the United States. “Take” is defined under the MMPA as “to hunt, harass, capture, or kill” any marine mammal or attempt to do so. The NMFS administers the MMPA in protecting dolphins, porpoises, seals, sea lions, and whales. USFWS administers the MMPA for the protection of dugongs, manatees, walruses, otters, and polar bears. Military readiness activities are not subject to the MMPA provisions of harassment. The “specified geographic area” requirement and the small numbers provision do not apply to military readiness activities or scientific research activities conducted by or on behalf of the federal government.

3.5.1.5 Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act of 1976 (16 U.S.C. § 1801 et seq.) and amended by the Sustainable Fisheries Act in 1996, requires the identification and conservation of Essential Fish Habitat. Essential Fish Habitat includes those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. This can include areas that were historically used by fish. Federal agencies are required to consult with NMFS and prepare an Essential Fish Habitat Assessment if potential adverse effects on Essential Fish Habitat are anticipated from the Proposed Action.

3.5.2 Existing Conditions – Joint Base Pearl Harbor-Hickam

The information presented in this section was gathered from the *Joint Base Pearl Harbor-Hickam Integrated Natural Resources Management Plan* (JBPHH, 2011) and the *Final Hawaii-Southern California Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement* (US Navy, 2018). Data were also gathered from the USFWS, NMFS, and Hawaii Division of Forestry and Wildlife.

3.5.2.1 Regional Biological Setting

Vegetation and Wildlife

The area around the facilities proposed to support contract ADAIR and near the airfield where operations are proposed are entirely developed and no suitable habitat is present at these locations to support sensitive wildlife. The Pearl Harbor Entrance Channel, shoreline of a portion of JBPHH, coastal waters, and areas of intertidal wetlands are sensitive habitats that can support wading and shorebirds, and estuarine and marine species.

Invasive Species

No new development would occur at JBPHH and no activities that could cause the spread or distribution of invasive flora and fauna are proposed; therefore, invasive species are not discussed further.

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 is no suitable terrestrial habitat at JBPHH for any federally or state listed species. The entire base is developed and is located in urban Honolulu; however, federally and state listed species that occur in estuarine and coastal habitats proximate to JBPHH could potentially be affected. One federally listed endangered waterbird, the Hawaiian black-necked stilt (*Himantopus mexicanus knudseni*), is common in coastal wetland areas at JBPHH. Hawaiian duck (*Anas wyvilliana*) X mallard (*Anas platyrhynchos*) hybrids, and potentially

Hawaiian ducks, are also frequently observed in ponding areas around base. The Hawaiian common moorhen (*Gallinula chloropus sandviciensis*) and Hawaiian coot (*Fulica alai*) have also been observed on base, and Hawaiian black-necked stilts (*Himantopus mexicanus knudseni*) are frequently observed in ditches at the airfield. The Hawaiian short-eared owl (*Asio flammeus sandwichensis*) occurs on JBPHH and has been observed on the airfield on several occasions. Hawaiian monk seals (*Monachus schauinslandi*) are occasionally observed at JBPHH beaches, green turtles (*Chelonia mydas*) occasionally use JBPHH beaches for basking (but not generally in the vicinity of the airfield), and injured green turtles occasionally wash up on shore.

A complete list of all federal and state listed species with the potential to occur on or near JBPHH and the special use airspace is provided in **Table 3-8**. Species descriptions for these listed species are provided in **Appendix D**. Because there would be no construction or ground-disturbing activities and all potential impacts on listed species would be from aircraft noise and movement, there would be no impacts on terrestrial reptiles, amphibians, freshwater fish, mollusks, crustaceans, insects, and plants on other areas of Oahu proximate to JBPHH. Potential impacts would be limited to birds, mammals, and marine reptiles and fish listed in **Table 3-8.**

There is no designated critical habitat on or immediately adjacent to JBPHH.

Table 3-8
Federally and State Listed Species with the Potential to Occur on or near Joint Base Pearl Harbor-Hickam and the Special Use Airspace

Species	Federal Status[1]	Hawaii State Status[2]	JBPHH	Warning Areas W-188C, W-189, W-190	Warning Areas W-192, W-193, W-194
Birds					
Hawaiian common moorhen (*Gallinula chloropus sandviciensis*)	E	E	X		
Hawaiian coot (*Fulica alai*)	E	E	X		
Hawaiian duck (*Anas wyvilliana*)	E	E	X		
Hawaiian short-eared owl (*Asio flammeus sandwichensis*)	-	E	X		
Hawaiian black-necked stilt (*Himantopus mexicanus knudseni*)	E	E	X		
Newell's Townsend's shearwater (*Puffinus auricularis newelli*)	T	T		X	X
Short-tailed albatross (*Phoebastria* (=*Diomedea*) *albatrus*)	E	E		X	X
White tern (*Gygis alba*)	-	T	X		
Mammals					
Blue whale (*Balaenoptera musculus*)	E	-		X	X
Bryde's whale – Gulf of Mexico DPS* (*Balaenoptera edeni*)	E	-			
False killer whale – Main Hawaiian Islands Insular DPS (*Pseudorca crassidens*)	E	E		X	X
Fin whale (*Balaenoptera physalus*)	E	E		X	X
Hawaiian monk seal (*Monachus schauinslandi*)	E	E	X	X	x
Humpback whale – Western North Pacific DPS (*Megaptera novaeangliae*)	E	-	X	X	X

Table 3-8
Federally and State Listed Species with the Potential to Occur on or near Joint Base Pearl Harbor-Hickam and the Special Use Airspace

Species	Federal Status[1]	Hawaii State Status[2]	JBPHH	Warning Areas W-188C, W-189, W-190	Warning Areas W-192, W-193, W-194
Humpback whale – Mexico DPS (*Megaptera novaeangliae*)	T	E	X	X	X
Killer whale – Southern Resident DPS* (*Orcinus orca*)	E	-			
Sei whale (*Balaenoptera borealis*)	E	-		X	X
Sperm whale (*Physeter macrocephalus*)	E	E		X	X
Reptiles					
Green turtle – Central South Pacific and Central West Pacific DPSs (*Chelonia mydas*)	E	T	X	X	X
Hawksbill turtle (*Eretmochelys imbricata*)	E	E	X	X	X
Leatherback turtle (*Dermochelys coriacea*)	E	E		X	X
Loggerhead turtle – North Pacific Ocean DPS (*Caretta caretta*)	E	T	X	X	X
Olive ridley turtle (*Lepidochelys olivacea)*	T	T		X	X
Fish					
Giant manta ray (*Manta birostris*)	T	-		X	X
Oceanic whitetip shark (*Carcharhinus longimanus*)	T	-		X	X
Scalloped hammerhead shark – East Pacific DPS (*Sphyrna lewini*)	E	-		X	X

Source:
[1] USFWS, 2019
[2] JBPHH, 2011; Hawaii Division of Forestry and Wildlife, 2019

Notes:
* Although federally listed, the federally listed DPS for these species does not occur in the project area, but another nonlisted DPS of the species could occur.

DPS = Distinct Population Segment; E = Endangered; JBPHH = Joint Base Pearl Harbor-Hickam; T = Threatened

3.5.3 Existing Conditions – Airspace

The information presented in this section was gathered from the *Joint Base Pearl Harbor-Hickam Integrated Natural Resources Management Plan* (JBPHH, 2011) and the *Hawaii-Southern California Testing and Training Environmental Impact Statement/Overseas Environmental Impact Statement* (US Navy, 2018). Data were also gathered from NMFS.

3.5.3.1 Regional Biological Setting

The Insular Pacific-Hawaiian Large Marine Ecosystem encompasses an area of approximately 386,000 square miles. This marine ecosystem extends 1,500 mi from the main Hawaiian Islands to the outer northwestern Hawaiian Islands (US Navy, 2018; Aquarone and Adams, 2009). This Ecosystem is characterized by limited ocean nutrients, leading to high biodiversity but low sustainable yields for fisheries (US Navy, 2018; Aquarone and Adams, 2009).

Circulation in the North Pacific Ocean is driven by the clockwise motion of the North Pacific Subtropical Gyre (US Navy, 2018; Tomczak and Godfrey, 2003). The North Pacific Subtropical Gyre occurs between the equator and 50 degrees North and is defined to the north by the North Pacific Current, to the east by the California Current, to the south by the North Equatorial Current, and to the west by the Kuroshio Current (US Navy, 2018; Tomczak and Godfrey, 2003). The Warning Areas are within the North Pacific Subtropical Gyre.

Bathymetric features in the Warning Areas are dominated by the Hawaiian Archipelago, which were formed from volcanic eruptions. The Hawaiian Archipelago does not have a continental shelf (US Navy, 2018). The Hawaiian Archipelago is composed of high islands, reefs, banks, atolls (coral reef islands surrounding a shallow lagoon), and seamounts (deep seafloor underwater mountains) (US Navy, 2018; Polovina et al., 1995; Rooney et al., 2008). Submarine canyons are present within the Warning Areas, which reach depths greater than 6,000 ft. Further from the archipelago, bathymetric features of the open ocean areas of the Hawaii Range Complex include a variety of bottom types, including seamounts and submarine canyons (US Navy, 2018; Vetter et al., 2010).

The Proposed Action is limited to aircraft overflights and the use of defensive countermeasures by aircraft in the Warning Areas; therefore, a discussion of biological resources is limited to those species that could be found on the ocean surface, primarily marine mammals and sea turtles. All sea turtles are federally listed under the ESA and are discussed in the Threatened and Endangered Species section.

There are 25 cetacean and 1 pinniped species that could occur within the Warning Areas (**Table 3-9**). Some cetacean species are resident year round while others occur seasonally as they migrate through the area.

Table 3-9
Marine Mammals with the Potential to Occur in the Warning Areas

Common Name	Scientific Name	Endangered Species Act Listing	Occurrence in the Warning Areas[1]
Cetaceans			
Blue whale	*Balaenoptera musculus*	Endangered	Peak abundance would be in winter
False killer whale	*Pseudorca crassidens*	Endangered	Occurs year round
Fin whale	*Balaenoptera physalus*	Endangered	Rare in occurrence in the Warning Areas
Humpback whale	*Megaptera novaeangliae*	Endangered, Threatened	Occurs year round
Sei whale	*Balaenoptera borealis*	Endangered	Rare in occurrence in the Warning Areas
Sperm whale	*Physeter macrocephalus*	Endangered	Occurs year round in deep waters
Bryde's whale	*Balaenoptera brydei*	-	Occurs year round
Minke whale	*Balaenoptera acutorostrata*	-	Rare in occurrence in the Warning Areas
Pygmy sperm whale	*Kogia breviceps*	-	Occurs year round
Dwarf sperm whale	*Kogia sima*	-	Occurs year round
Killer whale	*Orcinus orca*	-	Rare in occurrence and primarily in winter
Short-finned pilot whale	*Globicephala macrorhynchus*	-	Occurs year round
Melon-headed whale	*Peponocephala electra*	-	Occurs year round
Cuvier's beaked whale	*Ziphius cavirostris*	-	Occurs year round
Blainville's beaked whale	*Mesoplodon densirostris*	-	Occurs year round
Longman's beaked whale	*Indopacetus pacificus*	-	Occurs year round

Table 3-9
Marine Mammals with the Potential to Occur in the Warning Areas

Common Name	Scientific Name	Endangered Species Act Listing	Occurrence in the Warning Areas[1]
Ginkgo-toothed beaked whale	*Mesoplodon ginkgodens*	-	Potential to occur in Warning Areas although no records of this species exist off Hawaii
Hubbs' beaked whale	*Mesoplodon carlhubbsi*	-	Potential to occur in Warning Areas although no records of this species exist off Hawaii
Common bottlenose dolphin	*Tursiops truncatus*	-	Occurs year round
Pantropical spotted dolphin	*Stenella attenuata*	-	Occurs year round
Striped dolphin	*Stenella coeruleoalba*	-	Occurs year round
Spinner dolphin	*Stenella longirostris*	-	Occurs year round
Rough-toothed dolphin	*Steno bredanensis*	-	Occurs year round
Fraser's dolphin	*Lagenodelphis hosei*	-	Occurs year round
Risso's dolphin	*Grampus griseus*	-	Occurs year round
Pinnipeds			
Hawaiian monk seal	*Neomonachus schauinslandi*	Endangered	Occurs in nearshore waters

Notes:
[1] Source: US Navy, 2018

Invasive Species

Overflight activities from contract ADAIR training in the Warning Areas would have no impacts on invasive species. Invasive species in the Warning Areas are therefore not described further.

Threatened and Endangered Species and/or Species of Concern

Federally endangered and threatened marine species protected under the ESA that could occur in the offshore environment in the Warning Areas are managed by NMFS (see **Appendix D** and **Table 3-8**). Because there are no proposed ocean surface or underwater activities in Warning Areas, and activities are limited to aircraft overflights in the airspace where noise and visual cues could cause behavioral changes in birds, mammals, and sea turtles, there would be no impacts on listed invertebrates or crustaceans.

3.6 Land Use

3.6.1 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 JBPHH and discusses land use categories identified on the base.

ACTIVITY MANAGEMENT PLANS ARE DEVELOPED FOR AN ACTIVITY THAT USES MULTIDISCIPLINARY MANAGEMENT TECHNIQUES (E.G., FINANCIAL, ENGINEERING, PLANNING, PROGRAMMING, ENVIRONMENTAL, INFORMATION TECHNOLOGY, RISK MANAGEMENT, ADMINISTRATION) OVER THE LIFECYCLE ON ASSETS AND APPLIES THEM IN THE MOST COST EFFECTIVE MANNER IN ORDER TO ACHIEVE SPECIFIED AIR FORCE LEVELS OF SERVICE.

The JBPHH Installation Development Plan (IDP) consolidates the installation's Area Development Plans and Network Plans (e.g., transportation, utility plans) into one plan and establishes the installation-wide planning vision. The plan serves as guidance for future development within the installation's eleven planning districts (JBPHH, 2013).

The location(s) and extent of the Proposed Action is evaluated for potential effects from the use of the proposed buildings and 7 Row and land uses adjacent to these facilities on JBPHH. There would be no effect on land use compatibility associated with the airspace that would be used for contract ADAIR training as training areas are over open water. As such, there is no land use discussion associated with the airspace. 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 (**Figure 3-7**).

3.6.2 Existing Conditions – Joint Base Pearl Harbor-Hickam

JBPHH is located approximately 9 mi west of downtown Honolulu, Hawaii. The installation's airfield is bordered by Honolulu International Airport to the east, the Naval Base Pearl Harbor portion of the installation to the north and west, and Mamala Bay to the south. The airfield encompasses approximately 2,520 ac and includes 9,000- and 12,000-ft runways, taxiways, aprons, refueling, and aircraft support facilities. The runways operate under a joint use agreement with the Daniel K. Inouye International Airport. Land use surrounding the airfield is comprised of federal and state lands. No private lands border the airfield boundary (Hickam AFB, 2007).

There are 11 on-base land use categories identified at JBPHH (Hickam AFB, 2007). Categories for housing, community services, and administration are primarily located in the northern portion of the installation and include accompanied and unaccompanied housing, community-related services, and commercial services. Land use categories directly supporting the military mission, such as the airfield, industrial and aircraft operations, are located in the southern portion of the installation. Open space and outdoor recreation are located throughout but generally along the outer edges of the base (Hickam AFB, 2007). Two special interest areas are located beneath the takeoff and approach path of the airfield. These areas are designated as preservation districts and were established by the City of Honolulu and State of Hawaii to provide an outdoor recreation opportunity for public use. The Keehi Lagoon Beach Park is located on the northeastern point of the airfield along Keehi Lagoon and the Sand Island State Recreation Area is located on the oceanfront of Sand Island (Hickam AFB, 2007).

Off-base land within the JBPHH noise contours account for approximately 7,036 ac (**Table 3-10**). Approximately 42 percent of this land is classified as intensive industrial (federal and military preservation comprise approximately 23 percent of the area). Waterfront industrial, industrial mixed use, Kaka'ako Community Development District, and residential make up most of the remaining land use within the noise contours. The Kaka'ako Community District is a living urban development district with housing, parks, commercial business, entertainment, and workplaces (State of Hawaii, 2019a). Most of the development area is located within the existing 65- to 70-dBA noise contours.

Approximately 277 ac of off-base land are within the RPZs of the airfield. Of the 277 ac, approximately 163 ac represent industrial land use and approximately 109 ac of military land uses. Approximately 3 ac of preservation land use are located within the RPZs. Additional information regarding RPZs and other safety zones can be found in **Section 3.3**.

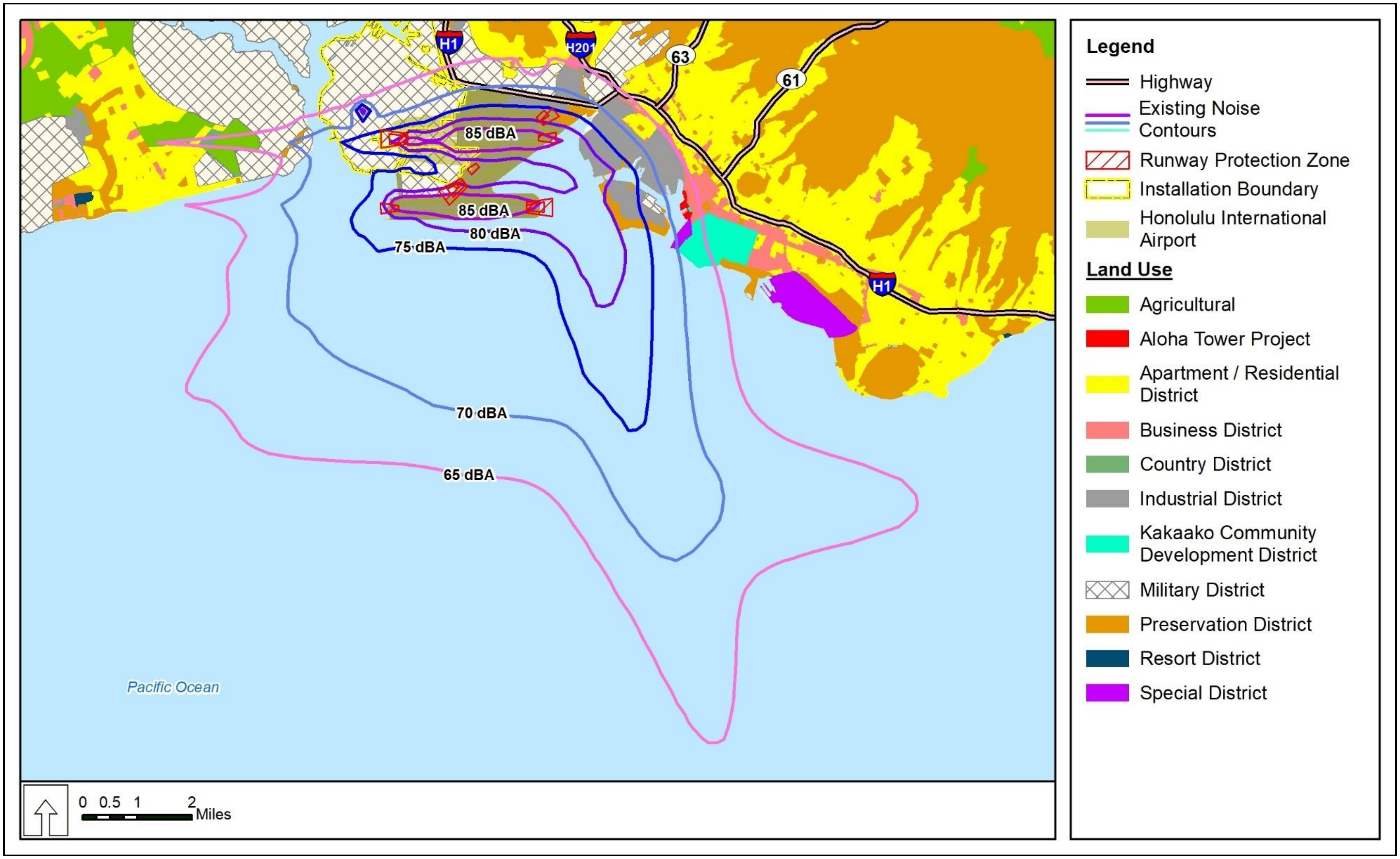


Figure 3-7. Generalized Existing Land Use Categories, Noise Contours, and Runway Protection Zones at Joint Base Pearl Harbor-Hickam.

Table 3-10
Off-base Land Use within Joint Base Pearl Harbor-Hickam Noise Contours

Zone Description	Acres Within Noise Contours						Percent of Total
	65- to 70-dBA DNL	70- to 75-dBA DNL	75- to 80-dBA DNL	80- to 85-dBA DNL	>85-dBA DNL	Total	
Apartment Low-Med-High Density	55.5	0.0	0.0	0.0	0.0	55.5	1.0
General Agriculture	145.7	0.0	0.0	0.0	0.0	145.7	2.0
State: Aloha Tower Project	32.2	0.0	0.0	0.0	0.0	32.2	0.5
Neighborhood Business	7.5	0.0	0.0	0.0	0.0	7.5	0.1
Community Business	55.2	3.3	0.0	0.0	0.0	58.5	0.8
Community/Central Mixed-Use Business	98.0	0.0	0.0	0.0	0.0	98.0	1.3
Country District	24.0	0.0	0.0	0.0	0.0	24.0	0.4
Federal and Military Preservation	896.6	204.8	246.5	208.1	83.5	1,639.5	23.3
Intensive Industrial	198.5	461.5	678.2	661.8	945.0	2,945.0	41.8
Waterfront Industrial	35.1	141.2	253.5	64.5	0.0	494.3	7.0
Industrial Mixed Use	405.7	159.0	1.6	4.0	0.0	570.3	8.1
Kaka'ako Community Development District	199.0	0.1	0.0	0.0	0.0	199.1	2.8
Kaka'ako Special Design District	1.6	0.0	0.0	0.0	0.0	1.6	0.1
Restricted Preservation	33.5	23.2	15.1	5.6	0.0	77.4	1.1
General Preservation	11.3	91.5	161.2	15.8	0.0	279.8	4.0
Public Use Kaka'ako Special Design District	7.4	0.0	0.0	0.0	0.0	7.4	0.1
Residential	246.2	97.0	0.0	0.0	0.0	343.2	4.8
Waterfront Industrial Precinct – Kaka'ako Special Design District	46.7	10.1	0.0	0.0	0.0	56.8	0.8
Total	**2,499.7**	**1,191.7**	**1,356.1**	**959.8**	**1,028.5**	**7,035.8**	**100.0**

Source: City and County of Honolulu, 2018

Notes:
dBA = A-weighted decibels; DNL= Day-Night Average Sound Level

Coastal Zone Management Act

The coastal zone refers to coastal waters and the adjacent shorelines, including islands, transition and intertidal areas, salt marshes, wetlands, and beaches, extending to the outer limit of State title and ownership under the Submerged Lands Act (i.e., 3 NM). The National Oceanic and Atmospheric Administration (NOAA) oversees the Coastal Zone Management (CZM) Program for the federal government. Coastal areas in the United States receive special land use protections through the federal CZM Program. Authorized by the Coastal Zone Management Act (CZMA) of 1972 (16 U.S.C. § 1451 et seq., as amended), this federal program addresses the coastal issues of the United States through a voluntary partnership among the federal government and the coastal and Great Lakes states and territories. The program's purpose is to protect, restore, and responsibly develop the nation's diverse coastal communities and resources.

The Hawaii CZM Program (Hawaii Revised Statutes, Chapter 205A, *Coastal Planning and Management*) was approved by NOAA in 1978. The lead agency for the program is the State of Hawaii, Department of Business, Economic Development and Tourism and consists of a network of authorities and partnerships for implementing the regulations including the planning departments of the Hawaii, Kauai, Maui Counties and the City and County of Honolulu. The objective of the Hawaii CZM Program is to protect valuable coastal ecosystems and promote the protection, use and development of marine and coastal resources (NOAA, 2010). The CZM area encompasses the entire State of Hawaii because of the land-sea connection and the effect of the land on coastal waters (State of Hawaii, 2019b). The CZM area also extends seaward to the limit of the State's police power and management authority, to include the territorial sea. This legal seaward boundary definition is consistent with Hawaii 's historic claims over the Hawaiian archipelagic waters based on ancient transportation routes and submerged lands. JBPHH and much of the area surrounding the airfield are within the Hawaii coastal zone.

3.7 Socioeconomics – Income and Employment

3.7.1 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. Economic 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 Honolulu County, Hawaii, for JBPHH. The special use airspace is entirely over water and is therefore not considered further.

3.7.2 Existing Conditions – Joint Base Pearl Harbor-Hickam

The unemployment rate for Honolulu County, Hawaii, was 2.3 percent in 2017 (US Bureau of Labor Statistics, 2019). This was similar to the 2017 unemployment rate for Hawaii (2.4 percent) and lower than the United States (3.9 percent) (US Bureau of Labor Statistics, 2019). The median household income in 2017 was $80,078 for Honolulu County and $74,923 for the state of Hawaii. The rate of persons in poverty in 2017 was 8.3 percent for Honolulu County and 9.5 percent for the state of Hawaii (US Census Bureau, 2019). The median household income and rate of persons in poverty in the United States in 2017 was $57,652 and 12.3 percent, respectively (US Census Bureau, 2019).

JBPHH is an important part of the Hawaiian and Honolulu County economies. On 1 October 2010, JBPHH was created by combining two historic bases into a single joint installation to support both Air Force and US Navy missions, along with tenant commands, all Servicemembers and their families. Annually, Naval Station Pearl Harbor completed an average of 65,000 boat runs and transported 2.4 million passengers between Ford Island and other harbor locations. US Navy-manned USS Arizona Memorial tour boats transport nearly 2 million visitors to the Pearl Harbor National Memorial each year. Naval Station owns and operates one of the US Navy's largest recreation and special services programs, has its own police and security force and is responsible for DOD firefighters in 13 stations islandwide. Located within the Hawaiian archipelago on the southern, central, and western portions of the island of Oahu, Naval Station Pearl occupies more than 14,000 ac of land on three separate locations: Pearl Harbor Naval Complex, Naval Magazine Lualualei Branch (Lualualei Annex), and Naval Computer and Telecommunications Area Master Station Pacific in Wahiawa, also known as Wahiawa Annex (JBPHH, 2013).

3.8 Environmental Justice and Protection of Children

3.8.1 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 project, 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 US Census Bureau; and youth populations are children under the age of 18 years.

3.8.2 Existing Conditions – Joint Base Pearl Harbor-Hickam

An evaluation of minority and low-income populations in Honolulu County, Hawaii, forms a baseline for the evaluation of the potential for disproportionate impacts on these populations from the Proposed Action at the airfield and on and around JBPHH. In 2018, Honolulu County had a larger percentage of the population that identified as minorities (81.7 percent) compared to the state of Hawaii (78.1 percent) and US (39.3 percent) populations (US Census Bureau, 2019). In Honolulu County in 2018, 43.0 percent of the population identified as Asian, 9.6 percent as Native Hawaiian and Other Pacific Islander, and 22.4 percent as two or more races. This minority population distribution was similar to the self-identified minority populations for the state of Hawaii, where 37.8 percent of the population identifies as Asian, 10.2 percent as Native Hawaiian and Other Pacific Islander, and 23.8 percent as two or more races. In the United States, the distribution of these same minority populations in 2018 were 5.8 percent Asian, 0.2 percent Native Hawaiian and Other Pacific Islander, and 2.7 percent two or more races (US Census Bureau, 2019).

The percentage of the population in poverty in 2017 was only slightly lower in Honolulu County, Hawaii, (8.3 percent) than in the state of Hawaii (9.5 percent) but substantially lower than the percentage of the population in poverty in the United States (12.3 percent). The percentage of the population under the age of 18 in Honolulu County was 21.2 percent in 2018, which was similar to the percentage of children in Hawaii (21.4 percent) and the United States as a whole (22.6 percent).

3.9 CULTURAL RESOURCES

3.9.1 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 and other communities).

Historic properties are cultural resources that have been listed in or determined eligible for listing in the National Register of Historic Places (NRHP). 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, 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, and the NHPA, as amended through 2016, and associated regulations (36 CFR Part 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 to 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 Part 800. Section 106 of the NHPA also requires agencies to consult with federally recognized Native Hawaiian organizations or 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 on 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 contract ADAIR including the area of proposed use at JBPHH and the airspace described in **Section 2.1.6** (see **Figure 1-4**). As per the PA among the Commander, Navy Region Hawaii, the Advisory Council on Historic Preservation, and the Hawaii State Historic Preservation Officer Regarding Navy Undertakings in Hawaii (US Navy, 2012), the ROI for the area of proposed use for JBPHH is specifically limited to the individual buildings being considered for use, Buildings 2030 and 3220.

3.9.2 Existing Conditions – Joint Base Pearl Harbor-Hickam

3.9.2.1 Environmental Setting

JBPHH is situated on the coastal plain located on the leeward side of the Koolau Mountain Range. This is the largest flat expanse of land on Oahu, with elevations ranging from 0 to 20 ft MSL. The base is located just above MSL and is relatively flat throughout. Prior to military construction, the inland area consisted primarily of marshland and ponds. Most of its present surface, including the APE, is fill land, consisting of dredged and graded coral rubble fill from either the entrance to Pearl Harbor or from inland deposits. JBPHH occupies an area which traditionally provided an excellent environment for Hawaiian fishponds. Historic maps indicate that several Hawaiian fishponds once existed in the vicinity of Hickam AFB though during the nineteenth century, the fishponds fell into disuse. By the early twentieth century, the area was leveled and filled with dredged coral fill from Ke'ehi Lagoon and the Pearl Harbor channel. There are no surface remnants of the fishponds and the exact subsurface location of these fishponds is still in question (Hickam AFB, 2008).

3.9.2.2 Archaeological and Traditional Cultural Properties

Native Hawaiians inhabited and extensively utilized the land upon which JBPHH was developed. The archaeological resources resulting from this use are important to the study of Native Hawaiian culture and its development. JBPHH also contains valuable historic resources, including nineteenth century settlements, but primarily through its association with the 7 December 1941 bombing of Hickam Field (Hickam AFB, 2008).

Documented archaeological surveys in the JBPHH area stretches back into the early twentieth century; the first inventory of archaeological resources was completed in 1905. Most recent investigations have focused on the prehistoric occupation of Fort Kamehameha (approximately 0.4 m south of the proposed 7 Row aircraft parking). As a result, a wide range of archaeological sites, dating from the pre-Contact period to the early 1900s and including fishpond complexes, seasonal occupation areas, mortuary activity areas, historic 1800s settlements, early 1900s settlements and early military sites have been recorded. No archaeological sites have been placed on the NRHP; however, 11 sites are documented as potentially eligible and are generally representative of the site types at JBPHH (Hickam AFB, 2008; **Table 3-11**).

Table 3-11
Potentially Eligible National Register of Historic Places on Joint Base Pearl Harbor-Hickam

State Historic Preservation Division Site Name	Site Number	Period of Significance
Ka`ihikapu Fishpond	50-80-13-00081	Pre-Contact (Prior to 1778)
Lelepaua Fishpond	50-80-13-00082	Pre-Contact (Prior to 1778)
Loko Waiaho	50-80-13-00094	Pre-Contact (Prior to 1778)
Loko Keoki	50-80-13-00095	Pre-Contact (Prior to 1778)
Loko Papiolua	50-80-13-00096	Pre-Contact (Prior to 1778)
Fort Kamehameha Burial Area	50-80-13-4499	Pre-Contact (Prior to 1778)
Midden site (possibly Holokahiki)	50-80-13-5325	Pre-Contact (Prior to 1778)
Hearths site	50-80-13-6406	Pre-Contact (Prior to 1778)
Hearths and post molds site	50-80-13-6692	Pre-Contact (Prior to 1778)
Queen Emma Residence	(no number)	Post-Contact (1800s Settlement)
Watertown	(no number)	Post-Contact (1800s Settlement)
Pu'uloa Camp	(no number)	Post-Contact (1800s Settlement)

A predictive model of archaeologically sensitive areas for the installation was developed based on the results of archaeological investigations conducted on Hickam AFB between 1975 and 2006. Areas were classified as having either a low, medium, or high probability for discovery of archaeological resources. Low probability areas include those portions of the base where extensive ground-disturbing activities have occurred and/or areas in which archaeological investigations have determined that no cultural resources exist (Hickam AFB, 2008). The APE is classified as having low potential for archaeological resources based on disturbance; this area of the base was developed prior to WWII and as a result, no archaeological surveys were conducted prior to construction. The APE is also believed to have been constructed upon a filled fishpond[2].

Traditional cultural properties (TCPs) and sacred sites are a special class of cultural resources that require specialized expertise in their identification and assessment. A TCP study was completed for Hickam AFB in 2005. The Hickam AFB Integrated Cultural Resources Management Plan (ICRMP) (2008) indicates that though the study contains archival data and ethnographic interview information, it does not formally designate any TCPs. An updated, consolidated study was completed for JBPHH in 2016 (NAVFAC) in which the location of 22 potential Native Hawaiian TCPs were presented within the boundaries of JBPHH. The term “potential TCP” is used in the 2016 JBPHH study explicitly to refer to Hawaiian cultural places that might be considered eligible for inclusion in the NRHP for possible cultural significance following the definitions and guidelines in the NRHP based on archival research and ethnographic data. These potential TCPs include fishponds, fish traps, fisheries, settlements, and burial locations.

Many human skeletal remains, burial pits, grave goods, and other Native American Graves Protection and Repatriation Act (“NAGRPA”) items have been archaeologically recovered across JBPHH, particularly, associated with the Fort Kamehameha area of the base. Among the most common sites for burial grounds used by Hawaiians were coastal sand dunes.

The coastline of Fort Kamehameha contained pre-Contact and post-Contact burials of Native Hawaiians. Between 1975 and 1999, approximately 100 sets of human remains, in addition to animal burials such as dogs, a cat, and an ungulate (likely a horse or mule), were found at Fort Kamehameha. Standard Operating Procedures are outlined in various management documents (e.g., ICRMP, PA) to ensure the correct and respectful treatment of remains and that ownership of the remains and funerary objects is determined following Native American Graves Protection and Repatriation Act policy, in consultation with Native Hawaiians and Native Hawaiian organizations. The ICRMP specifically identifies three groups as having expertise in Native Hawaiian affairs, the Office of Hawaiian Affairs, the Oahu Burial Council, and *Hui Malama I Na Kupuna O Hawai`i Nei*. (Hickam AFB, 2008).

3.9.2.3 Architectural Properties

Building 2030 is located within the Hickam Field National Historic Landmark (NHL) along the flight line. Building 2030 (Hangars 15 and 17) was constructed in 1937. Building 2030 is one of the first four double-hangar buildings (Hangars 15 and 17) constructed at Hickam Field. The H-shaped concrete hangars are connected by a central bay. Building 2030’s character-defining features include the gabled end wall, corner piers, and sliding 30-ft-high hangar doors with multilight, metal windows (Hickam AFB, 2008).

Building 2030 has been classified as Historic Category I (Property of Major Importance) with two periods of significance. Period 2 was the Army period from 1937 to 1947, including the establishment of Hickam Field and World War II. Period 3 is the Air Force period post 1947 including the Cold War. Building 2030 is listed on the NRHP as part of the Hickam Field NHL. The NHL includes part of the original flight line, five hangars, an air operations building, and a former barracks. The NHL is significant for its association with the Japanese attack on Oahu on 7 December 1941 during World War II. Building 2030 is also located within the boundaries of the Hickam Historic District located in the northwestern portion of the installation (Hickam AFB, 2008).

[2] Jeff Pantaleo, CIV EV2 Archaeologist, NAVFAC Hawaii, e-mail to Mackenzie Caldwell Rohm, MA RPA, Cultural Resources Specialist, Versar, Inc., 30 January 2019.

Building 3220 is located southeast of Building 2030, across the flight line. Constructed in 1945, Building 3220 is eligible for inclusion in the NRHP. It was one of two relocated Butler hangars that served as the initial maintenance facilities for HIANG's Fighter Interceptor Squadron through the 1950s. The Fighter Interceptor Squadron program was an important component of the US Air Defense Command mission during the Cold War. It is believed that Building 3220 was relocated to its current location in 1947 (Hickam AFB, 2008).

Building 3220 is a prefabricated Butler hangar of steel truss construction with corrugated metal sheathing. The hangar features an elliptical arch shape and is open at two ends. Interior office additions constructed of vertical wood siding, along one side of the interior and at the back end, are believed to be independent of the hangar structure. Building 3220 is not located within a historic district.

3.9.3 Existing Conditions – Airspace

3.9.3.1 Environmental Setting

The airspace APE for contract ADAIR includes the airspace as described in **Section 2.1.6**. Because this airspace is over water, no discussion of TCPs or NRHP-listed resources is included. Potential underwater archaeological resources are described below.

3.9.3.2 Cultural Resources in the Marine Environment

Though the location, number, and type of underwater archaeological resources have not been as formally documented through time as terrestrial resources have, underwater resources have gained scientific and public prominence in the past two decades and are currently being tracked through several industry and government-run vehicles. The Maritime Archaeology and History of the Hawaiian Islands Foundation was developed to identify key issues affecting submerged cultural resource management within the Pacific and is working towards developing a submerged cultural resource management plan tailored to the unique social, cultural and political environments of Hawaii and the Pacific Islands. Part of this process includes educating the public on submerged cultural resources, cultivating community interest in the field, and recruiting and training volunteers. Currently data are being gathered to produce a Hawaiian shipwreck database that can be utilized by the public (Maritime Archaeology and History of the Hawaiian Islands Foundation, 2011). The NOAA maintains a Wrecks and Obstructions Database. Their Automated Wreck and Obstruction Information System contains information on over 10,000 submerged wrecks and obstructions in the coastal waters of the United States including latitude and longitude and a brief historic description. Approximately 50 obstructions, visible wrecks, submerged wrecks, and distributed remains of wrecks are associated with Pearl Harbor and the southern coast of Honolulu (NOAA, n.d.).

Underwater resources can include shipwrecks associated with naval preparations for World War I and World War II. Private and commercial wrecks that span the seventeenth through twentieth centuries are documented as well. While shipwrecks have understandably been the primary subject of underwater archaeology, it is important to note that the potential for submerged prehistoric sites is equally great, particularly for an island nation, where the people's lives and lifeways have traditionally been so intrinsically tied to the water.

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

3.10.1 Definition of the Resource

The Comprehensive Environmental Response, Compensation, and Liability Act, as amended by the Superfund Amendments and Reauthorization Act 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 Part 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 semisolid 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, *Environmental Quality*, 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. AFI 32-7042, *Waste Management*, sets forth procedures for management of hazardous waste and is the driver for the development of the NAVFAC Hawaii *Hazardous Waste Management Plan*.

Through the Environmental Restoration Program (ERP) (formerly the Installation Restoration Program [IRP]) initiated in 1980, a subcomponent of the Defense ERP that became law under the Superfund Amendments and Reauthorization Act, 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 and Comprehensive Environmental Response, Compensation, and Liability Act. 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 Part 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 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 Part 1303), the Consumer Product Safety Commission 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 US Surgeon General 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 (US Surgeon General, 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 US Surgeon General 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 Part 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 Part 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 this resource is JBPHH, except for radon which is the city of Honolulu.

3.10.2 Existing Conditions – Joint Base Pearl Harbor-Hickam

The information below was summarized from several documents, including management plans, material surveys, the Hawaii DOH, and other State of Hawaii records, and related documentation.

3.10.2.1 Hazardous Materials and Wastes

Under federal law, state regulations can be more stringent than federal policies. The Hawaii DOH received primacy of its hazardous waste program from the USEPA in 2001; therefore, the regulations governing hazardous waste in Hawaii are contained in the HAR Title 11. The majority of HAR regulating hazardous waste mirrors USEPA regulations; HAR § 11-260 to 272 control the identification, treatment, storage, transportation, handling, labeling and disposal of hazardous waste. HAR § 11-273 regulates the management of universal waste and HAR § 11-279 regulates used oil storage, transportation, and disposal (NAVFAC Hawaii, 2014).

Hazardous and toxic material procurements at JBPHH are approved and tracked by the NAVFAC Hawaii Environmental Services hazardous waste Disposal Branch which has overall management responsibility of the installation environmental program. NAVFAC Hawaii Environmental Services Hazardous Waste Disposal Branch supports and monitors environmental permits, HAZMAT, and hazardous waste storage, spill prevention and response (NAVFAC Hawaii, 2014).

The NAVFAC Hawaii Environmental Services Hazardous Waste Disposal Branch maintains the *Hazardous Waste Management Plan* (NAVFAC Hawaii, 2014) as directed by Office of the Chief of Naval Operations Instruction 5090.1 (series) Chapter Title – Hazardous Waste Management Ashore and complies with 40 CFR Parts 260 to 272. This plan prescribes the roles and responsibilities 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 JBPHH are managed by the Naval Supply Systems Command Fleet Logistics Center Pearl Harbor Hazardous Materials Information Network Center. Hazardous materials and petroleum products such as fuels, flammable solvents, paints, corrosives, pesticides, deicing fluid, refrigerants, and cleaners are used throughout JBPHH for various functions including aircraft maintenance; aircraft ground equipment maintenance; and ground vehicles, communications infrastructure, and facilities maintenance (NAVFAC Hawaii, 2014).

Hazardous wastes generated at JBPHH 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 Part 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. JBPHH recycles all lubricating fluids, batteries, and shop rags and hazardous wastes are managed in accordance with the JBPHH *Hazardous Waste Management Plan* (NAVFAC Hawaii, 2014).

JBPHH is classified as a large-quantity hazardous waste generator as defined by the USEPA (40 CFR § 260.10), generating more than 2,200 pounds of nonacute hazardous waste per month. JBPHH operates numerous initial accumulation points (IAPs), where up to 55 gallons of “total regulated hazardous wastes” or up to 1 quart of “acutely hazardous wastes” are accumulated. IAP managers are responsible for properly segregating, storing, characterizing, labeling, marking, packaging, and transferring all hazardous wastes for disposal from the IAP to an established 90-day storage area according to federal, state, local, and US Navy regulations. The Hazardous Waste Program Manager is responsible for characterizing and profiling each waste stream. JBPHH also operates several 90-day accumulation sites, where hazardous waste accumulates before transfer to the DLA Disposition Services for transportation off-installation for ultimate disposal (NAVFAC Hawaii, 2014). Wastes generated on base are managed under regulations set forth in the JBPHH RCRA Part B permit. JBPHH also holds a RCRA permit for handling the disposal and treatment of waste munitions. DLA Disposition Services Pearl Harbor, formerly Defense Reutilization and Marketing Office, manages hazardous waste and HAZMAT disposal.

The Navy Region Hawaii owns a permitted treatment, storage, and disposal facility, referred to as the Conforming Storage Facility (CSF), at Building No. 1526 under the USEPA ID No. HI 117 002 4334. The CSF is utilized as a central facility for the receipt and temporary storage of hazardous waste. The CSF is a jointly operated hazardous waste storage facility between NAVFAC Hawaii and the DLA Disposition Services Pearl Harbor. After the hazardous waste is received, the CSF Site Manager verifies if the hazardous waste can be reused or treated. If reuse or treatment is not feasible, the hazardous waste shall be temporarily stored at the CSF pending transfer to the DLA Disposition Services Pearl Harbor or shipment to an USEPA-approved disposal site in the continental United States.

Under the same USEPA ID No., the Region owns the Industrial Waste Treatment Facility (IWTC) at Building 1424 in JBPHH. The management and hazardous waste processing requirements for both the CSF and IWTC are detailed in the CSF and IWTC Permit.

3.10.2.2 Installation Restoration Program

The JBPHH IRP investigated locations of various Areas of Concern and Solid Waste Management Units for hazardous waste contamination. A total of 102 sites were identified at JBPHH. Of those sites, 85 are closed with no further action planned and 17 are in the investigation stage. Ten sites are identified as IRP sites, and seven sites are UST sites. Three identified sites that are in the vicinity of facilities or areas proposed for use by contract ADAIR are currently under investigation and consist of Unexploded Ordnance (UXO) H00106 – TS01A-MRA1X/Skeet Range (aircraft parking on 7 Row), Site H0074 – ST031 – Hangar Avenue USTs (Building 2030), and Site H0037 – ST028 – Hickam Runway USTs (Building 3220).

Building 2030 is adjacent to and northwest of Environmental Restoration, Navy (ERN) Site H0009 LUC; and 7 Row is adjacent to and south of ERNs Site H0061 LUC and north of ERNs Site UXO H00106; Building 3220 is not adjacent to an ERN Site (NAVFAC EV, 2018).

The aircraft parking area 7 Row is within area of concern for Site ST29 – Bishop Point Underground Storage Tanks at JBPHH. A Final Record of Decision requiring no further action was issued in 2011. Site ST29 is 1 of 13 geographical groupings of POL components within Operable Unit 2 (NAVFAC Hawaii, 2011).

ERNs Site UXO H00106 are a former skeet and trap range, active between 1940 and 1943. The area covers approximately 20.5 ac and is part of the restricted JBPHH flight line. Approximately 40 percent of the land is paved, including a separately fenced parking area enclosing RV Lot 1-108. The former firing stations are entirely located within RV Lot 1-108. A portion of the shot fall area is a storage area occupied by the HIANG and is partially paved[3].

Sites ST28 and ST31 are large areas that contain many USTs that were identified at various times and in various Air Force reports[4]. Site ST28 (H0037), Hickam Runway USTs, formerly consisted of 21 POL system components located in the southwestern portion of JBPHH and includes part of the aircraft taxiway and parking apron. Two of the subsites were transferred to become part of Hickam Site SS156. Of the remaining 19 POL system components of Site ST28, 13 are USTs, 3 are cesspools, 1 is an oil-water separator, 1 is a fuel pipeline, and 1 is a concrete vault that contained petroleum-contaminated water and sludge. Sixteen of the 19 remaining subsites have been granted unrestricted closure. Three of the remaining subsites (ST28 3214A, ST28 F-3016 and ST28 43-10-11 Hangar) are being managed under a Revised Final Environmental Hazard Management Plan (EHMP) produced in September 2013. Building 3220 is in the general vicinity of these subsites. These subsites are

- ST28 3214A (Former Cesspool) – lead (soil), 1-methylnaphthalene (groundwater);
- ST28 F-3016 (UST) – Tank not investigated because site is under laydown yard for heavy equipment and a soil stockpile is above the area; and

[3] Pete LaPlaca, NAVFAC HI EV3, JBPHH Oahu Hawaii, e-mail forwarded to Eric Webb, Ph.D., Technical Services Director, Vernadero Group, Inc., 28 January 2019.

[4] Jeffrey Klein, NAVFAC HI EV3, JBPHH Oahu Hawaii, e-mail forwarded to Eric Webb, Ph.D., Technical Services Director, Vernadero Group, Inc., 23 January 2019.

- ST28 43-10-11 Hangar (Fuel Pipeline) – total petroleum hydrocarbons (TPH)-gasoline, TPH-diesel, 1-methylnaphthalene, 2-methylnaphthalene, and naphthalene (soil and groundwater) and benzo[a]pyrene (soil).

Per the September 2013 Revised Final Closure Summary Report and EHMP for Site ST28, the US Navy will implement the following self-directed site management and monitoring activities within the site management areas:

- Implement administrative controls to prevent unauthorized excavation of soils and ensure proper management of authorized excavation activities and excavated soils at ST28 F-3016 (at any depth), at ST28 43-10-11 Hangar (at depths greater than 3.25 ft), and at ST28 3214A (at depths at which groundwater may be encountered, at approximately 5 ft).
- Should future activities identify contamination in areas that were not previously identified in the remedial investigation, conduct further site investigations, and expand the site management area boundaries, if necessary.

Site ST31 is an IRP site known as the Hangar Avenue USTs. Building 2030 and 7 Row are in the general vicinity of this site. The site is made up of 36 POL system components (subsites), of which 26 are USTs, 6 are pipelines, 2 are oil-water separators, and 2 are ASTs. Three subsites ST31 F-233, ST31 40-8-1-Cargo, and ST31 1046 are being managed under the EHMP. Contaminants of concern for the subsites are:

- ST31 F-233 (UST): TPH-diesel (soil and groundwater), 1-methylnaphthalene (groundwater), benzo[a]pyrene (groundwater)
- ST31 40-8-1-Cargo (Fuel Pipeline): TPH-gasoline, lead (soil)
- ST31 1046 (UST): TPH-diesel (soil and groundwater), 1-methylnapthalene (soil)

The US Navy will implement the following self-directed site management and monitoring activities within the site management areas:

- Implement administrative controls to prevent unauthorized excavation of soils at depths greater than 4.5 ft in the management area and ensure proper management of excavation activities and proper management of excavated soils.
- Should future activities identify contamination from the spill site in areas that were not previously discovered or identified in the remedial investigation, the US Navy will conduct further site investigations and expand the site control boundaries, if necessary.

3.10.2.3 Asbestos and Lead-Based Paint

NAVFAC developed the *Asbestos Program Management Plan* (P-502) for JBPHH, which includes program administration, organizational roles and responsibilities, standard work practices, and documentation (NAVFAC Hawaii, 2017). All buildings have been added to the JBPHH File Repository for Electronic Data. Within the File Repository for Electronic Data, architectural plans for all buildings are stored and electronic copies of all available analytical results for asbestos sampling and analysis associated with individual buildings are in the early stages of being added (NAVFAC Hawaii, 2017). Buildings constructed prior to 2005 are assumed to contain ACM unless proven by sampling that materials are not ACM. Asbestos surveys for Buildings 2030 and 3220 were not available for review.

Comprehensive information or records on the presence or absence of LBP in Buildings 2030 and 3220 is not available.

3.10.2.4 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 Hawaii is Zone 3 (Low Potential, predicted indoor average level less than 2 pCi/L. The Hawaii Noise Radiation and Indoor Air Quality Branch (2019) indicates that radon levels in Honolulu County vary from under 2.0 pCi/L (92 percent of reported results in Zone 3), to 8 percent of results between 2.0 and 3.9 pCi/L (Zone 2). Each zone designation reflects the average short-term radon measurement that can be expected in a building without the implementation of radon control methods.

3.10.2.5 Polychlorinated Biphenyls

Specific PCB materials at the installation have not been identified. Note 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-PCB containing). As facility repairs and demolition occur, the suspected ballasts should be removed and properly disposed. Comprehensive information or records on the presence or absence of PCBs in Buildings 2030 and 3220 is not available.

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 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- 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 assessed 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.

4.1 AIRSPACE MANAGEMENT AND USE

4.1.1 Evaluation Criteria

Adverse impacts on airspace might include modifications to Warning Areas 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 14 contract ADAIR aircraft would provide training sorties at JBPHH and Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194 as described in **Chapter 2**.

An estimated 3,100 contracted sorties would be added to the current number of sorties flown at JBPHH. 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 the Warning Areas would increase by an estimated 3,072 sorties. Sorties in Warning Areas would include both subsonic and supersonic flight operations.

4.1.2.1 Alternatives 1 and 2

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 on to airspace management and use are the same for all action alternatives.

The addition of an estimated 3,100 sorties is negligible, increasing the annual number of sorties by 2 percent. This change is not expected to impact the operational capacity or necessitate changes to airspace locations or dimensions around JBPHH. Potential impacts on the airspace around the airfield are expected to be negligible and long-term.

There would be a 69 percent increase in Air Force aircraft operations in Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194. Additionally, Air Force flights at night would increase by approximately 93 sorties per year. The local squadron does not depart the airport after 10:00 p.m., but 2 to 3 percent of the sorties do return after 10:00 p.m. Contractor night sorties would be flown during the 154 WG's approved flying window and concurrent to the 154 WG's operations in the airspace. There is no identifiable negative impact on current operations in the Warning Areas when considering the Proposed Action in conjunction with existing military activity. All operations would be conducted and deconflicted in accordance with existing Using Agency operating procedures and scheduling instruction procedures and priorities (Air Warfare Division [OPNAV N98], Naval Airspace and Air Traffic Control Standards and Evaluation Agency)[1].

The Warning Areas proposed for use have the capacity and are in locations with the dimensions necessary to support the contracted sorties proposed; therefore, potential negligible impacts on airspace are expected from the implementation of Alternatives 1 and 2.

4.1.3 No Action Alternative

Under the No Action Alternative, contract ADAIR would not perform sorties at JBPHH and nearby airspaces. Under the No Action Alternative, there would be no change on 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 overwater Warning Areas are not expected to generate loud sonic booms that would be perceived on land.

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 for the Proposed Action and alternatives.

4.2.2 Proposed Action

The Proposed Action includes contracting for the support of an estimated 14 contractor aircraft to fly an estimated 3,100 annual sorties in support of the 154 WG at JBPHH. 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 3,100 sorties, about 3,072 of those are the training sorties that would occur within Warning Areas.

Because it is not known at this time what aircraft type would be used by contract ADAIR, three aircraft scenarios 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 contract ADAIR aircraft, potential impacts on the noise environment are expected to range from negligible to minor and would be long-term.

No significant impacts on 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** and **4.2.2.2**.

Table 4-1
Summary of Potential Noise Impacts

Alternative	Change in Noise
Alternatives 1 and 2	High Noise Scenario – Potential long-term, negligible to minor increases in noise from addition of contract ADAIR flight operations in the vicinity of the JBPHH airfield. Impacts are primarily localized north and south of JBPHH. Negligible increase in noise from the contract ADAIR subsonic and/or supersonic flight operation in Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194.
	Medium Noise Scenario – Potential long-term, negligible increases in noise from addition of contract ADAIR flight operations in the vicinity of the JBPHH airfield. Negligible increase in noise from the contract ADAIR subsonic and/or supersonic flight operation in Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194.
	Low Noise Scenario – Potential long-term, negligible increases in noise from addition of contract ADAIR flight operations in the vicinity of the JBPHH airfield. Negligible increase in noise from the contract ADAIR subsonic and/or supersonic flight operation in Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194.
No Action Alternative	None

Notes:
ADAIR = adversary air; JBPHH = Joint Base Pearl Harbor-Hickam

4.2.2.1 Alternatives 1 and 2

Implementation of the Proposed Action would establish contract ADAIR capabilities (an estimated 14 aircraft) providing 3,072 annual training sorties at JBPHH in Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194.

Since the exact fleet of contract ADAIR aircraft operating at JBPHH is unknown, three scenarios were designed to provide a bounded analysis of potential impacts on 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	Eurofighter Typhoon	F-18E/F
Medium Noise Scenario	Dassault Mirage	F-16C
Low Noise Scenario	JAS 39 Gripen	F-16A

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 Eurofighter Typhoon operations; however, the NOISEMAP database does not contain noise data for the Eurofighter Typhoon, so an appropriate noise modeling surrogate was selected, the F-18E/F in this case. The noise modeling surrogates for various aircraft presented in **Table 4-2** have been approved for use by the Air Force. 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 Eurofighter Typhoon aircraft. Since noise data for the Eurofighter Typhoon are not available in NOISEMAP, the F-18E/F was used as a modeling surrogate. Proposed contract ADAIR flight operations at JBPHH and associated airspaces would be identical to existing conditions except for the contract ADAIR sorties. Noise analysis of the High Noise Scenario was conducted to analyze changes to the airfield noise contours and the proposed airspaces.

Joint Base Pearl Harbor-Hickam Noise Environment

Implementation of the Proposed Action would result in a 2 percent increase in the number of operations at JBPHH. Contract ADAIR would fly up to a projected 3 percent of the estimated total 3,100 contracted 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 93 sorties per year. Runway utilization, flight tracks, and flight track utilization for contract ADAIR aircraft would be similar to the existing F-22 operations. Proposed annual departure, arrival, and closed pattern aircraft operations at JBPHH 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 postflight run-ups.

Table 4-3
Proposed Annual Aircraft Operations Summary at Joint Base Pearl Harbor-Hickam

Aircraft	Departures		Arrivals		Total Operations		
	Day	Night	Day	Night	Day	Night	Total
F-22	3,461	0	3,451	10	6,912	10	6,922
Other Military	1,252	548	1,195	605	2,447	1,153	3,600
Contract Adversary Air	3,100	0	3,007	93	6,107	93	6,200
Civilian	131,454	14,811	135,280	10,985	266,734	25,796	292,530
Transients	4,407	0	4,377	30	8,784	30	8,814
Grand Total	**143,674**	**15,359**	**147,310**	**11,723**	**290,984**	**27,082**	**318,066**

As described in **Section 3.2.1.2**, NOISEMAP was used to model military aircraft noise. The resultant 65- to 85-dBA DNL contours in 5-dBA increments for the daily flight events at JBPHH 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 would be the slight expansion of the DNL contours around the airfield. This slight overall increase in noise level is a result of contract ADAIR departure, straight-in arrival, and pitch arrival aircraft operations. A comparison of the DNL noise contours of the High Noise Scenario and the existing conditions is shown on **Figure 4-2**. In some locations shown on the figure, the baseline noise contour underlies the Proposed Action noise contour due to the negligible change in DNL.

Under the High Noise Scenario of the Proposed Action, the area within noise contours increases (**Table 4-4**). These increases are unlikely to lead to significant impacts in these areas. Further, 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 2 dBA under the High Noise Scenario. The increased DNL at these POIs and the surrounding areas would potentially be long-term, barely noticeable, and not significant under Alternatives 1 and 2.

Airspace Noise Environment

Under the High Noise Scenario, contract ADAIR would perform an estimated 3,072 annual airspace operations in the Warning Areas. Contract ADAIR would only operate in the same Warning Areas already used by based JBPHH aircraft. The northern Warning Areas (W-188C, W-189, and W-190) receive approximately 90 percent of all airspace operations originating from JBPHH while the southern Warning Areas (W-192, W-193, and W-194) receive 10 percent. A summary of estimated annual airspace operations is presented in **Table 4-6**.

JBPHH-based aircraft do not dominate the noise environment of the Warning Areas due to the large number of operations from aircraft based at other installations and the low number of JBPHH aircraft operations, and their corresponding lower L_{dnmr} noise levels, occurring in these airspaces. Due to the low number of airspace operations from the proposed High Noise Scenario, there is no significant impact expected to the noise environment of Warning Areas W-188C, W-189, W-190, W-192, W-193, or W-194.

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. That percentage of supersonic flight is in not expected to change with the addition of contract ADAIR aircraft.

Single event sonic boom levels were estimated, using the PCBoom program also described in **Section 3.2.1.2**, directly undertrack for the based F-22 aircraft at various altitudes and Mach numbers. The single event levels reported include overpressure (psf) and CSEL in decibels. Sonic boom levels estimated for contract ADAIR supersonic flights in Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194 are shown on **Table 4-7** along with the F-22 boom levels for comparison. Sonic boom levels are only shown for the ADAIR High Noise Scenario which uses the supersonic Eurofighter Typhoon, Dassault Mirage, and JAS 39 Gripen aircraft.

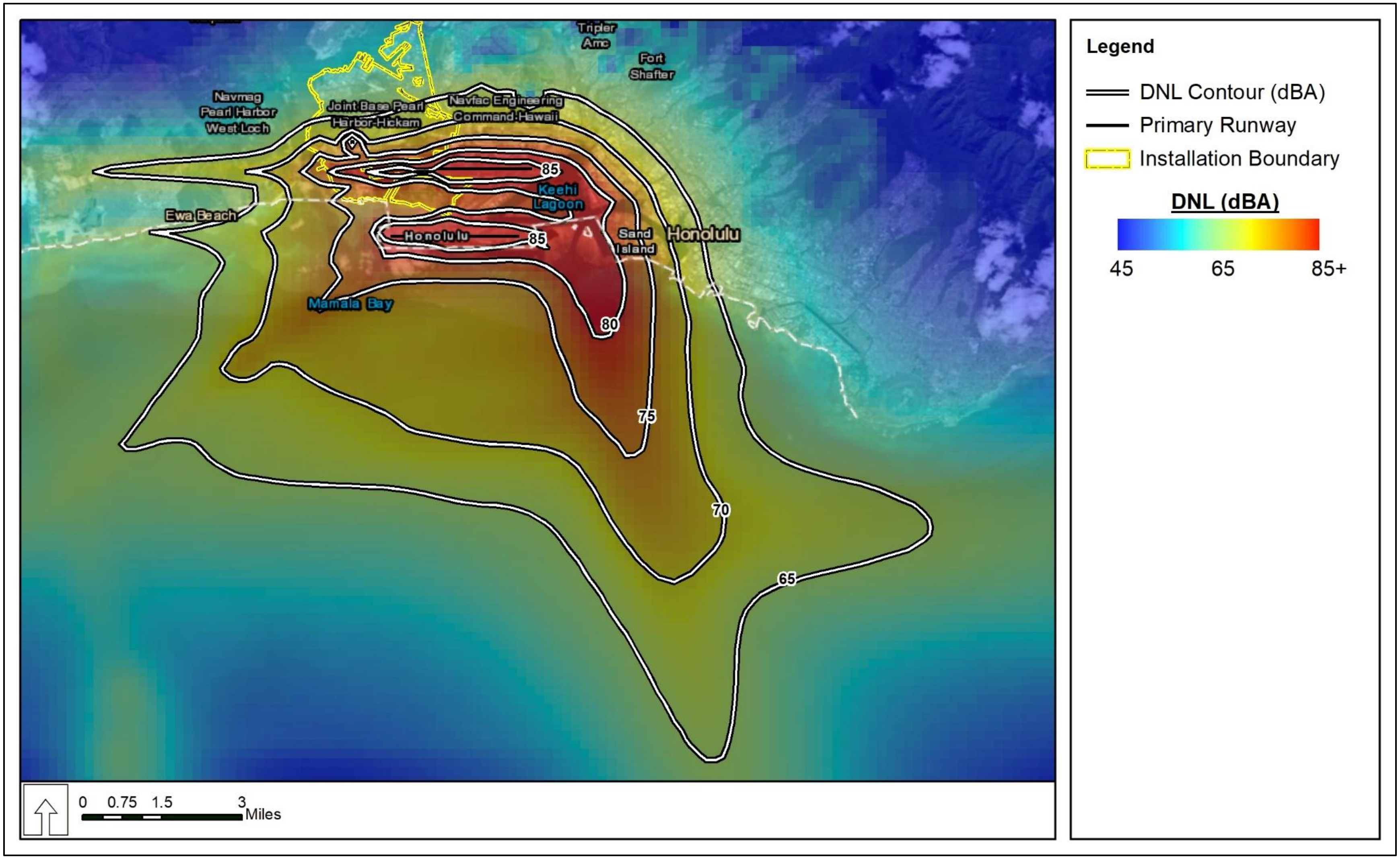


Figure 4-1. High Noise Scenario Day-Night Average Sound Level Contours at Joint Base Pearl Harbor-Hickam.

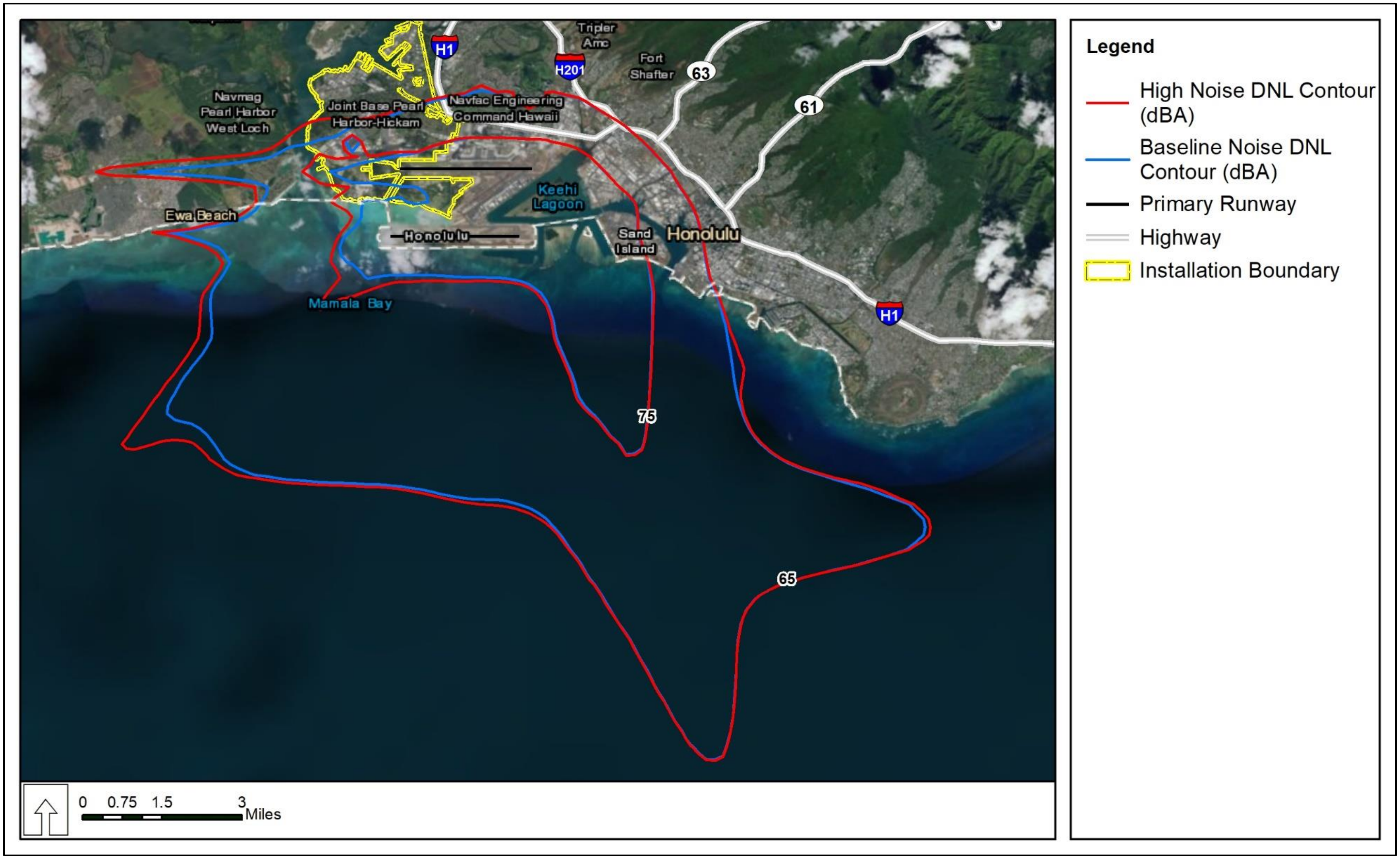


Figure 4-2. Comparison of High Noise Scenario and Existing Day-Night Average Sound Level Contours at Joint Base Pearl Harbor-Hickam.

Table 4-4
Proposed High Noise Scenario Day-Night Average Sound Level Area Affected on and Surrounding Joint Base Pearl Harbor-Hickam

Noise Level (dBA DNL)	Area Within Noise Contour (acres)		
	Existing	High Noise Scenario	Increase
>65	49,613	52,022	2,409
>70	26,798	28,174	1,376
>75	10,365	11,678	1,313
>80	4,292	4,804	512
>85	1,060	1,259	199

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 Joint Base Pearl Harbor-Hickam

POI		DNL (dBA)		
ID	Description	Existing	High Noise Scenario	Increase in DNL
C01	St. John The Baptist Church / School	64	64	0
C02	Kaumakapili United Church of Christ	66	66	0
H01	Lanakila Health Center	62	62	0
H02	Pauahi Wing Queens Medical Center	62	62	0
R01	Residential (108 Street)	70	71	1
R02	Residential (Iroquois Drive)	71	72	1
S01	Pearl Harbor Elementary School	62	62	0
S02	Kalakaua Middle School	67	67	0
S03	Iroquois Point Elementary School	66	68	2
S04	McKinley High School	62	62	0
S05	Aliamanu School	67	67	0
S06	Nimitz Elementary School	67	67	0
S07	Holy Family Catholic Academy	69	69	0
S08	Campbell High School	57	59	2

Notes:
Potentially affected POIs were derived from NOISEMAP-modeled noise contours.
dBA = A-weighted decibel(s); DNL = Day-Night Average Sound Level; POI = point of interest

Table 4-6
Proposed Annual Airspace Operations Summary at Joint Base Pearl Harbor-Hickam

Aircraft	North (W-188C, W-189, W-190)		South (W-192, W-193, W-194)		Total Operations		
	Day	Night	Day	Night	Day	Night	Total
F-22	3,014	101	336	11	3,349	112	3,461
ADAIR	2,682	83	297	10	2,979	93	3,072
LFE	873	27	96	3	969	30	999
Grand Total	**6,569**	**211**	**729**	**24**	**7,297**	**235**	**7,532**

Notes:
This table only includes Air Force operations in the Warning Areas; other military training flights occur in these same airspaces
ADAIR =adversary air; LFE = large force exercise

Table 4-7
Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194: Sonic Boom Levels Undertrack for Adversary Air Aircraft in Level Flight at Mach 1.2 and 1.5

Aircraft	Altitude (feet above mean sea level)			
	10,000	**20,000**	**30,000**	**50,000**
Mach 1.2				
Overpressure (psf)				
F-22	5.4	2.8	1.9	1.2
Eurofighter Typhoon[1]	5.1	2.7	1.8	1.2
Dassault Mirage[2]	4.2	2.2	1.5	0.9
JAS 39 Gripen[3]	4.2	2.2	1.5	0.9
C-Weighted Sound Exposure Level (dB)[1]				
F-22	116	111	107	103
Eurofighter Typhoon[1]	116	110	107	103
Dassault Mirage[2]	114	109	105	101
JAS 39 Gripen[3]	114	109	105	101
Mach 1.5				
Overpressure (psf)				
F-22	6.2	3.2	2.1	1.2
Eurofighter Typhoon[1]	5.9	3.1	2.0	1.2
Dassault Mirage[2]	4.9	2.5	1.6	0.9
JAS 39 Gripen[3]	4.9	2.5	1.6	0.9
C-Weighted Sound Exposure Level (dB)[1]				
F-22	117	112	108	103
Eurofighter Typhoon[1]	117	111	108	103
Dassault Mirage[2]	115	110	106	101
JAS 39 Gripen[3]	115	110	106	101

Notes:
[1] As modelled with the surrogate F-18E/F
[2] As modelled with the surrogate F-16C
[3] As modelled with the surrogate F-16A

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

The sonic boom levels shown on **Table 4-7** are the loudest levels computed at the center of the footprint for the constant Mach, level flight conditions indicated. 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 Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194 would range from 6.2 to 0.9 psf depending on the flight conditions. The F-22 overpressure and CSEL levels would be greater than those resulting from contract ADAIR. Public reaction (limited to vessels 15 NM or more from shore) may 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 postboom rumbling sounds may be heard. The addition of contractor aircraft operating at supersonic speeds means that the number of sonic booms heard would likely increase; however, potential impacts associated with sonic booms are still expected to be negligible under Alternatives 1 and 2.

Medium Noise Scenario

Under the Medium Noise Scenario, all contract ADAIR operations are assumed to be performed by Dassault Mirage aircraft. Since noise data for the Dassault Mirage are not available in NOISEMAP, the F-16C was used as a modeling surrogate. Proposed flight operations at JBPHH and associated Warning Areas would be identical to existing conditions except for the 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.

Joint Base Pearl Harbor-Hickam Noise Environment

Under the Medium Noise Scenario, contract ADAIR would perform the same operations as outlined under the High Noise Scenario (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-dBA DNL contours in 5-dBA increments for the existing daily flight events at JBPHH are shown on **Figure 4-3**. The primary changes in noise contour features between the Medium Noise Scenario and the existing conditions would be the slight expansion of the DNL contours to the west and south of the airfield. This slight over water increase in noise level is a result of contract ADAIR departure, straight-in arrival, and pitch arrival aircraft operations. A comparison of the DNL noise contours of the Medium Noise Scenario and the existing conditions is shown on **Figure 4-4**. In some locations shown on the figure, the baseline noise contour underlies the Proposed Action noise contour due to the negligible change in DNL.

Under the Medium Noise Scenario, the area within noise contours would increase (**Table 4-8**). 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 4-9**). At the representative noise-sensitive locations modeled, the DNL would not change under the Medium Noise Scenario.

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. 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 4-8** and **4-9**) under Alternatives 1 and 2.

Low Noise Scenario

Under the Low Noise Scenario, all contract ADAIR operations would be performed by JAS 39 Gripen aircraft. Since noise data for the JAS 39 Gripen are not available in NOISEMAP, the F-16A was used as a modeling surrogate. Proposed contract ADAIR flight operations at JBPHH and associated airspaces would be identical to existing conditions except for the contract ADAIR sorties. Noise analysis of the Low Noise Scenario was conducted to analyze changes to the airfield noise contours and the Warning Areas.

Joint Base Pearl Harbor-Hickam Noise Environment

Under the Low Noise Scenario, contract ADAIR would perform the same operations as outlined under the High Noise Scenario (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.

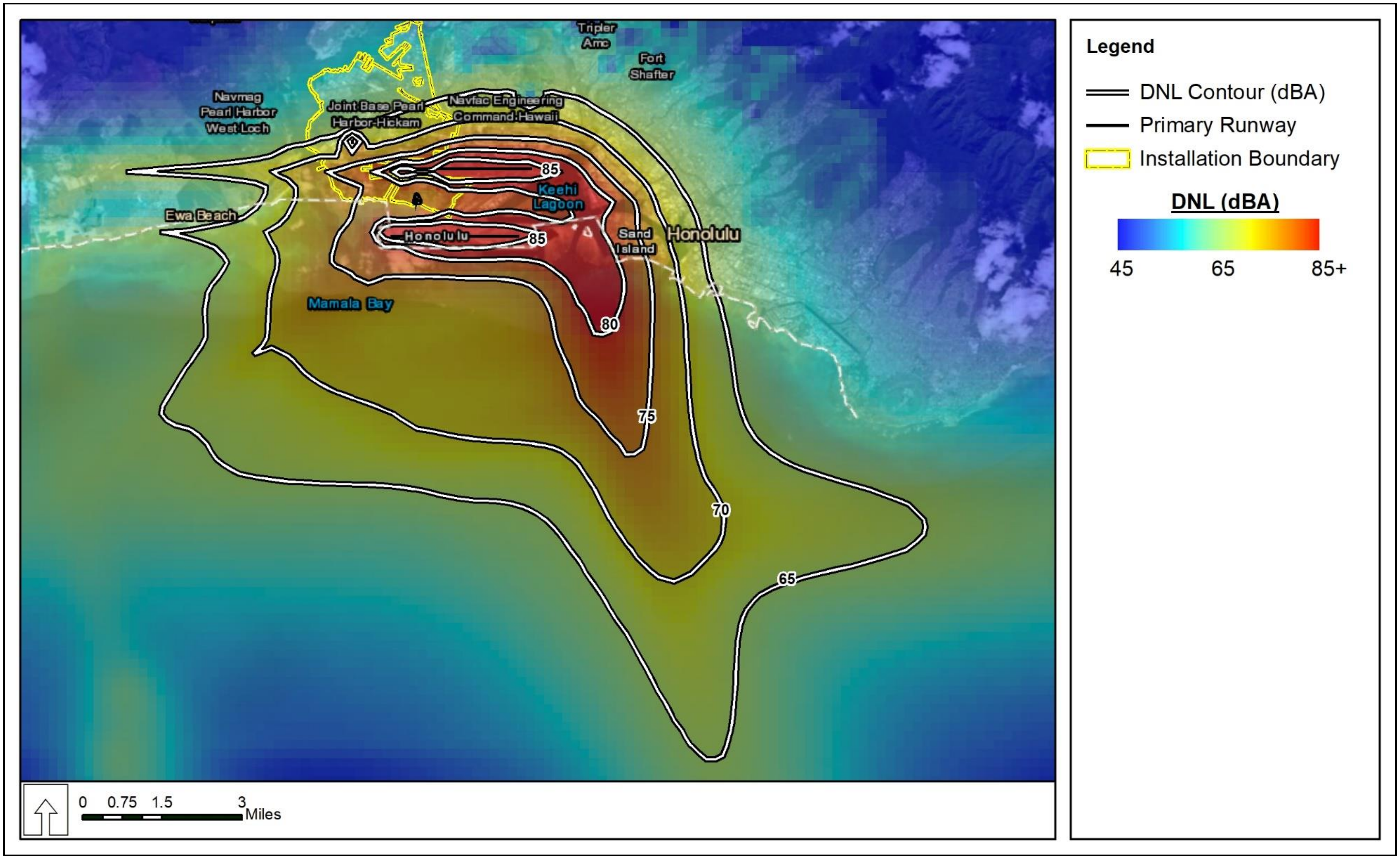


Figure 4-3. Medium Noise Scenario Day-Night Average Sound Level Contours at Joint Base Pearl Harbor-Hickam.

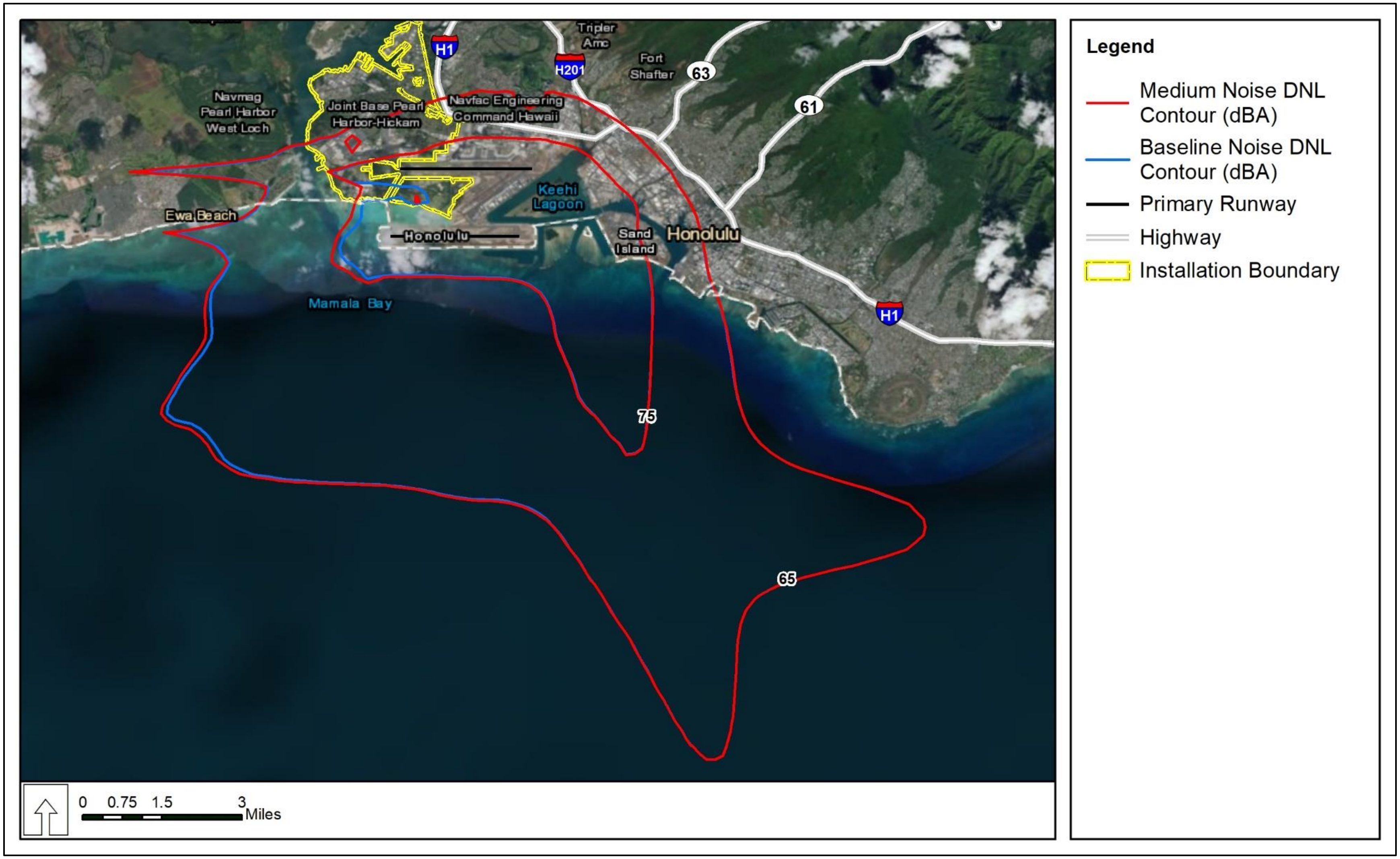


Figure 4-4. Comparison of Medium Noise Scenario and Existing Day-Night Average Sound Level Contours at Joint Base Pearl Harbor-Hickam.

Table 4-8
Proposed Medium Noise Scenario Day-Night Average Sound Level Area Affected on and Surrounding Joint Base Pearl Harbor-Hickam

Noise Level (dBA DNL)	Area Within Noise Contour (acres)		
	Existing	Medium Noise Scenario	Increase
>65	49,613	50,089	476
>70	26,798	27,157	359
>75	10,365	10,851	486
>80	4,292	4,394	102
>85	1,060	1,110	50

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

Table 4-9
Proposed Medium Noise Scenario Day-Night Average Sound Level at Representative Points of Interest on and near Joint Base Pearl Harbor-Hickam

POI		DNL (dBA)		
ID	Description	Existing	Medium Noise Scenario	Increase in DNL
C01	St. John The Baptist Church / School	64	64	0
C02	Kaumakapili United Church of Christ	66	66	0
H01	Lanakila Health Center	62	62	0
H02	Pauahi Wing Queens Medical Center	62	62	0
R01	Residential (108 Street)	70	70	0
R02	Residential (Iroquois Drive)	71	71	0
S01	Pearl Harbor Elementary School	62	62	0
S02	Kalakaua Middle School	67	67	0
S03	Iroquois Point Elementary School	66	66	0
S04	McKinley High School	62	62	0
S05	Aliamanu School	67	67	0
S06	Nimitz Elementary School	67	67	0
S07	Holy Family Catholic Academy	69	69	0
S08	Campbell High School	57	57	0

Notes:
Potentially affected POIs were derived from NOISEMAP-modeled noise contours.
dBA = A-weighted decibel(s); DNL = Day-Night Average Sound Level; POI = point of interest

NOISEMAP was used to model military aircraft noise. The resultant 65- to 85-dBA DNL contours in 5-dBA increments for the existing daily flight events at JBPHH 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 expansion of the DNL contours to the west and south of the airfield. This slight over water increase in noise level is a result of contract ADAIR departure, straight-in arrival, and pitch arrival aircraft operations. A comparison of the DNL noise contours of the Low Noise Scenario and the existing conditions is shown on **Figure 4-6**. In some locations shown on the figure, the baseline noise contour underlies the Proposed Action noise contour due to the negligible change in DNL.

The area within each DNL noise contour for both the existing conditions and the Low Noise Scenario is shown in **Table 4-10**. These increases would be unlikely to lead to significant impacts in these areas. As a result of the implementation of the Low Noise Scenario, noise levels at representative POIs identified in **Section 3.2.2** would not change (**Table 4-11**).

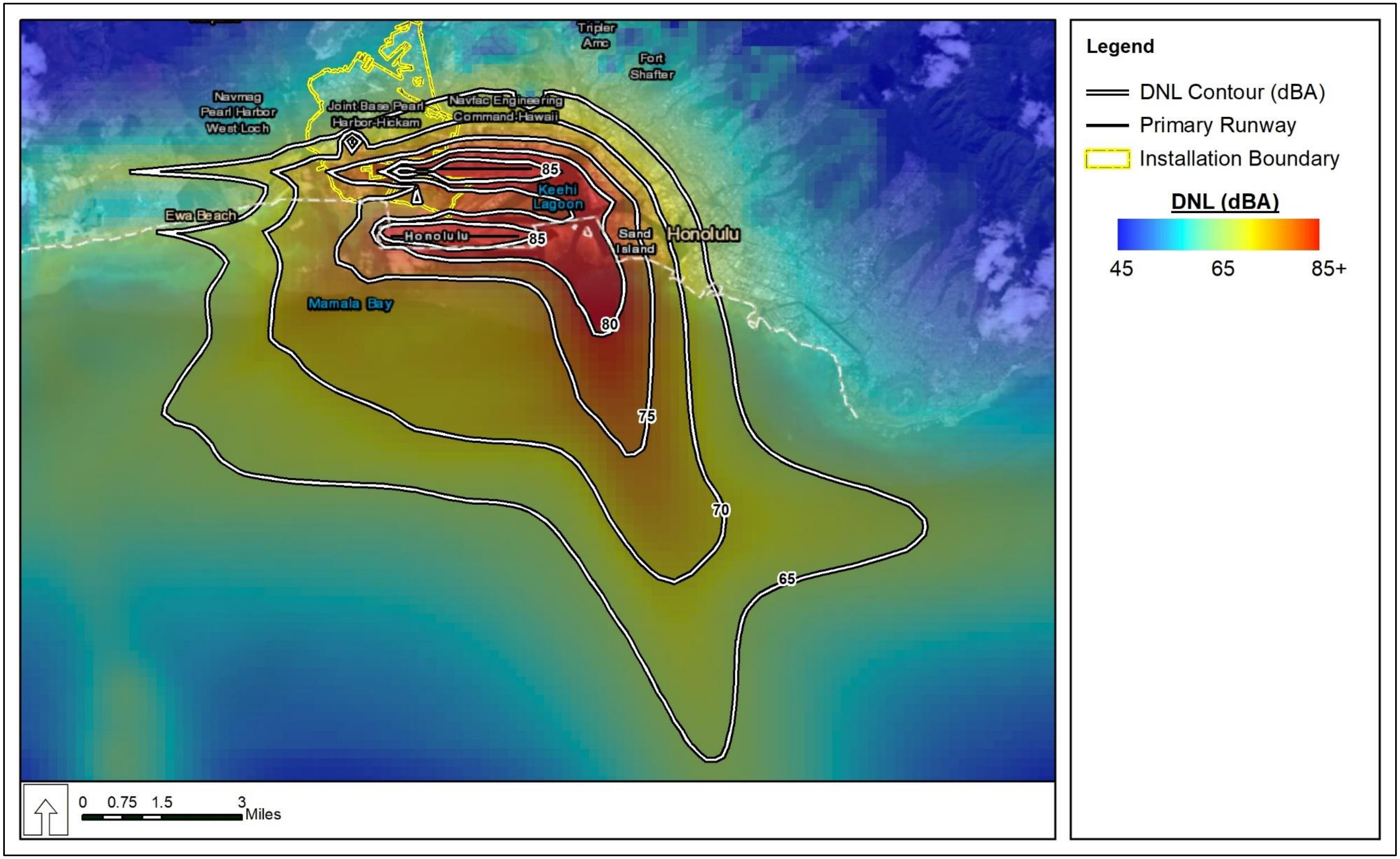


Figure 4-5. Low Noise Scenario Day-Night Average Sound Level Contours at Joint Base Pearl Harbor-Hickam.

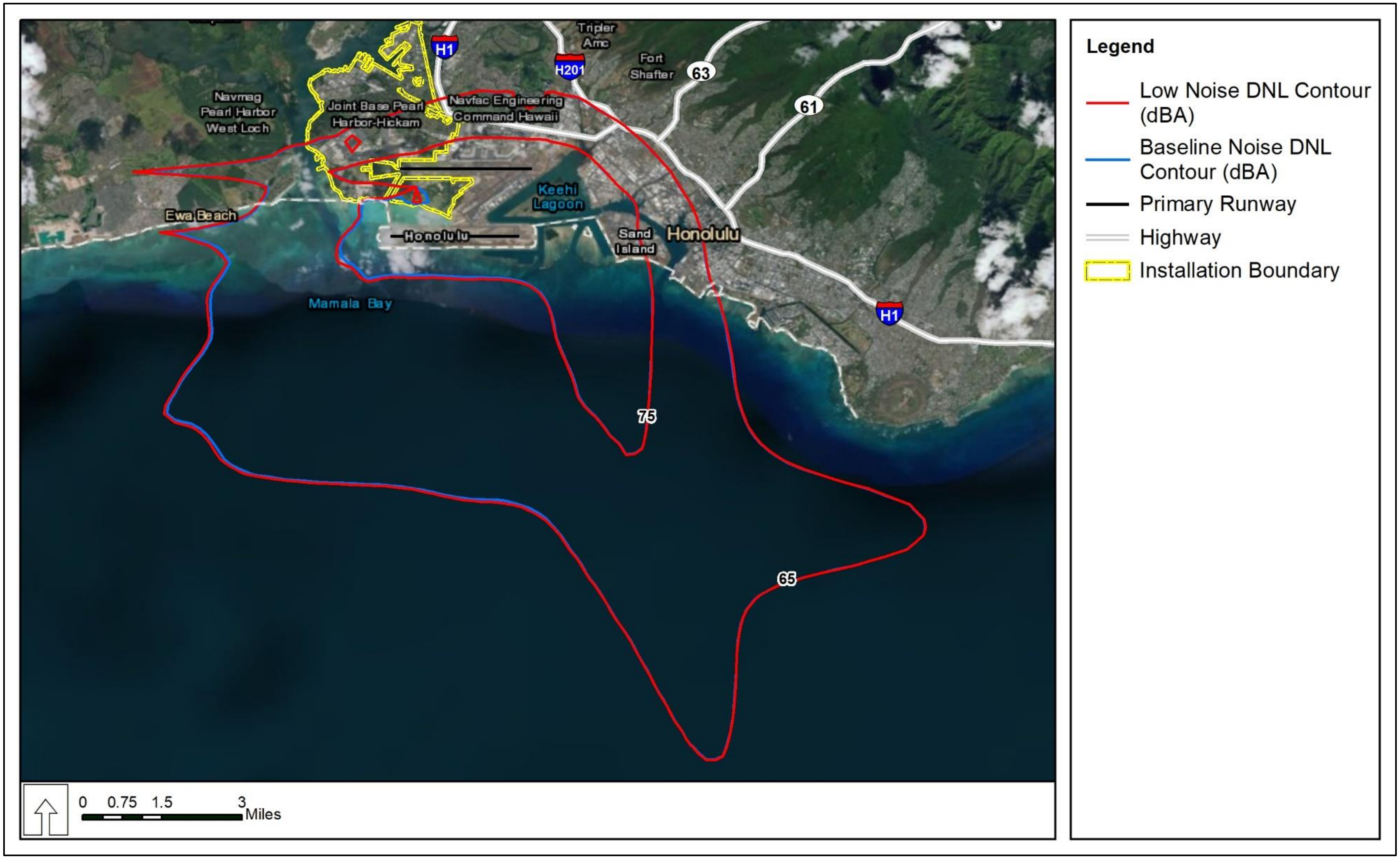


Figure 4-6. Comparison of Low Noise Scenario and Existing Day-Night Average Sound Level Contours at Joint Base Pearl Harbor-Hickam.

Table 4-10
Proposed Low Noise Scenario Day-Night Average Sound Level Area Affected on and Surrounding Joint Base Pearl Harbor-Hickam

Noise Level (dBA DNL)	Area Within Noise Contour (acres)		
	Existing	Low Noise Scenario	Increase
>65	49,613	50,049	436
>70	26,798	27,036	238
>75	10,365	10,612	247
>80	4,292	4,397	105
>85	1,060	1,129	69

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

Table 4-11
Proposed Low Noise Scenario Day-Night Average Sound Level at Points of Interest at Joint Base Pearl Harbor-Hickam

POI		DNL (dBA)		
ID	Description	Existing	Low Noise Scenario	Increase in DNL
C01	St. John The Baptist Church / School	64	64	0
C02	Kaumakapili United Church of Christ	66	66	0
H01	Lanakila Health Center	62	62	0
H02	Pauahi Wing Queens Medical Center	62	62	0
R01	Residential (108 Street)	70	70	0
R02	Residential (Iroquois Drive)	71	71	0
S01	Pearl Harbor Elementary School	62	62	0
S02	Kalakaua Middle School	67	67	0
S03	Iroquois Point Elementary School	66	66	0
S04	McKinley High School	62	62	0
S05	Aliamanu School	67	67	0
S06	Nimitz Elementary School	67	67	0
S07	Holy Family Catholic Academy	69	69	0
S08	Campbell High School	57	57	0

Notes:
Potentially affected POIs were derived from NOISEMAP-modeled noise contours.
dBA = A-weighted decibel(s); DNL = Day-Night Average Sound Level; POI = point of interest

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. 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 4-10** and **4-11**) under Alternatives 1 and 2.

4.2.3 No Action Alternative

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

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 safety risks to personnel, the public, property, or the environment. Adverse impacts on safety might include implementing contractor flight procedures that result in greater safety risk or constructing new buildings within established Q-D arcs. For the purposes of this EA, an impact is considered significant if the proposed safety measures are not consistent with AFOSH and OSHA standards resulting in unacceptable safety risks.

Safety concerns associated with ground, explosive, and flight activities are considered in this section. Ground safety considers issues associated with ground operations and maintenance 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.

RPZs 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 would 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) 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. Contract 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 and 2

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 JBPHH. 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 emergency response, NAVFAC Fed Fire provides emergency responders trained on the applicable mission-design series. Should NAVFAC Fed Fire request assistance then they would call the Airport Fire Rescue for back-up who are also trained. For crash response, JBPHH is manned with an Aircraft CDDAR Team. For events occurring off the airfield civilian authorizes will be first on scene with follow on assistance from NAVFAC Hawaii. After the initial response, the contractor would be required to facilitate crash site security and clean-up. The contractor would be responsible for cooperating 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 AFIs 91-202 and 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, RPZs 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 on arresting gear capability for the implementation of the Proposed Action under Alternative 1 or 2.

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

Explosives Safety

Under the Proposed Action, the 15 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 CAD/PAD 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 CAD/PAD. Short-term storage could be provided in the 15 MXS Munitions Storage Area provided a courtesy storage agreement is created and space is available. 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 authorized for chaff and flare operations (Hazard Class 1.3) in accordance with AFMAN 91-201 para 12.47.2 and 12.47.3.

No significant impacts on explosive safety are anticipated to occur under Alternative 1 or 2 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 Instrument Flight Rules 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 Receiver System, with Automatic Direction Finder 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 on airspace/flight safety are anticipated to occur under Alternative 1 or 2 provided that contractor flight safety rules are followed and all applicable AFOSH and OSHA requirements are implemented.

4.3.3 No Action Alternative

Under the No Action Alternative, contract ADAIR would not perform sorties at JBPHH 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. JBPHH is not subject to general conformity requirements since it is in attainment status for all six criteria pollutants.

This section discusses the potential effects of the Proposed Action and alternatives on air quality within the ROIs. Since the overland project area (State of Hawaii AQCR) is in an attainment or unclassified for all NAAQS the general conformity rule would not apply. In addition, operations in the Warning Areas would occur outside any AQCR. Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194 extend 3 NM from the coastline (state jurisdictional boundary), and most of the Warning Areas extend out past the 12-NM Territorial Sea boundary and the 24-NM Contiguous Zone boundary. Thus, compliance with the NAAQS would not apply in these Warning Areas and general conformity would not apply.

Although general conformity does not apply in either ROI, the applicability criteria of the rule are evaluated against project emissions to assess potential impacts. To do this, proposed project emissions were compared against the *de minimis* thresholds for conformity of 100 tpy each. 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 Parts 51 and 93); however, it still provides one means against which one can evaluate projected contract ADAIR emissions.

The Air Conformity Applicability Model (ACAM) (version 5.0.10) was used to provide emissions estimates for contract ADAIR airfield operations, maintenance activities, worker commutes, and flight operations in Warning Areas. ACAM was developed by the Air Force (AFCEC, 2017b); it provides estimated air emissions from proposed federal actions for each specific criterion 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* (AFCEC, 2017a). For aircraft, operational modes, including taxi/idle (in and out), takeoff, 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 a substantial 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]). Based on this, aircraft emissions released above 3,000 ft were not included in analysis for the ROIs.

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 Warning Areas. As such emissions from ACAM were determined separately for the airfield ROI and the Warning Areas ROI. In addition, emissions associated with the use of flares within the Warning Areas were estimated, using draft emission factors found in Emission Factors for AP-42 Section 15.8 (USEPA, 2009).

4.4.2 Proposed Action

Under the Proposed Action, Alternatives 1 and 2 are identical in terms of potential air emissions. As described in **Chapter 2**, the only substantive difference between the two alternatives is the location of the contract ADAIR facilities on JBPHH (Building 3220 versus Building 2030). The number of contract ADAIR sorties, use of associated support equipment, and number of affected personnel would be identical under both alternatives. No construction emissions would be associated with either alternative. For these reasons the emissions are calculated for a single alternative in each ROI. Only those emissions associated with the addition of contract ADAIR operations were evaluated as no substantive changes to current operations of the 154 WG and 15 WG are expected to change as a result of the action.

For Alternatives 1 and 2, analyses were performed for three different emission scenarios to evaluate the risk for 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-29, Engine: F-100-PW-100*
- Medium, Mirage, Engine: F110-GE-100*
- Low, F-5, Engine: J85-GE-21

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

4.4.2.1 Alternatives 1 and 2

Joint Base Pearl Harbor-Hickam Operations

The emissions were estimated for each year of the Proposed Action beginning in July 2019 and ending in June 2029. **Table 4-12** presents total increases in annual operational emissions under Alternatives 1 and 2 for the ROI in the vicinity of the airfield. 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 4-12
Proposed Contract Adversary Air Emissions – Airfield Operations

Scenario	Contract Year(s)	Emissions (tpy) [1,2]								
		VOC	NO_x	CO	SOx	PM_{10}	$PM_{2.5}$	CO_2e	Pb	NH_3
High	2019 (July – Dec)	7.8	44.1	60.6	3.5	5.7	5.2	8,825	0	0.01
	2020 through 2028	15.6	88.1	121.1	7.0	11.4	10.3	17,650	0	0.02
	2029 (January - June)	7.8	44.1	60.6	3.5	5.7	5.2	8,825	0	0.01
Medium	2019 (July - Dec)	4.4	24.4	31.9	2.2	3.2	2.1	5,497	0	0.01
	2020 through 2028	8.7	48.7	63.8	4.4	6.4	4.3	10,993	0	0.02
	2029 (January - June)	4.4	24.4	31.9	2.2	3.2	2.1	5,497	0	0.01
Low	2019 (July - Dec)	20.8	9.7	107.7	1.6	0.8	0.8	3,539	0	0.01
	2020 through 2028	41.6	19.4	215.5	3.1	1.6	1.6	7,078	0	0.02
	2029 (January - June)	20.8	9.7	107.7	1.6	0.8	0.8	3,539	0	0.01

Source: Air Conformity Applicability Model output

Notes:
1 Represents total per year emissions for: 1) flight operations (includes trim tests and APU use), 2) Aerospace Ground Equipment (AGE), 3) aircraft maintenance (parts cleaning), and 5) JET-A storage (fuel for contract ADAIR operation only).
2 Based on 3,100 Landing & Takeoff Cycles (LTOs) per year.

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

Table 4-12 shows that increases in VOC and NO_x potential emissions from either of the three emission scenarios would be below the 100-tpy *de minimis* threshold. The table also shows that CO would exceed the 100 tpy *de minimis* threshold for two (high and low) of the three emission scenarios. For the remaining pollutants (VOC, SO_x, $PM_{2.5}$, PM_{10}, CO_2e, and CO; Medium Scenario) the annual emission increases would not be considered significant under Alternatives 1 and 2, as they are below the 100 tpy *de minimis* threshold.

Airspace Operations

The emissions associated with contract ADAIR sorties proposed for the Warning Areas (W-188C, W-189, W-190, W-192, W-193, and W-194) were evaluated using ACAM for the High, Medium and Low scenarios described previously. 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 annual ADAIR sorties proposed, aircraft are expected to fly a small amount time between 500 to 3,000 ft above sea level in the Warning Areas. The flight time in the mixing layer for all Warning areas is estimated to be 1.38 minutes per sortie.

All sorties are expected to use chaff and flares. Chaff and flares can be dispensed in the offshore Warning Areas without altitude restrictions (Air Force, 2001). The air quality impacts of chaff were studied by the Air Force and reported in *Environmental Effects of Self-Protection Chaff and Flares* (Air Force, 1997). That study determined that chaff material maintains its integrity after ejection and that the use of explosive charge in impulse cartridges results in minimal PM_{10}. As a result, it was concluded that the deployment of chaff would not contribute to an exceedance of the NAAQS. Chaff deployment was therefore not included in the air quality assessment. Emission from M206 flares were estimated using Emission Factors for AP-42 Section 15.8 (USEPA, 2009). Only flares deployed at or below 3,000 ft were included in the analysis. The quantity deployed (total estimated future use minus current baseline use) was proportioned based on the percent of total time spent in the 500 to 3,000 ft altitude range per sortie.

Table 4-13 shows the emissions estimated for the Warning Areas that are the result of contract ADAIR sorties and the deployment of countermeasure flares. Emissions estimates cover the proposed 10-year period beginning in July 2019 and ending in June 2029. Overall the use of flares made a negligible contribution to the emissions for the High, Medium, and Low Scenarios. Maximum emission rates associated with use of flares were for PM_{10} at 2.9 pounds per year (0.002 tpy) and CO_2 at 5.2 pounds per year (0.003 tpy).

The methodologies, emission factors, and assumptions used for the emission estimates for each of the scenarios and related activities are outlined in **Appendix C**.

The offshore Warning Areas are not in a regulatory control area and are beyond state jurisdictional boundaries. As such, the general conformity rule would not apply; however, the 100 tpy *de minimis* threshold for the General Conformity Rule was applied as significance indicator. The criteria pollutants are below 100 tpy and CO_2e is below 100,000 tpy. As such, these pollutants would not be expected to impact air quality in any of the Warning Areas.

4.4.3 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, no impacts would occur to regional air quality under the No Action Alternative.

Table 4-13
Contract Adversary Air Emissions – Warning Areas

Warning Area	Scenario	Contract Years	Emissions (tpy)[1]								
			VOC	NO_x	CO	SO_x	PM_{10}	$PM_{2.5}$	CO_2e	Pb	NH_3
W-188C W-189 W-190[2]	High	2019 (July - Dec)	0.04	6.62	0.18	0.26	0.18	0.16	790	0	0
		2020 through 2028	0.07	13.24	0.35	0.52	0.35	0.32	1580.5	0	0
		2029 (January - June)	0.04	6.62	0.18	0.26	0.18	0.16	790.3	0	0
	Med	2019 (July - Dec)	0.35	2.81	3.00	0.32	0.16	0.07	1006.6	0	0
		2020 through 2028	0.69	5.63	6.01	0.65	0.32	0.15	2013.1	0	0
		2029 (January - June)	0.35	2.81	3.00	0.32	0.16	0.07	1006.6	0	0
	Low	2019 (July - Dec)	0.28	0.16	3.04	0.08	0.001	0.001	228.5	0	0
		2020 through 2028	0.57	0.33	6.08	0.15	0.002	0.001	457	0	0
		2029 (January - June)	0.28	0.16	3.04	0.08	0.001	0.001	228.5	0	0
W-192 W-193 W-194[3]	High	2019 (July - Dec)	0.004	0.74	0.02	0.03	0.02	0.02	88	0	0
		2020 through 2028	0.008	1.47	0.04	0.06	0.04	0.04	176	0	0
		2029 (January - June)	0.004	0.74	0.02	0.03	0.02	0.02	88	0	0
	Med	2019 (July - Dec)	0.04	0.31	0.33	0.04	0.02	0.01	112	0	0
		2020 through 2028	0.08	0.63	0.67	0.07	0.04	0.02	224	0	0
		2029 (January - June)	0.04	0.31	0.33	0.04	0.02	0.01	112	0	0
	Low	2019 (July - Dec)	0.03	0.02	0.34	0.01	0.0001	0.0001	25	0	0
		2020 through 2028	0.06	0.04	0.68	0.02	0.0002	0.0002	51	0	0
		2029 (January - June)	0.03	0.02	0.34	0.01	0.0001	0.0001	25	0	0

Source: Air Conformity Applicability Model output

Notes:
[1] Represents total per year emissions.
[2] 2,765 sorties (90 percent of total sorties)
[3] 307 sorties (10 percent of total sorties)

CO = carbon monoxide; CO_2e = carbon dioxide equivalent; NH_3 = ammonia; NO_x = nitrogen oxides; Pb = lead; $PM_{2.5}$ = particulate matter less than 2.5 microns; PM_{10} = particulate matter less than 10 microns; SO_x = sulfur oxides; tpy = ton(s) per year; VOC = volatile organic compounds

4.4.4 Climate Change Considerations

The oceans around Hawaii are very vulnerable to the effects of global warming. Thermal expansion caused by warming oceans and the melting of glaciers and ice caps appear responsible for an observed global sea level rise of about 8 in. since 1900, and recent regional sea level rise in the western tropical Pacific are reported to be higher than global average. Further rise in global average sea level is predicted over the next 100 years. This damages fragile ecosystems and contributes to the loss of wetlands. Warmer Pacific waters lead to unnatural changes in aquatic habitats that negatively impact marine life and fauna. Rising sea levels will escalate the threat to coastal structure and property, ground water reservoirs, airports, wastewater systems and other natural resources (Melillo et al., 2014).

Annual GHG emissions from the Proposed Action are relatively low. Although Title V and PSD are not applicable to this action the applicability thresholds for these permitting requirements were compared against projected CO_2e emission levels as an indicator of significance. In addition, projected CO_2e

emissions were compared against the State of Hawaii's 2015 GHG emission estimates and projections to further assess the significance of contract ADAIR generated greenhouse gas emissions. **Table 4-14** below shows the results of this analysis. CO_2e emissions for all three scenarios fall well below the permitting thresholds and account for less than 0.1 percent of the State of Hawaii's 2015 CO_2e emissions. This demonstrates that in isolation additional CO_2e emissions expected as a result of contract ADAIR would have a potential negligible impact. The relative quantity of GHG emissions from the Proposed Action is expected to be so low that it would be cost-prohibitive to consider mitigation measures.

Table 4-14
Indicators for Carbon Dioxide Emission Impacts

Emission Scenario	Contract ADAIR Projected CO_2e Emissions (tpy)[1]	CO_2 Permit Applicability Thresholds (tpy)		Inventory Data (MMt CO_2e/year)		
		Title V	PSD New/ Modified Source	2015 Hawaii Energy Sector[2]	Projected 2020 Hawaii Emissions: Energy Sector[2]	Projected 2025 Hawaii Emissions: Energy Sector[2]
High	19,406	100,000	100,000 / 75,000	18.57	18.00	15.51
Medium	13,230					
Low	7,586					

Notes:
[1] Sum of emissions from airfield operations and Warning Area sorties.
[2] Source: Hawaii DOH, 2019

CO_2 = carbon dioxide; CO_2e = carbon dioxide equivalent; MMt = million tons per year (to convert from MMt to tpy multiply by 1.1E6); PSD = Prevention of Significant Deterioration; tpy = ton(s) per year

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 (i.e., federally and state listed threatened and endangered species, marine mammals, designated critical habitat, and Essential Fish Habitat) are negatively affected. 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 unauthorized "take" of federally threatened or endangered species or adverse modification of designated critical habitat. The ESA section 7 consultation process would result in either a concurrence on the Air Force's determination of "effect, but no adverse effect" on listed species, or a biological opinion with either an Incidental Take Statement that authorizes a specified amount of "take" (or adverse modification of designated critical habitat) or a jeopardy determination.

4.5.2 Proposed Action

Because the alternatives are limited to different existing facilities to support contract ADAIR operations, there would be no difference in the effects on biological resources between Alternatives 1 and 2. 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 JBPHH and in the Warning Areas. The aircraft operations associated with the Proposed Action could have impacts on biological resources from aircraft movement, the use of defensive countermeasures, noise, or BASH.

Over twice as many chaff and flares (types similar to RR-188 chaff and M206 flares) compared to baseline conditions are proposed for annual use in the Warning Areas during the training operations. Potential direct impacts on resources from training activities include the deposition of residual materials, such as plastic, from chaff and flare use, its accumulation in sensitive areas, and the ultimate breakdown of these materials into substrate mediums. Indirect impacts include transportation of these materials to other areas by environmental elements and the potential for ingestion by sensitive marine species within the Warning Areas. 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, 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. 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; however, Pacific Ocean waters, where the majority of defensive countermeasures would be used during contract ADAIR training, are slightly more alkaline than neutral (USEPA, 2019). 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 anticlumping 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, significant effects on biological resources are not expected because previous studies have indicated that there are no health risks from flare components (Air Force, 1997), the amount of lead is expected to be very small and dispersed over great distances, and the use of BMPs would avoid the selection of flares containing lead. More significantly, flares have a potential to start fires that can spread, adversely and indirectly affecting many resources; however, all use of flares are over the Pacific Ocean in the Warning Areas where there would be no risk of fires from the use of flares.

The following BMPs would be implemented as appropriate:

- Comply with Air Force and local procedures.
- Replace impulse cartridges and initiators in future procurements of flares with models that do not contain toxic air pollutants such as chromium and lead.

4.5.2.1 Alternatives 1 and 2

Vegetation

Under the Proposed Action, there would be no ground-disturbing activities and as such no potential to disturb vegetation on JBPHH; therefore, there would be no impacts on vegetation under Alternative 1 or 2.

Wildlife

There is limited suitable habitat for wildlife on developed areas of JBPHH and immediately adjacent to the airfield where contract ADAIR takeoffs and landings would occur; however, undeveloped areas along the coastline of JBPHH and in the Pearl Harbor Entrance Channel support relatively common wildlife species associated with estuarine and nearshore environments. Wildlife, and especially avian species, utilizing bayshore/nearshore and beach and dune habitats 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 and civilian aircraft takeoffs and landings have been ongoing at JBPHH for decades. Under the High Noise Scenario, the area under the 65- and 75-dBA DNL contours along the coastline where numerous shorebirds forage would not change substantially (**Figure 4-2**). Wildlife in coastal environments would not experience any changes in the noise environment with the addition of contract ADAIR operations at JBPHH. As such, the noise and movement from increased contract ADAIR aircraft operations is anticipated to have potential negligible, short- and long-term impacts on wildlife, including birds foraging in nearby coastal habitats.

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 JBPHH, there is a potentially increased risk of BASH; however, JBPHH maintains 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 and the contractor's BASH plan, the potential impacts on birds and other wildlife from contract ADAIR aircraft strikes during air operations at JBPHH are minor as discussed in **Section 4.3.2.1**.

Although contract ADAIR aircraft training can operate as low as the sea level surface in the Warning Areas, the majority of 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 or migrating birds or have a risk of BASH. 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 where training would occur, that most contract ADAIR training would occur 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, potential adverse impacts on birds from aircraft movement is negligible. Further, given the altitudes that the majority of training occurs in the special use airspace, aircraft movement in the Warning Areas would have no impacts on marine mammals or sea turtles.

Noise modeling for the contract ADAIR aircraft training operations (see **Section 4.2.2**) indicates that there would be no substantial increase in noise impacts within the special use airspace, and that subsonic and/or supersonic noise levels in the airspace would only experience potentially negligible increases. The negligible change to the noise environment as a result of contract ADAIR training would have no impact on marine wildlife in the Warning Areas.

Sonic booms from supersonic flights within the Warning Areas could cause startle effects on avian and mammal species at or near sea level; however, the sonic boom and postboom rumbling sounds that would be experienced by wildlife do not differ substantially from thunder. Further, the sonic boom events would be highly isolated and rare occurrences in the Warning Areas and occur in areas where supersonic flights currently occur with military training activities. Numerous studies indicate that most wildlife do not react substantially to sonic booms (Air Force, 2006), and no breeding or nesting activities for terrestrial species would occur in the Warning Areas. As such, sonic booms from supersonic flights would have no impact on wildlife, including marine mammals and sea turtles in the Warning Areas.

Under the Proposed Action, the use of chaff and flares would more than double within the Warning Areas as a result of contract ADAIR training operations. Potential impacts on avian species from the use of chaff and flares would be limited to a startle effect from chaff and flare deployment, inhalation of chaff fibers or flare combustion products, and in some species, the potential to digest residual plastic caps if mistaken for prey items. The potential of being struck by debris, or by a dud flare, given the increase in chaff and flare use in such a large area over the Pacific Ocean, is remote. Startle effects from the release of chaff and flares would be minimal relative to the noise of the aircraft. The potential for avian species, terrestrial mammals, marine mammals, or sea turtles 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 and the very small number of night training flights that are proposed. 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 the small amount of lightweight material ejected during their deployment would have an adverse impact on birds or that the material would reach the Pacific Ocean surface. 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 a potential negligible impact on birds.

Small residual plastic components of chaff and flares such as end caps and pistons, however, would be deposited on the ocean surface during training activities. Some large foraging bird species as well as marine mammals and sea turtles could ingest the remaining plastic components of chaff and flares if these components remain on the ocean surface or in the water column. The effect of chaff and flare components on federally listed bird species, marine mammals, and sea turtles is discussed under the threatened and endangered species section below.

Fish

Increased aircraft operations in the Warning Areas would have no impact on anadromous and marine fish. The increased use of chaff and flares does increase the potential for plastics associated with chaff and flares to end up in aquatic ecosystems and in the Pacific Ocean; however, the amount of plastic material expended in the use of chaff and flares is small, the size of the plastic material is also very small, and most of the material would fall to the ocean floor at depths below which most fish species forage; however, the use of chaff and flares may have a minor, adverse impact on fish species that are large enough to ingest plastic pieces that fall to the ocean floor or remain suspended in the water column for a period of time, even though the likelihood of any large fish species encountering plastic caps from chaff and flares is extremely low. The contract ADAIR sorties in the Warning Areas, including the use of defensive countermeasures, would have no impact on Essential Fish Habitat.

Threatened and Endangered Species

There are no federally or state listed terrestrial reptiles, amphibians, invertebrates, or plants on JBPHH or in the Warning Areas; therefore, contract ADAIR would have no effect on any of these species that could potentially occur on Oahu. Further, contract ADAIR would not have any in-water or ground-disturbing activities and would therefore not impact any listed species of coral that could occur in reefs proximate to Oahu or in the Warning Areas.

Effects on listed bird and mammal species could occur from flight operations associated with contract ADAIR training. These aircraft operations could affect biological resources from aircraft movement, noise, bird and animal aircraft strikes, and use of defensive countermeasures. For listed bird species, given the large area and high altitude where the majority of contract ADAIR training would occur, and that most ADAIR training would occur during daytime hours, the likelihood for birds to encounter aircraft during training operations is low. Because contract ADAIR would fly only up to a projected 3 percent of the estimated 3,072 annual sorties in the special use airspace during environmental night hours and most of the training flight times would be at higher altitudes, these night flights would not adversely affect migrating birds including listed bird species. Additional takeoffs and landings at JBPHH would have no effect on the Hawaiian duck, Hawaiian black-necked stilt, Hawaiian common moorhen, and Hawaiian coot, which could occur in coastal areas near JBPHH, as there would be no increased noise in the very limited habitats where these species could occur. Although a Hawaiian duck was struck by a commercial aircraft at Daniel K. Inouye International Airport (which shares runways with JBPHH), it has been 15 years since that reported commercial aircraft strike, and most Hawaiian ducks on Oahu are hybrids with mallard ducks that are not protected. The Air Force and the ADAIR contractor would implement BASH measures to minimize the risk of bird strikes, and the Recovery Plan for Hawaiian Waterbirds (USFWS, 2011) does not list bird aircraft strikes as a threat to the Hawaiian duck or any other listed waterbird. There is no suitable habitat on or near JBPHH for the Hawaiian short-eared owl and white tern; as such, contract ADAIR operations would have no effect on these two avian species. Further, additional takeoffs and landings associated with contract ADAIR would not change the noise environment at the Hawaiian monk seal haul-out area across the Pearl Harbor Entrance Channel from JBPHH, and these seals are habituated to aircraft movement as JBPHH and Honolulu International Airport have been an active airfield for decades; therefore, additional takeoffs and landings by contract ADAIR at JBPHH would have no effect on the Hawaiian monk seal.

It is highly unlikely that either aircraft movement or noise emissions, especially at higher altitudes, would elicit a response from marine mammals or sea turtles (refer to **Table 3-8**). Noise from contract ADAIR aircraft would not increase substantially (including from sonic booms) in the Warning Areas and would therefore have no effect on the listed marine mammal species and sea turtles. Sonic booms from supersonic aircraft movement could cause a startle response by the listed species when they are present on the surface of the Pacific Ocean at the moment that a sonic boom occurred; however, sonic booms would be relatively rare events during contract ADAIR training in the action area, and the sonic boom and postboom rumbling would be similar to what mammal species and sea turtles experience during a thunderstorm. Sonic booms from supersonic aircraft movement would therefore have no effect on listed species.

There is the potential for components of chaff and flares that remain after use to fall to the surface of the Pacific Ocean where they could be ingested by birds, marine mammals, fish, and sea turtles. Chaff cartridges, chaff canisters, chaff components, and chaff and flare end caps and pistons would be released into the marine environment, where they would persist for long periods and could be ingested by marine wildlife while initially floating on the surface and sinking through the water column. Chaff and flare end caps and pistons would eventually sink (Spargo, 2007), which would reduce the likelihood of ingestion by marine wildlife at the surface or in the water column.

Bird species could potentially encounter chaff and flare components on the Pacific Ocean surface while foraging. Some species of seabirds are known to ingest plastic when it is mistaken for prey (Auman et al., 1997; Yamashita et al., 2011; Provencher et al., 2014). The ingestion of plastic such as chaff and flare compression pads or pistons by birds could cause gastrointestinal obstructions or hormonal changes leading to reproductive issues (Provencher et al., 2014). Unless consumed plastic pieces were regurgitated, the chaff and flare compression pads or pistons could cause digestive tract blockages and eventual starvation and be lethal to birds foraging on the Pacific Ocean surface; however, based on the available information, it is not possible to accurately estimate actual ingestion rates or responses of individual bird species (Moser and Lee, 1992); for example, it is possible that these bird species do not mistake these plastic components for prey and mistakenly consume them. Regardless, the majority of these chaff and flare plastic components would fall through the water column (Spargo, 2007) and would not remain on the surface of the Pacific Ocean where a foraging bird would encounter and consume the plastic pieces. The Newell’s Townsend’s shearwater and short-tailed albatross forage exclusively across the ocean surface. Although it is unknown whether these species could mistake small residual plastic components for prey, there remains the possibility that they could encounter and subsequently ingest plastic end caps; therefore, the use of chaff and flares over the Pacific Ocean as a result of the contract ADAIR training may affect but is not likely to adversely affect the Newell’s Townsend’s shearwater and the short-tailed albatross.

In the very unlikely event that unconsumed chaff and flare components were encountered and ingested by a marine mammal, the small size of chaff and flare end-caps and pistons (i.e., 1.3-in. diameter and 0.13 in. thick) would pass through the digestive tract of marine mammals; therefore, the use of defensive countermeasures may affect but is not likely to adversely affect marine mammals. Sea turtles could also ingest the end caps of chaff and flares. It is likely that small residual plastic components of chaff and flares would also pass through the digestive tract of mature sea turtles. Small plastic components could, however, cause digestive problems for sea turtles if ingested, but with the large area that would be utilized for contract ADAIR training in the Warning Areas, it is highly unlikely that a sea turtle would encounter chaff and flare components; therefore, the use of chaff and flares over the Pacific Ocean as a result of contract ADAIR training may affect but is not likely to adversely affect sea turtles.

The giant manta ray, oceanic whitetip shark, and scalloped hammerhead shark would not be seeking prey that would be similar to plastic end caps from chaff and flares, nor do they typically feed on the Pacific Ocean surface or seafloor where these plastic components would be most prevalent; however, there is still the possibility of an encounter between these fish species and the chaff and flare residual plastic components; therefore, the use of defensive countermeasures by contract ADAIR in the Warning Areas may affect but is not likely to adversely affect the giant manta ray and oceanic whitetip shark.

The Air Force has made a may affect but not likely to adversely affect determination for the Newell's Townsend's shearwater, short-tailed albatross, blue whale, false killer whale, fin whale, humpback whale, sei whale, sperm whale, green turtle, hawksbill turtle, leatherback turtle, loggerhead turtle, olive ridley turtle, giant manta ray, oceanic whitetip shark, and scalloped hammerhead shark. Letters requesting concurrence with this determination have been sent to the USFWS and NMFS (**Appendix A**).

4.5.3 No Action Alternative

Under the No Action Alternative, the contract ADAIR operations would not occur at JBPHH, and there would be no training operations in the special use airspace. As such, there would be no change to biological resources.

4.6 LAND USE

4.6.1 Evaluation Criteria

Potential impacts on land use are based on the level of land use sensitivity in areas potentially affected by the Proposed Action 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; and
- conflict with planning criteria established to ensure the safety and protection of human life and property.

4.6.2 Proposed Action

Under the Proposed Action and alternatives, contract ADAIR would augment current ADAIR sorties flown by 154 WG and 15 WG at JBPHH. Contract ADAIR personnel would use existing facilities at JBPHH 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 special use airspace for training. The Proposed Action and alternatives are compatible with the IDP for JBPHH (JBPHH, 2013). The Proposed Action and alternatives also would use existing facilities that are available for use at JBPHH. Under Alternative 1, contractor Operations and the AMU would be consolidated in Building 2030 with aircraft parking provided on 7 Row. Under Alternative 2, contractor Operations and AMU would be consolidated in Building 3220 with aircraft parking provided on 7 Row.

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 are the same for both alternatives.

4.6.2.1 Alternatives 1 and 2

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**, under the High Noise Scenario, the area within the noise contours would potentially increase. Noise levels would increase from 0 to 2 dBA for the POIs under the High Noise Scenario. The increased DNL at the POIs and areas surrounding the POIs would potentially be long-term, barely noticeable, and negligible. Changes to the noise contours would not result in a change to the safety zones. The Proposed Action and alternatives would not result in significant changes to existing land use or land use compatibility.

Since there would be no construction as part of the Proposed Action and alternatives, interference with the Hawaii's Coastal Zone Management Act program for protection of coastal communities and resources would not occur. As such, no impacts on coastal zones are expected.

4.6.3 No Action Alternative

Under the No Action Alternative, there would be no addition of contract ADAIR personnel or aircraft stationed at JBPHH. Contract ADAIR operations and maintenance facilities would not change from their current use; therefore, no changes would occur to the existing land use.

4.7 SOCIOECONOMICS – INCOME AND EMPLOYMENT

4.7.1 Evaluation Criteria

Consequences to socioeconomic resources were assessed in terms of the potential impacts on the local economy from the proposed contract ADAIR sorties. The level of impacts associated with the proposed contract ADAIR expenditure is assessed in terms of direct effects on the local economy and related effects on other socioeconomic resources (e.g., property values and 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.

4.7.2 Proposed Action

Under the Proposed Action, the Air Force would contract an estimated 3,100 sorties annually at JBPHH which requires an estimated 14 contracted aircraft and 109 contract personnel for this requirement. As such, there is no substantive difference in where the aircraft and personnel are located at JBPHH as it pertains to impacts on socioeconomics.

4.7.2.1 Alternatives 1 and 2

Any minor requirement for materials and labor would have no impacts on the socioeconomic condition on the region. The 109 contract ADAIR maintenance personnel, pilots, staff, family members or dependents would represent a potential small increase in the total population of Honolulu County where there are over 900,000 residents; therefore, no adverse impacts on income and employment would occur under the Proposed Action.

It is estimated that the maximum contracted value for contract ADAIR training would be $30,000 per flight hour (Headquarters Air Combat Command [ACC] Acquisition Management and Integration Center, 2018), though most likely between $8,500 and $15,000 based on technical solution sought; therefore, there could potentially be increased annual expenditures in the region of up to approximately $46.5 million to support the 14 contracted fighter aircraft flying 3,100 annual sorties from JBPHH. 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 109 highly skilled contracted personnel (maintainers and pilots); however, given the size of the local economy of Honolulu County, these increased expenditures would potentially provide a long-term, minor, beneficial impact on the region through increased payroll tax revenue and the purchase of additional equipment, materials, and fuel needed for aircraft operations and maintenance under the Proposed Action.

4.7.3 No Action Alternative

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

4.8 ENVIRONMENTAL JUSTICE AND PROTECTION OF CHILDREN

4.8.1 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.

4.8.2 Proposed Action

Under the Proposed Action, the increase in the number of personnel at JBPHH supporting contract ADAIR would not result in a disproportionate impact on minorities, low-income populations, and protection of children, because there would be adequate housing, community resources, and community services in the Honolulu region available to support the increase in personnel. The 109 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 the Proposed Action.

4.8.2.1 Alternatives 1 and 2

The potential negligible to minor noise increase associated with contract ADAIR training (i.e., 0- to 2-dBA increase at some nearby residential communities) would be long-term and barely noticeable and is not expected to impact POIs or residential communities (see **Section 4.2.2.1**); therefore, there would be no disproportionate impacts from minor increase in noise on minority populations, low-income communities, or children under Alternative 1 or 2.

4.8.3 No Action Alternative

Contract ADAIR operations would not occur at JBPHH 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.

4.9 CULTURAL RESOURCES

4.9.1 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 JBPHH or results in the loss of contributing resources in the historic district or potentially impacts TCPs.

4.9.2 Proposed Action

The Proposed Action includes elements affecting the base and special use 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.

4.9.2.1 Alternative 1

Architectural Resources

Under Alternative 1, contract ADAIR operations would be consolidated with AMU and hangar space in Building 2030. This collocation of space would require some minor interior modifications to Building 2030.

Building 2030 is presently listed on the NRHP as a contributing element of the Hickam Field NHL. The character defining features of Building 2030 are located on the exterior. The proposed interior modifications to Building 2030 are not expected to affect any characteristics that contribute to the double-hangar's historic significance or its overall contribution to the NHL. Alternative 1 would therefore have no effect, and consequently no impact, on historic properties.

Traditional Cultural Properties

No TCPs or sacred sites have been formally identified at JBPHH; nor have any been identified as part of ongoing consultation on the Proposed Action. Alternative 1 would therefore have no effect, and consequently no impact, on TCPs or sacred sites.

Archaeological Resources

No ground disturbance would take place as part of the Proposed Action; therefore, potential archaeological deposits would not be impacted. Sorties within the Warning Areas would be performed at an altitude over the Pacific Ocean that would not affect potential submerged resources. Alternative 1 would therefore have no effect, and consequently no impact, on archaeological resources.

4.9.2.2 Alternative 2

Architectural Resources

Under Alternative 2, contract ADAIR operations would be consolidated with AMU and hangar space in Building 3220. This collocation of space would require some minor interior modifications to Building 3220. These include the possible creation of an interior room or cage for pilots and their equipment.

Building 3220 has been determined to be eligible for inclusion in the NRHP. The character defining features of Building 3220 are located on the exterior. The proposed interior modifications to Building 3220 are not expected to affect any characteristics that contribute to its historic significance or its overall contribution to the NHL. Alternative 2 would therefore have no effect, and consequently no impact, on historic properties.

Traditional Cultural Properties

No TCPs or sacred sites have been formally identified at JBPHH; nor have any been identified as part of ongoing consultation on the Proposed Action. Alternative 2 would therefore have no effect, and consequently no impact, on TCPs or sacred sites.

Archaeological Resources

No ground disturbance would take place as part of the Proposed Action; therefore, potential archaeological deposits would not be impacted. Sorties within the Warning Areas would be performed at an altitude over the Pacific Ocean that would not affect potential submerged resources. Alternative 2 would therefore have no effect, and consequently no impact, on archaeological resources.

4.9.3 No Action Alternative

Under the No Action Alternative, the contract ADAIR operations would not occur at JBPHH, and there would be no training operations in the special use airspace. As such, there would be no change to cultural resources.

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

4.10.1 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 generated or procured beyond current JBPHH 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.

4.10.2 Proposed Action

Under the Proposed Action, maintenance and operations of 14 contracted ADAIR aircraft could contribute to the volume of HAZMAT stored and used at JBPHH and the amount of hazardous waste generated. Impacts associated with hazardous materials and wastes, contaminated sites, and toxic substances are limited to JBPHH. As discussed previously, an emergency fuel dump could occur in the special use airspace; 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.

4.10.2.1 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 operations and maintenance of contract ADAIR aircraft at JBPHH. HAZMAT required for the contract ADAIR aircraft and used by contract personnel would be procured, controlled, and tracked through the Environmental Services Hazardous Waste Disposal Branch, following established NAVFAC Hawaii procedures. This would ensure that only HAZMAT needed for operations and maintenance at the smallest quantities would be used and that all of the HAZMAT used for contract ADAIR at JBPHH would be properly tracked.

The quantity of hazardous waste generated would increase as a result of the contract ADAIR operations at JBPHH; however, all hazardous waste generated as a result of contract ADAIR aircraft operations and maintenance would be properly handled, stored, and disposed of following the NAVFAC Hawaii *Hazardous Waste Management Plan* (NAVFAC Hawaii, 2014). This ensures that hazardous waste is managed according to all federal, state, and local laws and regulations. As such, there would be no impact from the procurement and use of HAZMAT or the storage and disposal of hazardous waste under Alternative 1.

Installation Restoration Program

Building 2030 and 7 Row parking are adjacent to several ERN sites. There is no indication that remedial activities at the ERN sites would have any impacts on the use of Building 2030 or 7 Row, nor would the use of Building 2030 or 7 Row affect remedial activities on the ERN site. There would be no ground-disturbing activities that could spread existing contamination or expose workers to contamination at the ERN sites. No impact on the ERP program is anticipated under Alternative 1 from the contract ADAIR.

Asbestos-Containing Materials and Lead-Based Paint

If ACM is determined to be present in Building 2030 and renovation is required, the ACM would be properly removed and disposed of according to the NAVFAC Hawaii *Asbestos Management and Operations Plan* (NAVFAC Hawaii, 2017).

LBP could be present in Building 2030. If renovations would be required for Building 2030 to support contract ADAIR, any potential LBP would be properly handled and disposed of in accordance with federal, state, and local laws.

With the implementation of the requirements described by the *Asbestos Management Plan* and proper handling of LBP if it was determined to be present in Building 2030, there would be no impact from potential ACM or LBP under Alternative 1.

Radon

There is a low potential for radon to pose a health hazard at JBPHH. 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 interior renovations require the removal of fluorescent lighting fixtures that could contain PCBs, the lighting fixtures would be disposed of according to federal, state, and local laws. The removal and proper disposal of light fixtures containing PCBs is a potential long-term, minor, beneficial impact under Alternative 1.

4.10.2.2 Alternative 2

Hazardous Materials and Wastes

The handling of HAZMAT and disposal of hazardous waste under Alternative 2 would be the same as described for Alternative 1. All hazardous waste generated as a result of contract ADAIR aircraft operations and maintenance would be properly handled, stored, and disposed of following the NAVFAC Hawaii *Hazardous Waste Management Plan* (NAVFAC Hawaii, 2014); therefore, there would be no impact from the procurement and use of HAZMAT or the storage and disposal of hazardous waste under Alternative 2.

Environmental Restoration Program

There are no ERN sites proximate to Building 3220, but Building 3220 is near the POL subsites being managed under an ENHP. Parking on 7 Row is adjacent to two ERN sites; however, there is no indication that remedial activities at the ERN and POL sites would have any impacts on the use of Building 3220 or parking of aircraft on 7 Row nor would the use of Building 3220 or 7 Row affect remedial activities on the ERN and POL sites. There would be no ground-disturbing activities that could spread existing contamination or expose workers to contamination at the ERN sites. No impact on the ERP program is anticipated under Alternative 2.

Asbestos-Containing Materials and Lead-Based Paint

If ACM is determined to be present in Building 3220 and renovation is required, the ACM would be properly removed and disposed of according to the NAVFAC Hawaii *Asbestos Management and Operations Plan* (NAVFAC Hawaii, 2017).

LBP could be present in Building 3220. If renovations would be required for Building 2030 to support contract ADAIR, any potential LBP would be properly handled and disposed of in accordance with federal, state, and local laws.

With the implementation of the requirements described by the *Asbestos Management Plan* and proper handling of LBP if it was determined to be present in Building 2030, there would be no impact from potential ACM or LBP under Alternative 2.

Radon

There is a low potential for radon to pose a health hazard at JBPHH. Further, no new construction is proposed. As such, no impact from radon is anticipated under Alternative 2.

Polychlorinated Biphenyls

Removal of any light fixtures has the potential to disturb PCBs. If interior renovations require the removal of fluorescent lighting fixtures that could contain PCBs, the lighting fixtures would be disposed of according to federal, state, and local laws. The removal and proper disposal of light fixtures containing PCBs is a potential long-term, minor, beneficial impact under Alternative 2.

4.10.3 No Action Alternative

Under the No Action Alternative, the contract ADAIR operations would not occur at JBPHH. 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 JBPHH buildings. As a result, there would be no direct or indirect impact on any HAZMAT or hazardous or special wastes under the No Action Alternative.

This page intentionally left blank

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.

This section identifies and evaluates past, present, and reasonably foreseeable future projects that could cumulatively affect environmental resources in conjunction with the Proposed Action. The ROI for the cumulative effects analysis is the same as defined for each resource in **Chapter 3**. Actions identified in **Tables 5-1** and **5-2** would not interact with all resources; therefore, resources that potentially could result in a cumulative effect with the addition of the Proposed Action and alternatives are noted in these tables.

Assessing cumulative effects begins with defining the scope of other actions and their potential interrelationship with the Proposed or alternative actions. 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 or alternative actions, 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 JBPHH.

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 Proposed Action or alternatives, 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 military at JBPHH as well as in the region and special use airspace were considered.

5.2.1 Department of Defense Actions

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

JBPHH 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 outlined in the IDP (JBPHH, 2013). JBPHH, like other major military installations, requires new construction and infrastructure improvements. These routine projects are environmentally cleared using NEPA's Categorical Exclusion process and would continue to occur in conjunction with the Proposed Action. In addition to these routine projects, **Table 5-1** lists the past, present, and reasonably foreseeable future major military projects that were considered in the cumulative analysis. Anticipated future nonfederal, off-base projects that may overlap in the potentially affected area or project timing with the Proposed Action also were considered and listed in **Table 5-2**.

Table 5-1
Past, Present, and Reasonably Foreseeable Future Projects at Joint Base Pearl Harbor-Hickam and Special Use Airspace

Scheduled Project	Project Summary	Implementation Date	Relevance to Proposed Action	Resource Potentially Affected
Past Actions				
C-17 SAAF, Hickam AFB, Hawaii	Construction of a SAAF in the Kona area for training operations including a connecting taxiway, paved shoulders, graded areas around the runway, pavement marking, and airfield light improvements; C-17 aircraft to use existing Runway 17-35 for takeoffs	2004	Existing conditions/activity would be in proximity to contract ADAIR implementation.	Airspace Management and Use, Land Use
Replacement of F-15 Aircraft with F-22A Aircraft EA, Hickam AFB, Hawaii	Air Force and Air National Guard replacement of HIANG F-15 aircraft with F-22 aircraft at Hickam AFB	2007	Existing conditions/activity would be in proximity to contract ADAIR implementation.	Airspace Management and Use, Noise, Safety, Air Quality, Biological Resources, Cultural Resources, Land Use, Socioeconomics – Income and Employment, Environmental Justice
New Homeland Defense Fighter Alert Facility Categorical Exclusion	Construction of a new Homeland Defense Fighter Alert Facility to replace the existing facility at JBPHH including the relocation of the existing hush house outside of the explosive area and demolition of the existing Alert Facility to remove buildings from the Clear Zone	2016	Existing conditions/activity would be in proximity to contract ADAIR implementation.	Safety, Air Quality, Land Use, Hazardous Materials/Waste
Present Actions				
US Navy Hawaii-Southern California Training and Testing EIS	Proposal to conduct military readiness activities including training and testing in the Hawaii-Southern California Training and Testing area	2018	Testing area would be beneath the Proposed Action special use airspace.	Air Quality, Noise, Safety, Biological Resources

Notes:
ADAIR = adversary air; AFB = Air Force Base; EIS = Environmental Impact Statement; HIANG = Hawaii Air National Guard; JBPHH = Joint Base Pearl Harbor-Hickam; SAAF = Short Austere Airfield; US = United States

5.2.2 Nonfederal Actions

Nonfederal actions such as new development or construction projects occurring in the area surrounding JBPHH were considered for potential cumulative impacts. Several current and proposed projects were considered in addition to JBPHH projects as shown in **Table 5-2**.

Table 5-2
Past, Present, and Reasonably Foreseeable Future Projects – Nonfederal Actions

Scheduled Project	Project Summary	Implementation Date	Relevance to Proposed Action	Resource Potentially Affected
Past Actions				
Kaka'ako Community District Development – Kewalo Basin Harbor Improvements Project	Construction of 214 boat slips and modernization of existing harbor infrastructure at the Kewalo Basin Harbor	2016	Zoned portions of the development district lie beneath the JBPHH noise contours.	Air Quality, Socioeconomics – Income and Employment
Kaka'ako Community District Artspace Project	Construction of 84 affordable housing units for artists	2014	Zoned portions of the development district lie beneath the JBPHH noise contours.	Air Quality, Land Use, Socioeconomics – Income and Employment
Kaka'ako Community District Ward Village-Gateway Project	Construction of two mixed use, high-rise towers development	2014	Zoned portions of the development district lie beneath the JBPHH noise contours.	Air Quality, Socioeconomics – Income and Employment
Present Actions				
Hawaii Department of Transportation Halawa Heights Road Pedestrian Bridge Project	Construction of a pedestrian bridge on Halawa Heights Road between Kaakau Place and Mikoi Place	2019	Construction would overlap with contract ADAIR implementation.	Air Quality, Socioeconomics – Income and Employment
Hawaii Department of Transportation H-201 Resurfacing Project	Repaving westbound lanes of H-201 between Halawa to H-1 Aiea including reconstruction of shoulders, replacement of guardrails, and drainage improvements	2019	Construction would overlap with contract ADAIR implementation.	Air Quality, Socioeconomics – Income and Employment
Hawaii Department of Transportation Route 99 Slope Improvements	Clearing, site grading, demolition and removal of existing concrete ditch and installation of new drainage culverts	2019	Construction would overlap with contract ADAIR implementation.	Air Quality, Socioeconomics – Income and Employment

Table 5-2
Past, Present, and Reasonably Foreseeable Future Projects – Nonfederal Actions

Scheduled Project	Project Summary	Implementation Date	Relevance to Proposed Action	Resource Potentially Affected
Hawaii Department of Transportation Route 92 Stormwater Improvements	Improvements at Maintenance Baseyards on Oahu including demolition and removal of existing asphalt pavement, installation of new asphalt pavement, equipment shed, hazardous materials storage containers, and concrete channel	2019	Construction would overlap with contract ADAIR implementation	Air Quality, Socioeconomics – Income and Employment, Hazardous Materials
Hawaii Board of Water Supply 6-Year Capital Improvement Program, City and County of Honolulu, Hawaii	Includes wells, pumping units, pump stations replacements/ rehabilitation, replacement and new reservoirs and pipelines, installation of mains and appurtenances throughout Honolulu	2015-2020	Construction and upgrade activities would overlap with contract ADAIR implementation.	Air Quality, Socioeconomics – Income and Employment
Future Actions				
Hawaii Department of Transportation Route H-1 Resurfacing Project	Resurfacing of H-1 from Salt Lake Boulevard to Airport Viaduct including resurfacing and repair of pavement, upgrade guardrails, restriping, and new signage	2020	Construction would overlap with contract ADAIR implementation.	Air Quality, Socioeconomics – Income and Employment
Kaka’ako Community District – Universal Building Project and additional projects	Improvements to the interior and exterior of the existing Universal Building plus upgrades to recreational amenities, construction of a 400-foot-high tower for residential and commercial, and a 5-megawatt solar power project installation	2020	Zoned portions of the development district lie beneath the JBPHH noise contours.	Air Quality, Socioeconomics – Income and Employment

Sources: Hawaii Community Development Authority, 2019; Hawaii Department of Transportation, 2019; Honolulu County Water Development Board, 2015

Notes:
ADAIR = adversary air

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

Potential cumulative impacts on airspace management and use from contract ADAIR operations, in addition to past, present, and reasonably foreseeable future actions, are expected to be negligible. The addition of contract ADAIR sorties would increase by 2 percent at the installation and a 69 percent increase in aircraft operations in the Warning Areas. When added to past, present, and reasonably foreseeable future projects, the addition of contract ADAIR operations may result in a negligible cumulative effect.

5.3.2 Noise

The Proposed Action would result in potential long-term, minor impacts on noise under the High, Medium, and Low Noise Scenarios. Under the High Noise Scenario, there would potentially be an increase to noise levels of 0- to 2-dBA DNL to representative POIs. While roadway work and new facility construction is proposed off-base, and on-base routine maintenance and construction activities would occur during ADAIR implementation, these potential increases in noise levels would be negligible and short-term. The Proposed Action when added to past, present, and reasonably foreseeable future project on- and off-JBPHH may result in adverse, negligible cumulative impacts on noise. The incremental increase in the number of sonic booms when compared to what currently exists in the airspace proposed for contract ADAIR would potentially result in a negligible cumulative effect.

5.3.3 Safety

The Proposed Action, in addition to past, present, and reasonably foreseeable future actions on and off JBPHH, 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 established aircraft flight manuals as implemented by the contract. Training sorties would increase by approximately 2 percent at JBPHH. This increase could pose an increased risk to flight safety; however, through compliance with the BASH plan and flight safety rules, the potential incremental cumulative impact would be minimized. As such, no cumulative impacts on ground and flight safety are expected with implementation of the Proposed Action.

5.3.4 Air Quality

The Proposed Action, in addition to past, present, and reasonably foreseeable future actions on and off the JBPHH, may result in negligible cumulative impacts on air quality. With the addition of ongoing construction projects at JBPHH, in addition to Hawaii Department of Transportation roadway work and the Kaka'ako Community Development construction off-base, PM_{10} emissions would potentially increase; however, these increases would be short in duration and the potential incremental impact on air quality would be negligible.

ADAIR training activities would occur at times below the mixing height (3,000 ft AGL) in the Warning Areas; however, the duration would be brief (approximately 1.38 minutes per sortie); therefore, no impacts on air quality are expected in any of the Warning Areas. A potential negligible, short-term incremental change associated with off-base construction to air quality is expected when adding the contract ADAIR operations to past, present, and reasonably foreseeable future actions. No cumulative impact on air quality is expected in the proposed Warning Areas.

5.3.5 Biological Resources

The Proposed Action, in addition to past, present, and reasonably foreseeable future actions on and off JBPHH, would potentially result in a less than significant cumulative impacts on biological resources. Since there are no ground-disturbing activities proposed, there could be no cumulative impacts on vegetation. Noise impacts on wildlife using the bayshore/nearshore habitats from the Proposed Action in combination with onshore road and community development construction projects may result in short- and long-term, negligible cumulative impacts under the Proposed Action. When added to past, present, and foreseeable future action, the Proposed Action may result in an increased risk of aircraft bird and other wildlife strikes. Compliance with the JBPHH BASH prevention program would reduce the potential cumulative risk of additional sortie operations associated with aircraft bird and other wildlife conflicts. There would be no cumulative impacts on marine mammals, sea turtles, or Essential Fish Habitat with the contract ADAIR in combination with ongoing and proposed US Navy training activities. No cumulative effects on federal or state listed plant species, terrestrial reptiles, amphibians, fish, or invertebrates are anticipated because there would be no ground-disturbing activities from the Proposed Action. Further, no significant cumulative impacts on threatened and endangered species are anticipated. The Air Force has made a may affect but not likely to adversely affect determination for several federally listed species for the Proposed Action. No potential for significant cumulative effects on biological resources are expected.

5.3.6 Land Use

The Proposed Action, in addition to past, present, and reasonably foreseeable future actions on and off JBPHH, would not change land use or land use compatibility. The proposed modifications associated with Buildings 2030 and 3220 under the Proposed Action and alternatives include minimal interior modifications and would not create a cumulative change to the surrounding on-installation land use. No significant cumulative effects on or off base are expected.

5.3.7 Socioeconomics – Income and Employment

The Proposed Action as well as past, present, and reasonably foreseeable actions on and off JBPHH would not result in an adverse cumulative impact on the region’s employment; however, the Proposed Action would potentially increase annual expenditures in the local economy to approximately $46.5 million. This, along with other proposed projects in the area, may create an economic boost to the region and represents a potential long-term, minor, beneficial cumulative impact on the local economy.

5.3.8 Environmental Justice and Protection of Children

The Proposed Action, as well as past, present, and reasonably foreseeable future actions on and off JBPHH, are not expected to have a disproportionate cumulative impact on minority and low-income populations or children.

5.3.9 Cultural Resources

The Proposed Action would require minor interior modifications to either Building 2030 or 3220. Building 2030 is presently listed on the NRHP as a contributing element of the Hickam Field NHL; however, the character-defining features of Building 2030 are located on the exterior. Building 3220 has been determined to be eligible for inclusion in the NRHP; however, the character defining features of Building 3220 are also located on the exterior. As such, impacts on architectural resources would be negligible. No impacts are expected under the Proposed Action to Native American TCPs or archeological resources (on base or under the Warning Areas).

5.3.10 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 JBPHH, are not anticipated to result in potentially significant cumulative impacts on 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 contract ADAIR operations in addition to past, present, and foreseeable future projects would likely increase; however, this increase would potentially result in a negligible cumulative effect. The proposed contract ADAIR project in addition to other proposed projects on base would require compliance with the NAVFAC Hawaii *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 on the storage and disposal of hazardous waste is expected. There are several ERN sites adjacent to the proposed facilities and 7 Row parking; however, contract ADAIR activities or use of these facilities are not expected to affect remedial activities, and remedial activities would continue with the implementation of contract ADAIR. As such, no incremental impacts are expected to contaminated sites. The addition of the proposed contract ADAIR operations and foreseeable future projects on-base would be required to adhere to the *Asbestos Management and Operating Plan* for any modifications to existing structures. No significant, adverse cumulative impacts on hazardous materials and wastes, contaminated sites, and toxic substances are expected.

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 or alternatives.

Short-term effects on 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. BMPs in place for each project should reduce potential impacts or disruptions. Under the Proposed Action, these short-term uses would have a potential negligible cumulative effect.

The Proposed Action involves providing dedicated contract ADAIR sorties to employ adversary tactics within existing JBPHH airspace. There would be no short-term effects on the airspace used by contract ADAIR activities and therefore no adverse impact on the long-term productivity and future use of the Warning Areas proposed for contract ADAIR use. The Proposed Action also includes elements affecting the base such as contract ADAIR aircraft, facilities, maintenance, and personnel. Under the Proposed Action and alternatives, there would be no new construction. Existing installation facilities would be used with some internal modifications. While other maintenance activities would be occurring in the vicinity of the Proposed Action facilities, construction associated with these modifications represent a potential negligible effect on the short-term use of construction labor, goods, and services. No negative effects are expected from the Proposed Action short-term 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 contract ADAIR activities but would not result in an irreversible and irretrievable commitment of airspace resources; however, the Proposed Action calls for 3,100 contracted sorties which represent an increase of 40 percent in the number of operations. As such, flight operations and training would result in the consumption of additional fuel, increasing the irreversible and irretrievable commitment of fuels. The addition of 109 contract personnel to support the Proposed Action also would create additional fuel consumption from daily commute travel to and from JBPHH. Consumption of fuel associated with the Proposed Action, in addition to the total use of available fuels, is expected to result in a potential 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.

This page intentionally left blank

CHAPTER 6 LIST OF PREPARERS AND CONTRIBUTORS

The following individuals assisted in the preparation of this EA:

Dean Alford, PG
Vernadero Group, Inc.
Senior Geologist
M.S. Geology/Geochemistry
B.S. Geology
Years of Experience: 30
Contribution: Hazardous Materials and Wastes

Anna Banda
Versar, Inc.
Geoscientist/Copy Editor
M.S. Geology
B.S. Geology
Years of Experience: 12
Contribution: Editing, Report Production

Dan Becker, GISP
Vernadero Group, Inc.
Information Technology & Services Director
M.A. Geography
B.A. Geography
Years of Experience: 9
Contribution: GIS/Cartography

Brian Bishop
Versar, Inc.
Environmental Scientist
M.S. Environmental Science
B.S. Biology
Years of Experience: 17
Contribution: Description of the Proposed Action and Alternatives Development, Land Use, Biological Resources

Kevin Bradley
KBRWyle
Engineering Manager
B.S. Aerospace Engineering
M.S. Aerospace Engineering
Years of Experience: 23 years
Contribution: Noise

Mackenzie Caldwell Rohm
Versar, Inc.
M.A. Anthropology/Archaeology
B.A. Anthropology/Archaeology/Sociology
Years of Experience: 16
Contribution: Cultural Resources

Rahul Chettri
Versar, Inc.
Senior Air Quality Engineer
M.S. Environmental Studies
B.S. Economics
Years of Experience: 35
Contribution: Air Quality

Chris Clark
Versar, Inc.
Environmental Scientist
B.S. Environmental Sciences, Life Sciences
Years of Experience: 19
Contribution: Biological Resources,

Maggie Fulton
Vernadero Group, Inc.
Technical Editor
B.A., English
Years of Experience: 32
Contribution: Intergovernmental/Interagency Coordination for Environmental Planning, Notice of Availability

Chris Hobbs
KBRWyle
Senior Acoustician
M.S. Physics
Years of Experience: 20
Contribution: Noise

Isaac Jimenez
Versar, Inc.
B.S. Geology
Years of Experience: 2
Contribution: Air Quality

Anicka Kratina-Hathaway
Vernadero Group, Inc.
Biologist
M.S. Zoology and Physiology
B.S. Ecology and Organismal Biology
Years of Experience: 11
Contribution: Biological Resources

Radhika Narayanan
Versar, Inc.
M.S. Environmental Science
B.S. Chemistry
Years of Experience: 27
Contribution: Air Quality

Duane E. Peter, RPA
Heritage Consulting
President
M.A. Anthropology
B.A. History
Years of Experience: 40
Contribution: Cultural Resources

Thomas Phelan
KBRWyle
Director, Air Vehicle Operation Unit
B.S. Aeronautical Engineering
M.S. Aeronautical Engineering
Years of experience: 39 (US Navy and Contractor)
Contribution: Airspace and Safety

Kristen Reynolds
Versar, Inc.
M.A. History
B.A. English
Years of Experience: 15
Contribution: Architectural Historian

Peggy Roberts
Versar, Inc.
Senior NEPA Project Manager
M.S. Organizational Leadership/Project Management
M.S. Public Communications & Technology
B.A. Journalism/Public Relations
Years of Experience: 25 years
Contribution: Cumulative Impacts, Land Use

Tim Sletten
Versar, Inc.
Senior Environmental Scientist
B.S. Meteorology
Years of Experience: 33
Contribution: Air Quality

Derek Stadther
KBRWyle
Acoustical Engineer
MEng. Acoustics
Years of Experience: 6
Contribution: Noise and Airspace

Christa Stumpf
Versar, Inc.
Program Manager, NEPA Planner
M.S. Forest Resource and Land Use Planning
B.S. Wildland Management
Years of Experience: 23
Contribution: Project Management, QA/QC

Eric Webb
Vernadero Group, Inc.
Vice President and Technical Services Director
Ph.D. Oceanography and Coastal Sciences
M.S. Biology
B.S. Biology
Years of Experience: 23
Contribution: Program Management, Quality Control, Regulatory Interface, Socioeconomics

Government Contributors

The following individuals contributed to this Draft EA:

Contributor	Organization/Affiliation
Crystal Darnell	USACE Mobile
Brian Peck	USACE Mobile
John Doss	AFCEC/CZN
Mike Ackerman	AFCEC/CZN
John Saghera	ACC/A3TO
Joshua Hudson	ACC/A3TO
Sarah Amthor	ACC AFIMSC DET 8/IS
George Duda	ACC/A8BA
Donald Mattner	ACC A589/A8BG
Brent Cartagena	ACC/A8BA
Rob Anderson	ACC AMIC/PMSA
Wanda Gooden	ACC AMIC/PMSA
Chris Vance	ACC AMIC/PMSA
Steven Allen	ACC AMIC/PMSA
Kevin Stiens	ACC AQC MGMT INTEG CE/DRJ
Lt Col Jeff Hawkins	ACC AFLOA/JACE-FSC
Tom Bucci	AFLOA/JACE-FSC
Glen Bailey	JBPHH

This page intentionally left blank

CHAPTER 7 REFERENCES

AFCEC. 2017a. *Air Emissions Guide for Air Force Mobile Sources, Methods for Estimating Emissions of Air Pollutants for Mobile Sources at U.S. Air Force Installations*. Prepared by Solutio Environmental, Inc. September.

AFCEC. 2017b. *Air Quality Environmental Impact Analysis Process (EIAP) Guide – Fundamentals, Volume 1 of 2*. Prepared by Solutio Environmental, Inc. August.

AFCEC. 2018. *Noise Analysis Report for F-22 Relocation to Joint Base Pearl Harbor-Hickam (JBPHH).* Prepared by KBRWyle, Lorton, Virginia. 4 December.

Air Force Safety Center. 2018. *USAF Wildlife Strikes by Altitude (AGL) FY 1995-2016*.

Air Force. 1997. *Environmental Effects of Self-protection Chaff and Flares: Final Report*. Prepared for Headquarters Air Combat Command, Langley Air Force Base, Virginia.

Air Force. 2001. *Initial F-22 Operational Wing Beddown Final Environmental Impact Statement*. November.

Air Force. 2006. *F-22A Beddown Environmental Assessment, Elmendorf Air Force Base*. Appendix E: Review of Effects of Aircraft Noise, Chaff, and Flares on Biological Resources.

Air Force. 2018. *Performance Work Statement for the Combat Air Forces (CAF) Contract Air Support (CAF CAS)*. Version 1.1. October.

American National Standards Institute. 1988. *Quantities and Procedures for Description and Measurement of Environmental Sound: Part 1, ANSI S12.9-1988*.

Aquarone, M.C., and S. Adams. 2009. *Xiv-44 California Current LME*. *In* K. Sherman & G. Hempel (Eds.): *The UNEP Large Marine Ecosystem Report: A perspective on Changing Conditions in LMEs of the World's Regional Seas* (pp. 591–604). United Nations Environmental Programme, Nairobi, Kenya.

Auman, H. J., J. P. Ludwig, J. P. Giesy, and T. Colborn. 1997. *Plastic Ingestion by Laysan Albatross Chicks on Sand Island, Midway Atoll, in 1994 and 1995*. In G. Robinson and R. Gales (Eds.), Albatross Biology and Conservation, pp. 239–244. Surrey Beatty and Sons, Chipping Norton.

Berglund, B., and T. Lindvall, eds. 1995. *Community Noise.* Center for Sensory Research 2(1):1-195.

City and County of Honolulu. 2018. *Zoning – Land Use Ordinance, Honolulu Open Geospatial Data*. 15 November.

Czech, J.J. and K.J. Plotkin. 1998. *NMAP 7.0 User's Manual*. Wyle Research Report WR 98-13. Wyle Laboratories, Inc. November.

Grubb, T.Y, D.K. Delaney, W.W. Bowerman, and M.R. Weirda. 2010. *Golden Eagle Indifference to Heli-skiing and Military Helicopters in Northern Utah*. Journal of Wildlife Management 74:1275-1285.

Harris, C.M. 1979. *Handbook of Noise Control*. McGraw-Hill Book Co.

Hawaii Community Development Authority. 2019. *Kakaako Community Development Projects. Department of Business, Economic Development & Tourism*. <http://dbedt.hawaii.gov/hcda/discover-kakaako/about-kakaako/>. Accessed 7 June 2019.

Hawaii Department of Transportation 2019. *HDOT Highways Program Status*. <https://histategis.maps.arcgis.com/apps/MapSeries/index.html?appid=39e4d804242740a89d3fd0bc76d8d7de>. Accessed 7 June 2019.

Hawaii Division of Forestry and Wildlife. 2019. *State Wildlife Action Plan Fact Sheets*. <http://dlnr.hawaii.gov/wildlife/hswap/fact-sheets/>. Accessed May 2019.

Hawaii DOH. 2019. *Hawaii Greenhouse Gas Emissions Report for 2015*. January.

Hawaii Noise Radiation and Indoor Air Quality Branch. 2019. *Honolulu County Radon Information*. <http://county-radon.info/HI/Honolulu.html>. 6 June.

Headquarters ACC Acquisition Management and Integration Center. 2018. *Memorandum for CAF ADAIR (Solicitation No. FA4890-17-R-0007) – Maximum Price Per Flying Hour*. Provided to CAF ADAIR Interested Parties. 02 April.

Hickam AFB. 2007. *Replacement of F-15 Aircraft with F-22A Aircraft, Hickam AFB, Hawaii, Draft Environmental Assessment*. April.

Hickam AFB. 2008. *Final Integrated Cultural Resources Management Plan, 2008-2012 Update for Hickam AFB, Hawaii*. Prepared by J. M. Waller Associates, Inc. January.

Honolulu County Water Development Board. 2015. *Six-Year Capital Improvement Program for Fiscal Years Beginning 2014 and Ending 2020.* 23 February.

JBPHH. 2011. *Joint Base Pearl Harbor Hickam Integrated Natural Resources Management Plan*. September.

JBPHH. 2013. *Installation Development Plan Training Practicum Report for Joint Base Pearl Harbor-Hickam, Honolulu, Hawaii*. August.

Lucas, Michael J. and Paul T. Calamia. 1997. *Military Operating Area and Range Noise Model MR_NMAP User's Manual*. Wyle Laboratories, Inc. Research Report WR 94-12-R. March.

Maritime Archaeology and History of the Hawaiian Islands Foundation. 2011. *Goals and Volunteer Opportunities*. <http://www.mahhi.org/goals.html>. Accessed May 2019.

Melillo, Jerry M., Terese (T.C.) Richmond, and Gary W. Yohe, Eds. 2014. *Climate Change Impacts in the United States: The Third National Climate Assessment*. US Global Change Research Program, 841 pp. doi:10.7930/J0Z31WJ2.

Moser, M. L., and D. S. Lee. 1992. *A Fourteen-Year Survey of Plastic Ingestion by Western North Atlantic Seabirds*. Colonial Waterbirds 15(1):83–94.

NASA. 2017. *NASA Armstrong Fact Sheet: Sonic Booms*. <https://www.nasa.gov/centers/armstrong/news/FactSheets/FS-016-DFRC.html>. Accessed 10 October 2018.

National Park Service. 2002. *How to Apply the National Register Criteria for Evaluation.* National Register Bulletin 15. Washington, DC, US Department of the Interior, Interagency Resources Division. <https://www.nps.gov/nr/publications/bulletins/nrb15/nrb15_4.htm>. Accessed February 2018.

NAVFAC EV. 2018. *JBPHH Mapped ERN Sites*. 1 March.

NAVFAC Hawaii. 2011. *Final Record of Decision Site ST29 – Bishop Point Underground Storage Tanks JBPHH, Oahu, Hawaii*. September.

NAVFAC Hawaii. 2014. *Navy Region Hawaii Hazardous Waste Management Plan*. February.

NAVFAC Hawaii. 2017. *Asbestos Program Management*. NAVFAC P-502. September.

NOAA. no date. *Wrecks and Obstructions Database.* <https://nauticalcharts.noaa.gov/data/wrecks-and-obstructions.html>.Accessed May 2019.

NOAA. 2010. *Final Evaluation Findings, Hawaii Coastal Zone Management Program*. January.

Plotkin, K.J. 1993. *Sonic Boom Focal Zones from Tactical Aircraft Maneuvers. Journal of Aircraft, Volume 30, Number 1*. January-February.

Plotkin, K.J. 2002. *Computer Models for Sonic Boom Analysis: PCBoom4, CABoom, BooMap, CORBoom*. Wyle Laboratories Research Report WR 02-11. June.

Polovina, J.J., W.R. Haight, R.B. Moffitt, and F.A. Parrish. 1995. *The Role of Benthic Habitat, Oceanography, and Fishing on the Population Dynamics of the Spiny Lobster, Panulirus marginatus (Decapoda, Palinuridae), in the Hawaiian Archipelago*. Crustaceana 68(2):203–212.

Provencher, J., A. Bond, A. Hedd, W. Montevecchi, S. Muzaffar, S. Courchesne, H. Gilchrist, S. Jamieson, F. Merkel, K. Falk, J. Durinck, and M. Mallory. 2014. *Prevalence of Marine Debris in Marine Birds from the North Atlantic*. Marine Pollution Bulletin 84:411–417.

Rooney, J., P. Wessel, R. Hoeke, J. Weiss, J. Baker, F. Parrish, C.H. Fletcher, J. Chojnacki, M. Garcia, R. Brainard, and P. Vroom. 2008. *Geology and Geomorphology of Coral Reefs in the Northwestern Hawaiian Islands*. *In* B. M. Riegl and R. E. Dodge (Eds.): *Coral reefs of the U.S.A. Coral Reefs of the World* (Vol. 1, pp. 515–567). Springer.

Schultz, T.J. 1978. *Synthesis of Social Surveys on Noise Annoyance*. Journal of the Acoustical Society of America 64(2):377-405. August.

Spargo, Dr. Barry. 2007. Personal communication between Dr. Barry Spargo, Naval Research Laboratory, and Mark Collins, Parsons, 1 June 2007, as cited in the Gulf of Alaska Naval Training Activities Environmental Impact Statement/Overseas Environmental Impact Statement, March 2011.

State of Hawaii. 2019a. *About Kakaako, Department of Business, Economic Development & Tourism*. <http://dbedt.hawaii.gov/hcda/discover-kakaako/about-kakaako/>. Accessed 6 June 2019.

State of Hawaii. 2019b. *State CZM Program, Office of Planning*. <http://planning.hawaii.gov/czm/>. Accessed 6 June 2019.

Stusnick, E., K.A. Bradley, J.A. Molino, and G. DeMiranda. 1992. *The Effect of Onset Rate on Aircraft Noise Annoyance, Volume 2: Rented Home Experiment*. Wyle Laboratories Research Report WR 92-3. March.

The Heritage Foundation. 2015. *2016 Index of U.S. Military Strength: Assessing America's Ability to Provide for the Common Defense*. Davis Institute for National Security and Foreign Policy.

Tomczak, M., and J.S. Godfrey. 2003. *The Pacific Ocean Regional Oceanography: An Introduction* (2nd ed., pp. 105–174). Daya Publishing House.

US Bureau of Labor Statistics. 2019. *Local Area Unemployment Statistics for 2017*. <https://www.bls.gov/lau/lastrk17.htm>. Accessed June 2019.

US Census Bureau. 2019. *US Census Quick Facts*. <https://www.census.gov/quickfacts/fact/table/US/PST045218>. Accessed June 2019.

US Climate Data. 2018. *Climate Honolulu - Hawaii*. <https://www.usclimatedata.com/climate/honolulu/hawaii/united-states/ushi0026> Accessed 9 September 2018.

US Department of Interior. 2017. *Memorandum M-Opinion 37050, The Migratory Bird Treaty Act Does Not Prohibit Incidental Take*. 22 December.

US Navy. 2012. *Programmatic Agreement among the Commander Navy Region Hawaii, the Advisory Council on Historic Preservation, and the Hawaii State Historic Preservation Officer Regarding Navy Undertakings in Hawaii*. October.

US Navy. 2018. *Hawaii-Southern California Training and Testing Final Environmental Impact Statement/ Overseas Environmental Impact Statement*. October.

US Surgeon General. 2005. *Surgeon General Releases National Health Advisory on Radon*. US Department of Health and Human Services. January.

USEPA. 1978. *Protective Noise Levels*. Office of Noise Abatement and Control, Washington, DC. USEPA Report 550/9-79-100, November.

USEPA. 2008. *PCBs—Basic information*. <http://www.epa.gov/wastes/hazard/tsd/pcbs/pubs/about.htm>. 5 May 2018.

USEPA. 2009. *AP 42, Fifth Edition, Volume I, Chapter 15: Ordnance Detonation*.

USEPA. 2019. *Climate Change Indicators: Ocean Acidity*. <https://www.epa.gov/climate-indicators/climate-change-indicators-ocean-acidity>. Accessed April 2019.

USFWS. 2011. *Recovery Plan for Hawaiian Waterbirds, Second Revision*. Region 1, Portland, Oregon. 28 October.

USFWS. 2019. *Environmental Conservation Online System*. <https://ecos.fws.gov/ecp/>. Accessed May 2019.

Venable, J. 2016. *Fighter Pilots Aren't Flying Enough to Hone the Skills of Full-Spectrum War. Defense One*. 21 November. <http://www.defenseone.com/ideas/2016/11/fighter-pilots-arent-flying-enough-hone-skills-full-spectrum-war/133328/>. Accessed 16 March 2018.

Vetter, E.W., C.R. Smith, and F.C. De Leo. (2010). *Hawaiian Hotspots: Enhanced Megafaunal Abundance and Diversity in Submarine Canyons on the Oceanic Islands of Hawai*i. *Marine Ecology 31*(1):183–199.

Wasmer, F., and F. Maunsell. 2006a. *BaseOps 7.3 User's Guide*. Wasmer Consulting.

Wasmer, F., and F. Maunsell. 2006b. *NMPlot 4.955 User's Guide*. Wasmer Consulting.

Weatherbase. 2018. *Hickam Air Force Base, Hawaii.*<https://www.weatherbase.com/weather/weather-summary.php3?s=110032&cityname=Hickam+Air+Force+Base%2C+Hawaii%2C+United+States+of+America&units=>. Accessed 9 September 2018.

Western Regional Climate Center. 2018. *Climate of Hawaii*. <https://wrcc.dri.edu/Climate/narrative_hi.php>. Accessed 10 October 2018.

Yamashita, R., H. Takada, M. A. Fukuwaka, and Y. Watanuki. 2011. *Physical and Chemical Effects of Ingested Plastic Debris on Short-Tailed Shearwaters, Puffinus tenuirostris, in the North Pacific Ocean*. Marine Pollution Bulletin 62(12):2845-2849.

APPENDICES

This page intentionally left blank

APPENDIX A

INTERAGENCY AND INTERGOVERNMENTAL COORDINATION AND CONSULTATIONS

This page intentionally left blank

Table of Contents

This page intentionally left blank

Appendix A-1

Interagency and Intergovernmental Coordination for Environmental Planning – Description of Proposed Action and Alternatives

This page intentionally left blank

DEPARTMENT OF THE NAVY
COMMANDER
NAVY REGION HAWAII
850 TICONDEROGA ST STE 110
JBPHH HI 96860-5101

5750
Ser N4/0518
06 MAY 2019

CERTIFIED NO:7016 0910 0001 0891 7284
NOAA Fisheries
Pacific Islands Regional Office
1845 Wasp Blvd., Bldg 176
Honolulu, HI 96818

CERTIFIED NO:7016 0910 0001 0891 7291
U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Blvd., Rm 3-122
Honolulu, HI 96850

CERTIFIED NO:7016 0910 0001 0891 7307
State of Hawaii
Department of Land and Natural Resources
Kalanimoku Bldg.
1151 Punchbowl Street
Honolulu, HI 96813

SUBJECT: AIR FORCE'S PREPARATION OF AN ENVIRONMENTAL ASSESSMENT (EA) TO EVALUATE THE IMPACTS OF ESTABLISHING DEDICATED CONTRACT COMBAT AIR FORCES (CAF) ADVERSARY AIR (ADAIR) SUPPORT AT JOINT BASE PEARL HARBOR-HICKAM (JBPHH)

Dear Sir or Madam:

The National Guard Bureau, the U.S. Air Force (Air Force), and Headquarters Air Combat Command proposes to provide contract Combat Air Forces (CAF) Adversary Air (ADAIR) support at Joint Base Pearl Harbor-Hickam (JBPHH). This action 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 ADAIR support will result in an estimated 3,100 ADAIR flights by individual aircraft. ADAIR may use different types of fighter aircraft available with acceptable capabilities to support training requirements. An estimated 14 contractor aircraft would be stationed at JBPHH. Training activities would use airspace near JBPHH that overlie the Pacific Ocean off the coast of Hawaii. JBPHH has existing facilities available for use and will not require any new construction or modification of the exterior of any existing facilities. Some facilities may require minimal interior modification to be made ready for the ADAIR mission.

The Air Force is the Action Proponent and is preparing the EA for the proposed initiative in accordance with the National Environmental Policy Act (NEPA) of 1969. This pre-assessment notification is to ensure that interested parties are notified of the forthcoming Proposed Action and are given the opportunity to identify relevant environmental issues and concerns that should be addressed in the Draft EA.

Any questions or comments regarding the operational aspects of the proposed initiative and related impacts (e.g. number of sorties, types of aircraft, noise, proposed training areas, etc.) should be directed to Mr. Glen Bailey at 15 WG/XP, 800 Scott Circle, Hickam Field, JPBHH, Hawaii 96853, or via email to: glen.bailey@us.af.mil.

Any questions or comments related to facilities (e.g. facility impacts, infrastructure and utility impacts, etc.) should be directed to Mr. Aaron Poentis, Navy Region Hawaii Environmental Program Director, at 850 Ticonderoga Street, Suite 110, JBPHH, Hawaii, 96860-5101, or via email at aaron.poentis@navy.mil.

Please send any comments within 30 days of receipt of this letter to ensure we can address them in the Draft EA. Thank you for your interest and assistance.

Sincerely,

M. R. DELAO
Captain, CEC, U.S. Navy
Regional Engineer
By direction of the
Commander

Enclosure: DOPAA Summary

2

Attachment 1: DOPAA Summary

To accomplish the mission of the United States Air Force (Air Force), 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. Along with insufficient budgets to support the flying hours/training requirements needed by CAF pilots, they also have 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 provide minimal CAF training while taking up valuable flying hours that could otherwise be spent on core training tasks. This could potentially be resolved through contract ADAIR, which would reduce the need for in-house CAF ADAIR. At present, the current approach meets less than 50 percent of the total ADAIR requirement across the Air Force.

The Air Force proposes to provide dedicated contract ADAIR sorties to improve the quality of training and readiness of pilots of the 154th Wing (WG), 15th Wing (15 WG), and other units supported by Joint Base Pearl Harbor-Hickam (JBPHH; **Figure 1**).Contract ADAIR support would employ adversary tactics across the training spectrum from basic fighter maneuvers to higher-end, advanced, simulated combat training missions. This Proposed Action would include establishing an estimated 91 contracted maintainers and 18 contracted pilots who would operate approximately 14 contracted aircraft to fly an estimated 3,100 contract ADAIR sorties annually. Contract ADAIR would fly up to a projected 3 percent of the estimated 3,100 sorties during environmental night hours when the effects of aircraft noise are accentuated (10:00 p.m. to 7:00 a.m. local time).

JBPHH has sufficient facilities to support the Proposed Action with minimal modification. The Air Force has identified two alternatives for providing the operations facilities required for the Proposed Action (**Figure 2**). Under Alternative 1, the contractor Operations and Aircraft Maintenance Unit activities, including hangar space for aircraft maintenance, would be consolidated in Building 2030 with aircraft parking space provided on 7 Row under operational control of the 15 WG. Under Alternative 2, contractor Operations and Aircraft Maintenance Unit activities, including hangar space for aircraft maintenance, would be consolidated in Building 3220 with aircraft parking space provided on 7 Row under operational control of the 15 WG. These facilities would provide adequate office space for contractor Operations and Aircraft Maintenance Unit personnel and covered aircraft maintenance space, if required. At least 27,000 square yards of aircraft parking space are available on 7 Row.

Following training sorties, contract ADAIR pilots would land and park their aircraft at JBPHH on the ramp area on 7 Row. When required, contract pilots would participate in debriefs with pilots of the 154 WG, 15 WG, and other units at facilities on JBPHH.

CAF training activities utilize special use airspace proximate to JBPHH. Special use airspace includes Warning Areas, which provide offshore airspace for military aircraft training and serve to warn nonparticipating aircraft of potential danger. The United States Navy manages and controls Warning Areas W-188C, W-189, W-190, W-192, W-193, and W-194 proposed for ADAIR use. These Warning Areas overlie the Pacific Ocean, north and south of the Island of Oahu (**Figure 3**). Time spent within the airspace (W-188C, W-189, W-190, W-192, W-193, and W-194) would depend upon the specific training mission performed but would typically last 45 to 60 minutes. Contract ADAIR operations would occur in these Warning Areas under both alternatives concurrent to the 154 WG and 15 WG or other supported Air Force units. No airspace modifications would be required for contract ADAIR as part of the Proposed Action.

Contract ADAIR aircraft would employ chaff and flares (RR-188 chaff and M206 flares or similar) during 100 percent of their training sortie operations. Chaff and flares are the principal defensive countermeasure dispensed by military aircraft to avoid detection or attack by enemy air defense systems. Chaff and flares can be dispensed in the Warning Areas without altitude restrictions.

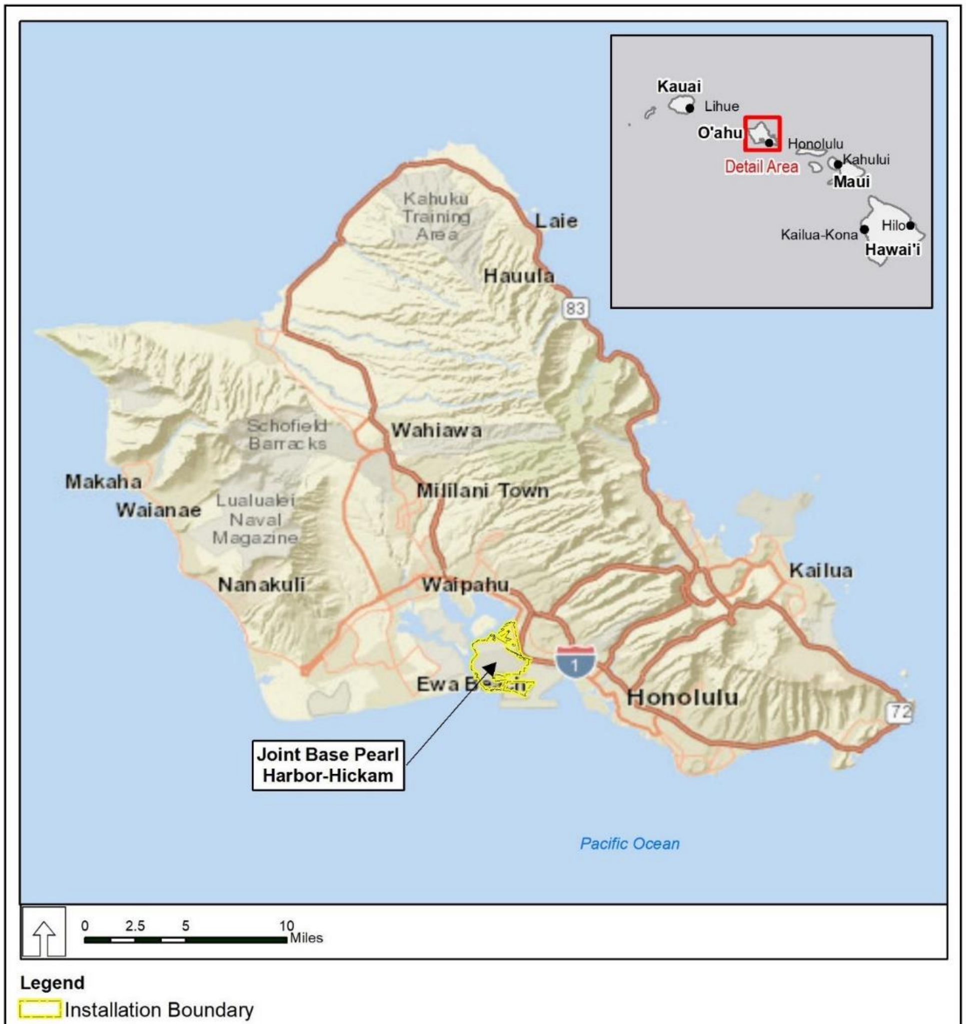


Figure 1. Location of Joint Base Pearl Harbor-Hickam.

Figure 2. Proposed Location for Combined Aircraft Maintenance Unit, Operations, and Maintenance Space in Building 2030 or in Building 3220 and Aircraft Parking on 7 Row.

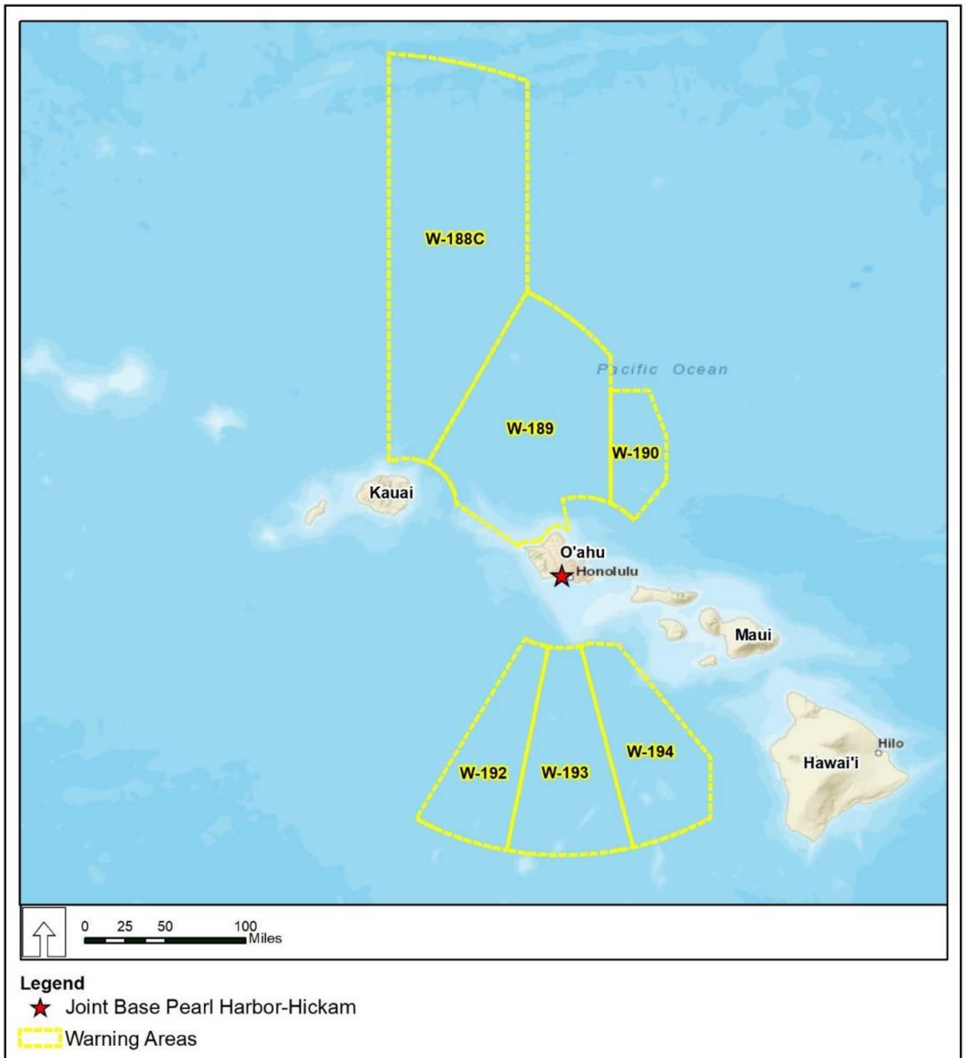


Figure 3. Warning Areas Proposed for Contract Adversary Air Sorties

Interagency and Intergovernmental Coordination and Consultations Mailing List

NOAA Fisheries
Pacific Islands Regional Office
1845 Wasp Boulevard
Building 176
Honolulu, Hawaii 96818

US Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard
Room 3-122
Honolulu, Hawaii 96850

State of Hawaii
Department of Land and Natural Resources
Kalanimoku Building
1151 Punchbowl Street
Honolulu, Hawaii 96813

This page intentionally left blank

Appendix A-2

Agency Comment Letters

This page intentionally left blank

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE
MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

LD 789

July 15, 2019

Department of the Navy
Attn: M.R. Delao
Captain, CEC, U.S. Navy Regional Engineer
Navy Region Hawaii
850 Ticonderoga Street, Suite 110
JBPHH, Hawaii 96860-5101

via USPS

Department of the Navy
Attn: Mr. Glen Bailey
800 Scott Circle, 15WG/XP
Hickam Field
JBPHH, Hawaii 96853

via email: [redacted]

Department of the Navy
Attn: Mr. Aaron Poentis
Navy Region Hawaii Environmental Program Director
850 Ticonderoga Street, Suite 110
JBPHH, Hawaii 96860-5101

via email: [redacted]

Gentlemen:

SUBJECT: **Air Force's Preparation of an EA to Evaluate Impacts of Establishing Dedicated Contract Combat Air Forces Adversary Air Support at Joint Base Pearl Harbor-Hickam**

Thank you for the opportunity to review and comment on the subject matter. The Land Division of the Department of Land and Natural Resources (DLNR) distributed or made available a copy of your request pertaining to the subject matter to DLNR's Divisions for their review and comments.

At this time, enclosed are comments from the (a) Engineering Division, (b) Division of Forestry & Wildlife, and (c) Land Division – Oahu District on the subject matter. Should you have any questions, please feel free to contact Barbara Lee at [redacted] or by email at [redacted] Thank you.

Sincerely,

Russell Y. Tsuji
Land Administrator

Enclosure(s)
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

RECEIVED LAND DIVISION
2019 JUN 28 AM 11:48
DEPT. OF LAND & NATURAL RESOURCES STATE OF HAWAII

June 20, 2019

LD 789

'19 JUN 28 AM10:56 ENGINEERING

MEMORANDUM

TO: **DLNR Agencies:**
__ Div. of Aquatic Resources
__ Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
__ Div. of State Parks
X Commission on Water Resource Management
__ Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator

SUBJECT: **Air Force's Preparation of an EA to Evaluate Impacts of Establishing Dedicated Contract Combat Air Forces Adversary Air Support at Joint Base Pearl Harbor-Hickam**

LOCATION: Joint Base Pearl Harbor-Hickam in Honolulu, Hawaii

APPLICANT: **Commander, Navy Region, Hawaii, Department of the Navy, 850 Ticonderoga St., Ste. 110, JBPHH, HI 96860-5101**

Transmitted for your review and comment is information on the above-referenced Air Force project. We would appreciate your comments by **July 12, 2019**. If no response is received by this date, we will assume your agency has no comments. If you have any questions, please contact Barbara Lee at [redacted] or by email at [redacted] with copy to darlene.k.nakamura@hawaii.gov. Thank you.

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed:

Print Name: Carty S. Chang, Chief Engineer

Date: 6/20/19

Attachments
cc: Central Files

DEPARTMENT OF LAND AND NATURAL RESOURCES
ENGINEERING DIVISION

LD/Russell Y. Tsuji

Ref: Air Force's Preparation of an EA to Evaluate Impacts of Establishing Dedicated Contract Combat Air Forces Adversary Air Support at Joint Base Pearl Harbor-Hickam
Location: Joint Base Pearl Harbor-Hickam in Honolulu, Island of Oahu
Applicant: Commander, Navy Region, Hawaii, Department of the Navy, 850 Ticonderoga St., Ste. 110, JBPHH, HI 96860-5101

COMMENTS

The rules and regulations of the National Flood Insurance Program (NFIP), Title 44 of the Code of Federal Regulations (44CFR), are in effect when development falls within a Special Flood Hazard Area (high risk areas). State projects are required to comply with 44CFR regulations as stipulated in Section 60.12. Be advised that 44CFR reflects the minimum standards as set forth by the NFIP. Local community flood ordinances may stipulate higher standards that can be more restrictive and would take precedence over the minimum NFIP standards.

The owner of the project property and/or their representative is responsible to research the Flood Hazard Zone designation for the project. Flood Hazard Zones are designated on FEMA's Flood Insurance Rate Maps (FIRM), which can be viewed on our Flood Hazard Assessment Tool (FHAT) (http://gis.hawaiinfip.org/FHAT).

If there are questions regarding the local flood ordinances, please contact the applicable County NFIP coordinating agency below:

- Oahu: City and County of Honolulu, Department of Planning and Permitting (808) 768-8098.
- Hawaii Island: County of Hawaii, Department of Public Works (808) 961-8327.
- Maui/Molokai/Lanai County of Maui, Department of Planning (808) 270-7253.
- Kauai: County of Kauai, Department of Public Works (808) 241-4846.

Signed: [signature]
CARTY S. CHANG, CHIEF ENGINEER

Date: 6/28/19

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RECEIVED
LAND DIVISION
2019 JUL 11 AM 10: 54

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

DEPT. OF LAND & NATURAL RESOURCES
STATE OF HAWAII

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 20, 2019

LD 789

MEMORANDUM

~~TO:~~ FROM **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
__Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

~~FROM:~~ TO. Russell Y. Tsuji, Land Administrator

SUBJECT: **Air Force's Preparation of an EA to Evaluate Impacts of Establishing Dedicated Contract Combat Air Forces Adversary Air Support at Joint Base Pearl Harbor-Hickam**

LOCATION: Joint Base Pearl Harbor-Hickam in Honolulu, Hawaii

APPLICANT: **Commander, Navy Region, Hawaii, Department of the Navy, 850 Ticonderoga St., Ste. 110, JBPHH, HI 96860-5101**

Transmitted for your review and comment is information on the above-referenced Air Force project. We would appreciate your comments by **July 12, 2019**. If no response is received by this date, we will assume your agency has no comments. If you have any questions, please contact Barbara Lee at [redacted] or by email at [redacted] with copy to darlene.k.nakamura@hawaii.gov. Thank you.

( ) We have no objections.
( ) We have no comments.
(✓) Comments are attached.

Signed: [signature]

Print Name: **DAVID G. SMITH, Administrator**
Date: 7/10/19

Attachments
cc: Central Files

DAVID Y. IGE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET, ROOM 325
HONOLULU, HAWAII 96813

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ROBERT K. MASUDA
FIRST DEPUTY

M. KALEO MANUEL
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

JUL 10 2019

MEMORANDUM

19846 / LD 789

TO: RUSSELL Y. TSUJI, Administrator
Land Division

FROM: DAVID G. SMITH, Administrator
Division of Forestry and Wildlife

SUBJECT: **Division of Forestry and Wildlife Comments on the Air Force's Preparation of an EA to Evaluate Impacts of Establishing Dedicated Contract Combat Air Forces Adversary Air Support at Joint Base Pearl Harbor-Hickam**

The Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW) has received your inquiry regarding the U.S. Air Force's preparation of an Environmental Assessment to evaluate the impacts of establishing dedicated contract Combat Air Forces Adversary Air (ADAIR) support at Joint Base Pearl Harbor-Hickam on the island of O'ahu, Hawai'i. The proposed ADAIR mission would result in an estimated 3,100 sorties (training flights), each between 45 minutes and one hour long, annually in the airspace off the coast of the main Hawaiian Islands, including during nighttime hours. No new construction or exterior modification of existing facilities is proposed.

Protected seabirds, such as the State threatened Newell's Shearwater (*Puffinus newelli*) and the State endangered Hawaiian Petrel (*Pterodroma sandwichensis*), are known to transverse the proposed training airspace off of the coasts of Kaua'i, O'ahu, Maui, Moloka'i, Lana'i, and Hawai'i to forage over the open ocean and transit between the islands. Other migratory seabirds such as the Pacific Golden Plover or Kōlea (*Pluvialis fulva*) and several resident seabirds such as the Laysan (*Phoebastria immutabilis*) and Black-footed Albatross (*Phoebastria nigripes*), Red-tailed (*Phaethon rubricauda*) and White-tailed Tropicbirds (*Phaethon lepturus*), and Wedge-tailed Shearwater (*Puffinus pacificus*), among other seabirds may seasonally migrate in the vicinity of the proposed ADAIR mission. DOFAW recommends assessing the potential for operational impacts to listed seabirds due to the high volume of projected flights in the areas where these species are found. Finally, the potential cumulative impacts on seabird foraging resources from the consistent use of chaff and flares during 100 percent of the projected 3,100 sorties should also be included in the preparation of the Environmental Assessment.

We appreciate your efforts to work with our office for the conservation of our native species. Should the scope of the project change significantly, or should it become apparent that threatened or endangered species may be impacted, please contact our staff as soon as possible. If you have any questions, please contact Jim Cogswell, Wildlife Program Manager at [redacted]-
[redacted]

DAVID Y. IGE
GOVERNOR OF HAWAII

SUZANNE D. CASE
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION

POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 20, 2019

LD 789

MEMORANDUM

TO: **DLNR Agencies:**
__Div. of Aquatic Resources
__Div. of Boating & Ocean Recreation
X Engineering Division
X Div. of Forestry & Wildlife
__Div. of State Parks
X Commission on Water Resource Management
__Office of Conservation & Coastal Lands
X Land Division – Oahu District
X Historic Preservation

FROM: Russell Y. Tsuji, Land Administrator
SUBJECT: **Air Force's Preparation of an EA to Evaluate Impacts of Establishing Dedicated Contract Combat Air Forces Adversary Air Support at Joint Base Pearl Harbor-Hickam**
LOCATION: Joint Base Pearl Harbor-Hickam in Honolulu, Hawaii
APPLICANT: **Commander, Navy Region, Hawaii, Department of the Navy, 850 Ticonderoga St., Ste. 110, JBPHH, HI 96860-5101**

Transmitted for your review and comment is information on the above-referenced Air Force project. We would appreciate your comments by **July 12, 2019**. If no response is received by this date, we will assume your agency has no comments. If you have any questions, please contact Barbara Lee at [redacted] or by email at [redacted] with copy to darlene.k.nakamura@hawaii.gov. Thank you.

( ) We have no objections.
(X) We have no comments.
( ) Comments are attached.

Signed: Darlene Bryant-Takamatsu for
Print Name: Darlene Bryant-Takamatsu
Date: 6/28/19

Attachments
cc: Central Files

APPENDIX B

NOISE

This page intentionally left blank

Appendix B-1

Sound, Noise, and Potential Effects

This page intentionally left blank

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.

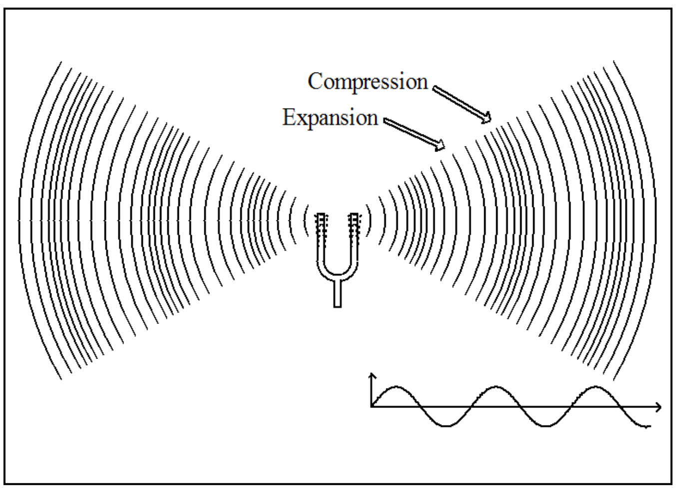


Figure B-1. Sound Waves from a Vibrating Tuning Fork.

The measurement and human perception of sound involves three basic physical characteristics: intensity, frequency, and duration.

- <u>Intensity</u> is a measure of the acoustic energy of the sound and related to sound pressure. The greater the sound pressure, the more energy carried by the sound and the louder the perception of that sound.
- <u>Frequency</u> 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.
- <u>Duration</u> 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 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, temperature, and 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.

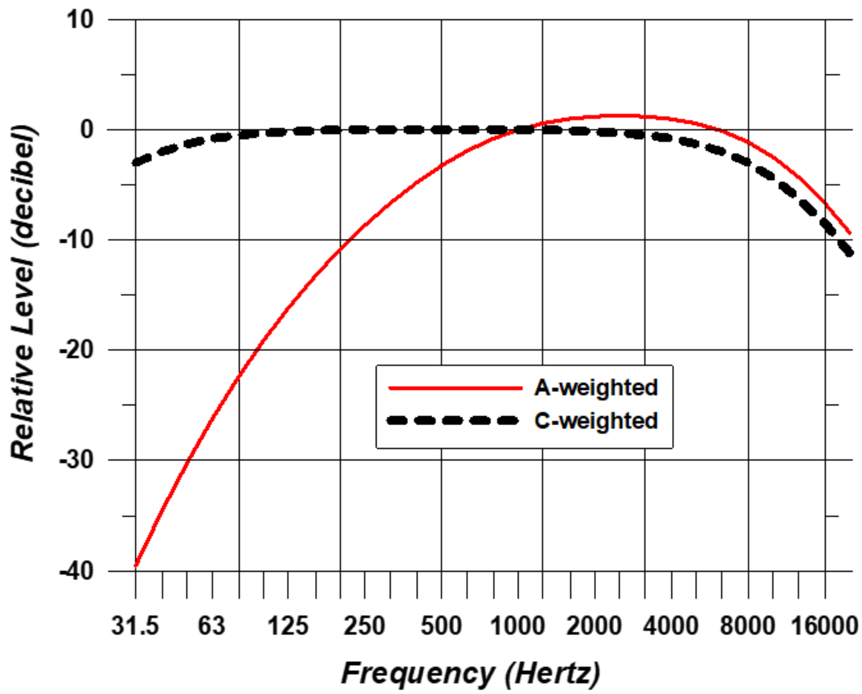
Because the addition of sound levels is different than that of ordinary numbers, this process is often referred to as "decibel addition."

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 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 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 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

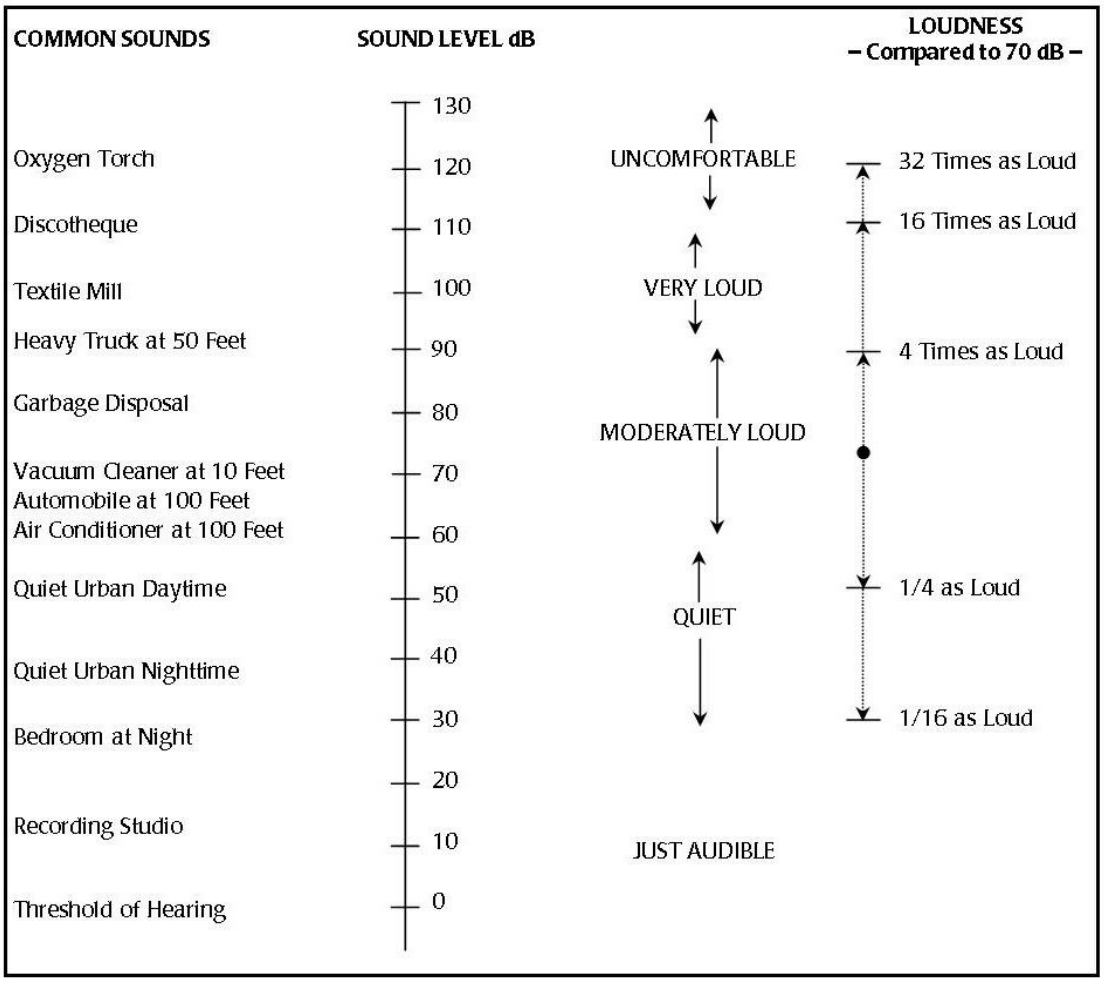
Most environmental sounds are measured using A-weighting. They are called A-weighted sound levels and sometimes use the unit dBA or dB(A) rather than dB. When the use of A-weighting is understood, the term "A-weighted" is often omitted and the unit dB is used. Unless otherwise stated, dB units refer 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 (United States Environmental Protection Agency [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).



Source: 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

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 in **Figure B-4**.

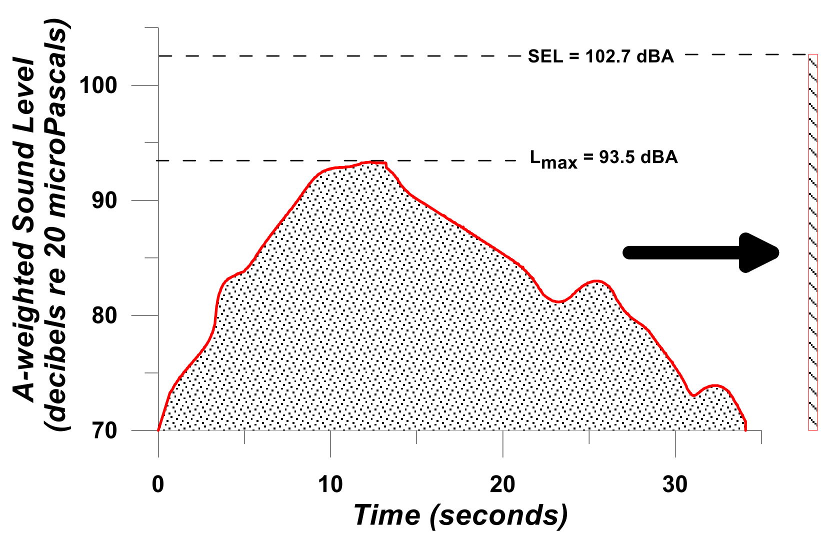
L_{max} is the maximum level that occurs over a fraction of a second. For aircraft noise, the “fraction of a second” is one-eighth of a second, denoted as “fast” response on a sound level measuring meter (ANSI, 1988). Slowly varying or steady sounds are generally measured over 1 second, denoted as “slow” 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

The Peak Sound Pressure Level (L_{pk}) 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

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 B-4** indicates the SEL for an example event, representing it as if all the sound energy were contained within 1 second.



Source: Wyle Laboratories

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 pounds per square foot 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

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 7:00 a.m. to 3:00 p.m. may give exposure of noise for a school day.

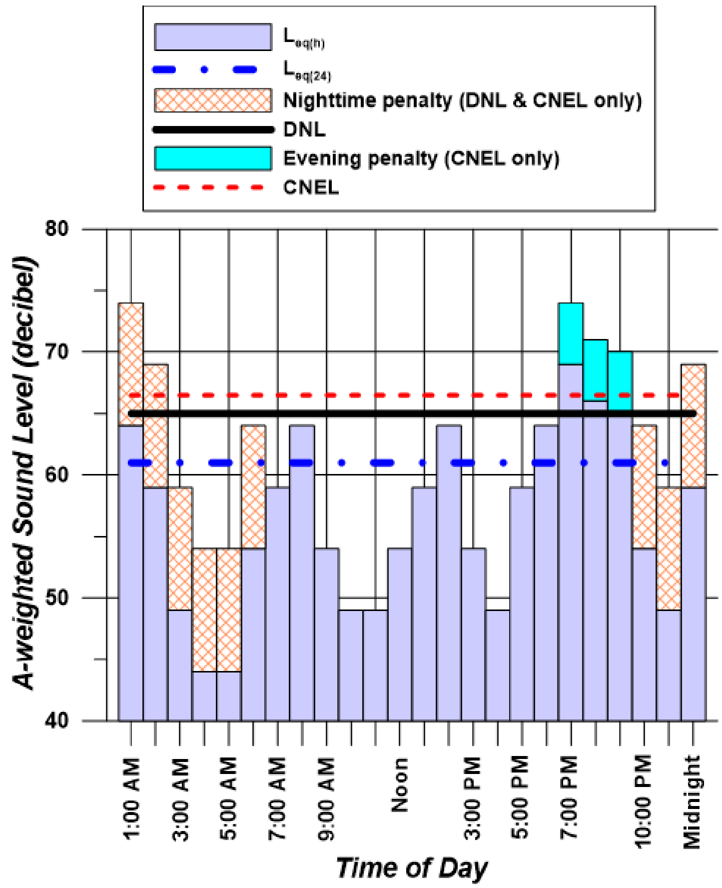
Figure B-5 gives an example of L_{eq}(24) using notional hourly average noise levels (L_{eq}[h]) for each hour of the day as an example. The L_{eq}(24) for this example is 61 dB.

Day-Night Average Sound Level and Community Noise Equivalent Level

Day-Night Average Sound Level (DNL or L_{dn}) 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.

Community Noise Equivalent Level (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 7:00 p.m. and 10:00 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).

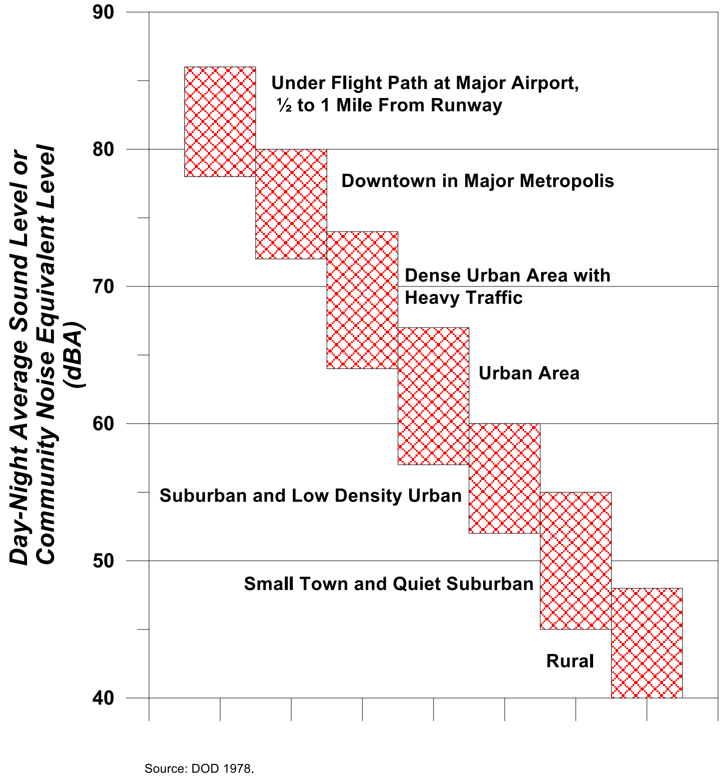


Figure B-6. Typical DNL or CNEL Ranges in Various Types of Communities.

Onset-Rate Adjusted Monthly Day-Night Average Sound Level and Onset-Rate Adjusted Monthly Community Noise Equivalent Level

Military aircraft utilizing special use airspace such as Military Training Routes, Military Operations Areas, and restricted areas generate a noise environment that is somewhat different from that around airfields. Rather than regularly occurring operations like at airfields, activity in special use airspace 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 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 Onset-Rate Adjusted Monthly Community Noise Equivalent Level ($CNEL_{mr}$).

B.1.3.3 Supplemental Metrics

Number-of-Events Above a Threshold Level

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, 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 a Specified Level

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 L_{dn} 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**.

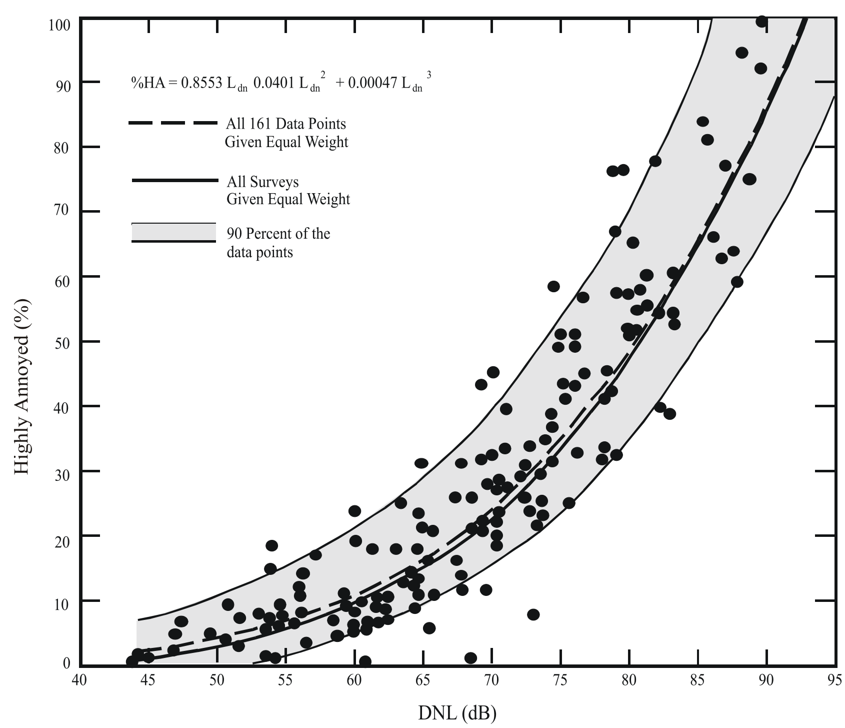


Figure B-7. Schultz Curve Relating Noise Annoyance to DNL (Schultz, 1978).

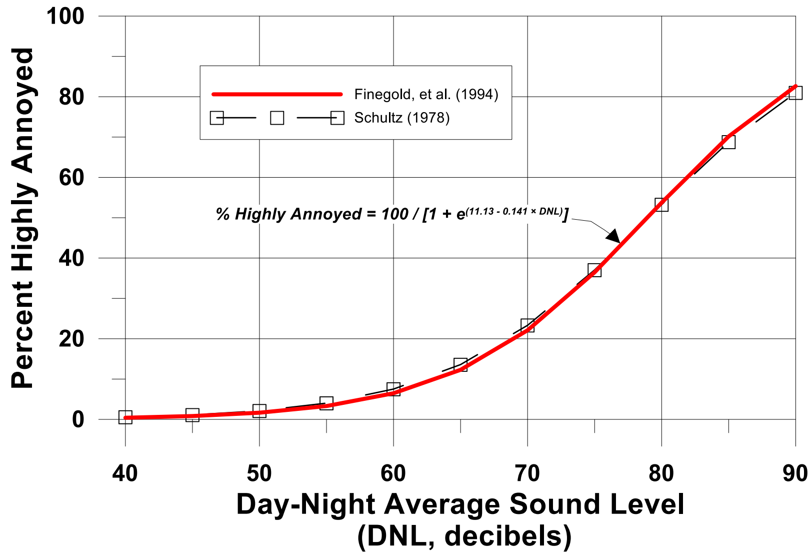


Figure B-8. Response of Communities to Noise; Comparison of Original Schultz (1978) with Finegold et al. (1994).

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
Predictability of the noise
Control over the noise source
Length of time individual is exposed to a noise.

Schreckenberg and Schuemer (2010) 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 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

Day-Night Average Sound Level (decibels)	Percent Highly 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 +3 to +6 dB for aircraft noise relative to road noise while the latest editions recommends an adjustment range of +5 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 the 65-dBA 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.

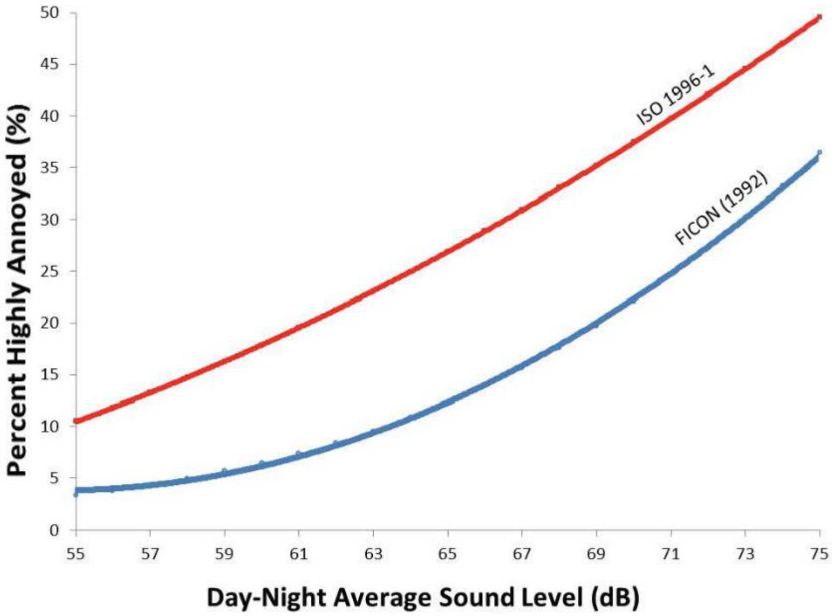


Figure B-9. Percent Highly Annoyed Comparison of ISO 1996-1 to FICON (1992).

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.

United States 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 the 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.

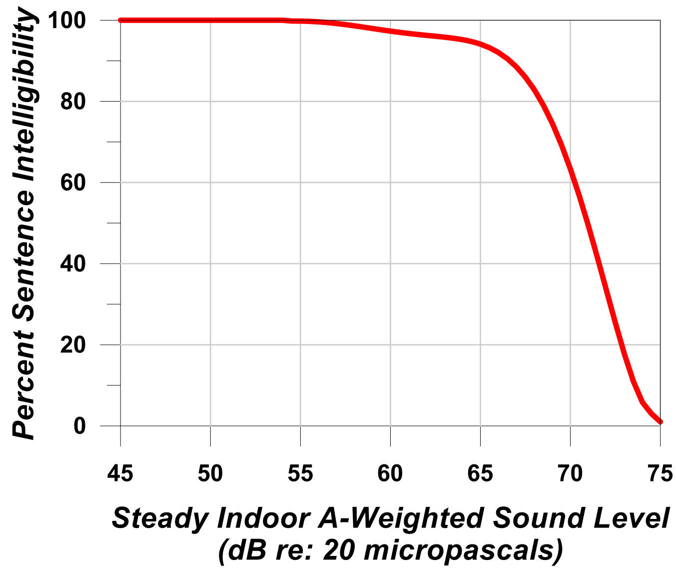


Figure B-10. Speech Intelligibility Curve (digitized from USEPA, 1974).

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, level of voice communication, and 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 (2002) classroom noise standard and American Speech-Language-Hearing Association (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 the 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 to 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
Federal Aviation Administration (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 / Speech Interference Level 45	Single event level permissible in the classroom.
World Health Organization (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.
American National Standards Institute (2010)	L_{eq} = 35 dB, based on Room Volume (e.g., cubic feet)	Acceptable background level for continuous and intermittent noise.
United Kingdom Department for Education and Skills (2003)	$L_{eq(30min)}$ = 30-35 dB L_{max} = 55 dB	Minimum acceptable in classroom and most other learning environs.

Notes:
dB = decibel(s); L_{eq} = Equivalent Sound Level; L_{max} = Maximum Sound Level

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.

<u>Initial Studies</u>

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 on 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 to 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

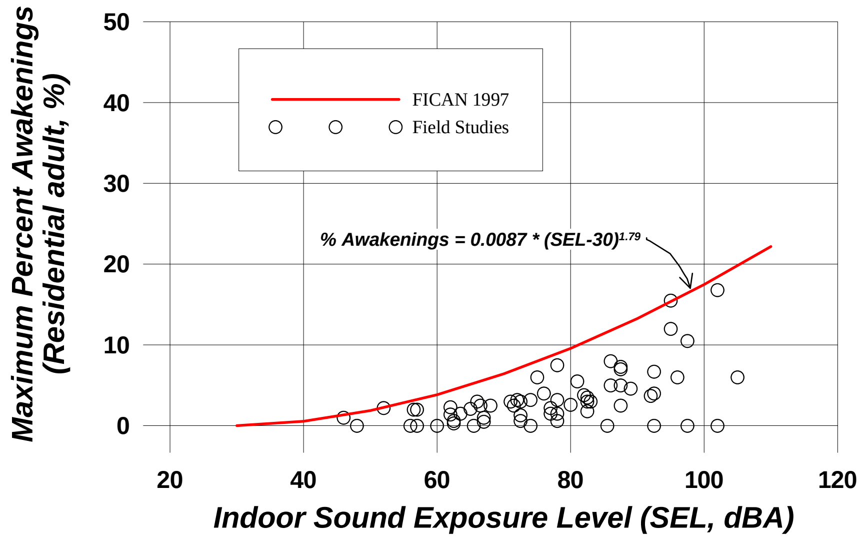
Based on this new information, in 1997 FICAN recommended a dose-response curve to use instead of the earlier 1992 FICON curve (FICAN, 1997). **Figure B-11** shows FICAN's curve, the red line, which is based on the results of three field studies shown in the figure (Ollerhead et al., 1992; Fidell et al., 1994, 1995a, 1995b), along with the data from six previous field studies.

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.



Source: FICAN 1997

Figure B-11. FICAN (1997) Recommended Sleep Disturbance Dose-Response Relationship.

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 between 2 to 3 percent with windows open. The probability of the exposed population awakening at least once from multiple aircraft events at the 90-dB SEL is shown in **Table B-4**.

Table B-4
Probability of Awakening from NA90SEL

Number of Aircraft Events at the 90-Decibel Sound Exposure Level 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

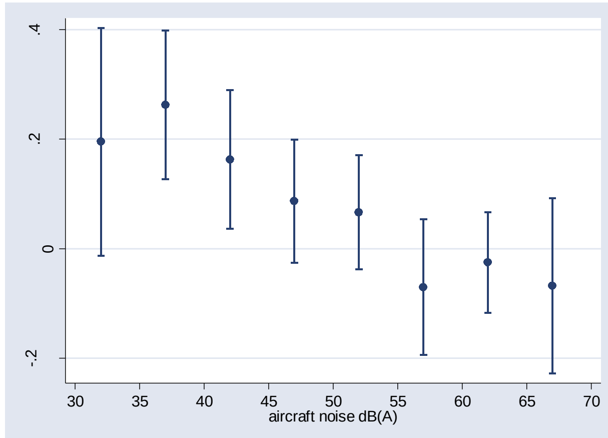
Early studies in several countries (Cohen et al., 1973, 1980, 1981; Bronzaft and McCarthy, 1975; Green et al., 1982; Evans et al., 1998; Haines et al., 2002; Lercher et al., 2003) showed lower reading scores for children living or attending school in noisy areas than for children away from those areas. 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.



Sources: Stansfeld et al. 2005; Clark et al. 2006

Figure B-12. RANCH Study Reading Scores Varying with L_{eq}.

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.

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 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 the 55-dBA 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 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 1-month reading delay; however, a recent study observing children at 11 schools surrounding Los Angeles International Airport 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, have 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 on 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 (e.g., 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.

B.1.5 References

American Speech-Language-Hearing Association. 2005. *Guidelines for Addressing Acoustics in Educational Settings, ASHA Working Group on Classroom Acoustics*.

ANSI. 1985. *Specification for Sound Level Meters, ANSI S1.4A-1985 Amendment to ANSI S1.4-1983*.

ANSI. 1988. *Quantities and Procedures for Description and Measurement of Environmental Sound: Part 1, ANSI S12.9-1988*.

ANSI. 1996. *Quantities and Procedures for Description and Measurement of Environmental Sound: Part 4, ANSI S12.9-1996*.

ANSI. 2002. *Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools, ANSI S12.60-2002*.

ANSI. 2008. *Methods for Estimation of Awakenings with Outdoor Noise Events Heard in Homes, ANSI S12.9-2008/Part6*.

ANSI. 2010. *Acoustical Performance Criteria, Design Requirements, and Guidelines for Schools, Part 1: Permanent Schools, ANSI/ASA S12.60-2010/Part 1*.

Basner, M, U. Muller, and E.M. Elmenhorst. 2011. *Single and Combined Effects of Air, Road, and Rail Traffic Noise on Sleep and Recuperation*. Sleep 2011(34):11–23.

Basner, M., H. Buess, U. Miller, G. Platt, and A. Samuel. 2004. *Aircraft Noise Effects on Sleep: Final Results of DLR Laboratory and Field Studies of 2240 Polysomnographically Recorded Subject Nights*. Internoise 2004, The 33rd International Congress and Exposition on Noise Control Engineering. 22-25 August.

Basner, M., W. Babisch, A. Davis, M. Brink, C. Clark, S. Janssess. 2014. *Auditory and Non-auditory Effects of Noise on Health*. The Lancet 383(9925):1325-1332.

Berglund, B., and T. Lindvall, eds. 1995. *Community Noise*. Jannes Snabbtryck, Stockholm, Sweden.

Bowles, A.E. 1995. *Responses of Wildlife to Noise*, In *Wildlife and Recreationists: Coexistence through Management and Research*, R.L. Knight and K.J. Gutzwiller, eds. Island Press, Covelo, California, pp. 109-156.

Bradley, J.S. 1985. *Uniform Derivation of Optimum Conditions for Speech in Rooms*. National Research Council, Building Research Note, BRN 239, Ottawa, Canada.

Bradley, J.S. 1993. *NRC-CNRC NEF Validation Study: Review of Aircraft Noise and its Effects*. National Research Council Canada and Transport Canada, Contract Report A-1505.5.

Bronzaft, A.L., and D.P. McCarthy. 1975. *The Effects of Elevated Train Noise on Reading Ability*. Journal of Environment and Behavior 7:517-527.

Clark, C., R. Crombie, J. Head, I. van Kamp, E. van Kempen, and S.A. Stansfeld. 2012. *Does Traffic-Related Air Pollution Explain Associations of Aircraft and Road Traffic Noise Exposure on Children's Health and Cognition? A Secondary Analysis of the United Kingdom Sample from the RANCH Project*. American Journal of Epidemiology 176(4):327–337.

Clark, C., R. Martin, E. van Kempen, T. Alfred, J. Head, H.W. Davies, M.M. Haines, I.L. Barrio, M. Matheson, and S.A. Stansfeld. 2005. *Exposure-Effect Relations Between Aircraft and Road Traffic Noise Exposure at School and Reading Comprehension: the RANCH Project*. American Journal of Epidemiology 163:27-37.

Clark, C., S.A. Stansfeld, and J. Head. 2009. *The Long-Term Effects of Aircraft Noise Exposure on Children's Cognition: Findings from the UK RANCH Follow-Up Study*. In Proceedings of the Euronoise Conference. Edinburgh, Scotland. October.

Cohen, S., D.C. Glass, and J.E. Singer. 1973. *Apartment Noise, Auditory Discrimination, and Reading Ability in Children*. Journal of Experimental Social Psychology 9:407-422.

Cohen, S., G.W. Evans, D.S. Krantz. 1980. *Physiological, Motivational, and Cognitive Effects of Aircraft Noise on Children: Moving from Laboratory to Field*. American Psychologist 35:231-243.

Cohen, S., G.W. Evans, D.S. Krantz. 1981. *Aircraft Noise and Children: Longitudinal and Cross-sectional Evidence on Adaptation to Noise and the Effectiveness of Noise Abatement.* Journal of Personality and Social Psychology 40:331-345.

Cottereau, P. 1978. *The Effect of Sonic Boom from Aircraft on Wildlife and Animal Husbandry*, In *Effects of Noise on Wildlife*, Academic Press, New York, New York, pp. 63-79.

DOD. 1978. *Environmental Protection: Planning in the Noise Environment*. AFMAN 19-10/ TM 5-803-2/NAVFAC P-970.

DOD. 2009a. *Improving Aviation Noise Planning, Analysis, and Public Communication with Supplemental Metrics*. Defense Noise Working Group Technical Bulletin. December.

DOD. 2009b. *Sleep Disturbance from Aviation Noise*. Defense Noise Working Group Technical Bulletin. November.

Eagan, M.E., G. Anderson, B. Nicholas, R. Horonjeff, and T. Tivnan. 2004. *Relation Between Aircraft Noise Reduction in Schools and Standardized Test Scores*. Washington, DC, FICAN.

Evans, G.W., M. Bullinger, and S. Hygge. 1998. *Chronic Noise Exposure and Physiological Response: A Prospective Study of Children Living Under Environmental Stress*. Psychological Science 9:75-77.

FAA. 1985. *Airport Improvement Program (AIP) Handbook*. Order No. 100.38.

FICAN. 1997. *Effects of Aviation Noise on Awakenings from Sleep*. June.

FICAN. 2007. *Findings of the FICAN Pilot Study on the Relationship Between Aircraft Noise Reduction and Changes in Standardised Test Scores*. Washington, DC, FICAN.

FICAN. 2008. *FICAN Recommendation for Use of ANSI Standard to Predict Awakenings from Aircraft Noise*. December.

FICON. 1992. *Federal Agency Review of Selected Airport Noise Analysis Issues*. August.

Fidell, S., and L. Silvati. 2004. *Parsimonious Alternatives to Regression Analysis for Characterizing Prevalence Rates of Aircraft Noise Annoyance*. Noise Control Engineering Journal 52:56–68.

Fidell, S., K. Pearsons, B. Tabachnick, R. Howe, L. Silvati, and D.S. Barber. 1995a. *Field Study of Noise-Induced Sleep Disturbance*. Journal of the Acoustical Society of America 98(2):1025-1033.

Fidell, S., K. Pearsons, R. Howe, B. Tabachnick, L. Silvati, and D.S. Barber. 1994. *Noise-Induced Sleep Disturbance in Residential Settings*. AL/OE-TR-1994-0131, Wright Patterson AFB, OH, Armstrong Laboratory, Occupational and Environmental Health Division.

Fidell, S., R. Howe, B. Tabachnick, K. Pearsons, and M. Sneddon. 1995b. *Noise-induced Sleep Disturbance in Residences near Two Civil Airports*. NASA Contractor Report 198252.

Finegold, L.S., C.S. Harris, and H.E. von Gierke. 1994. *Community Annoyance and Sleep Disturbance: Updated Criteria for Assessing the Impact of General Transportation Noise on People*. Noise Control Engineering Journal 42(1):25-30.

Green, K.B., B.S. Pasternack, and R.E. Shore. 1982. *Effects of Aircraft Noise on Reading Ability of School-Age Children.* Archives of Environmental Health 37(1):24-31.

Griefahn, B. 1978. *Research on Noise Disturbed Sleep Since 1973*. Proceedings of Third International Congress on Noise as a Public Health Problem, pp. 377-390 (as appears in NRC-CNRC NEF Validation Study: (2) Review of Aircraft Noise and Its Effects, A-1505.1, p. 31).

Haines, M.M., S.A. Stansfeld, J. Head, and R.F.S. Job. 2002. *Multilevel Modelling of Aircraft Noise on Performance Tests in Schools around Heathrow Airport London*. Journal of Epidemiology and Community Health 56:139-144.

Harris, C.M. 1979. *Handbook of Noise Control*. McGraw-Hill Book Co.

Horne, J.A., F.L. Pankhurst, L.A. Reyner, K. Hume, and I.D. Diamond. 1994. *A Field Study of Sleep Disturbance: Effects of Aircraft Noise and Other Factors on 5,742 Nights of Actimetrically Monitored Sleep in a Large Subject Sample*. American Sleep Disorders Association and Sleep Research Society: Sleep 17(2):146–195.

Klatte M., K. Bergström, and T. Lachmann. 2013. *Does Noise Affect Learning? A Short Review on Noise Effects on Cognitive Performance in Children*. Frontiers in Psychology 4:578.

Lazarus, H. 1990. *New Methods for Describing and Assessing Direct Speech Communication Under Disturbing Conditions*. Environment International 16:373-392.

Lercher, P., G.W. Evans, and M. Meis. 2003. *Ambient Noise and Cognitive Processes Among Primary School Children*. Journal of Environment and Behavior 35:725-735.

Lind, S.J., K. Pearsons, and S. Fidell. 1998. *Sound Insulation Requirements for Mitigation of Aircraft Noise Impact on Highline School District Facilities*. Volume I, BBN Systems and Technologies, BBN Report No. 8240.

Lukas, J.S. 1978. *Noise and Sleep: A Literature Review and a Proposed Criterion for Assessing Effect*, In Daryl N. May, ed., *Handbook of Noise Assessment*, Van Nostrand Reinhold Company: New York, pp. 313-334.

Manci, K.M., D.N. Gladwin, R. Villella, and M.G Cavendish. 1988. *Effects of Aircraft Noise and Sonic Booms on Domestic Animals and Wildlife: A Literature Synthesis*. US Fish and Wildlife Service National Ecology Research Center, Ft. Collins, Colorado, NERC-88/29. 88 pp.

Márki, F. 2013. *Outcomes of EU COSMA (Community Oriented Solutions to Minimise Aircraft Noise Annoyance) Project.* Budapest University of Technology and Economics, London. May.

Miedema, H.M., and C.G. Oudshoorn. 2001. *Annoyance from Transportation Noise: Relationships with Exposure Metrics DNL and DENL and Their Confidence Intervals*. Environmental Health Perspectives 109.4:409–416.

Miedema, H.M., and H. Vos. 1998. *Exposure-Response Relationships for Transportation Noise*. Journal of the Acoustical Society of America 104(6):3432–3445. December.

National Park Service. 1994. *Report to Congress: Report on Effects of Aircraft Overflights on the National Park System*. Prepared Pursuant to Public Law 100-91, The National Parks Overflights Act of 1987. 12 September.

NATO. 2000. *The Effects of Noise from Weapons and Sonic Booms, and the Impact on Humans, Wildlife, Domestic Animals and Structures*. Final Report of the Working Group Study Follow-up Program to the Pilot Study on Aircraft Noise, Report No. 241. June.

Newman, J.S., and K.R. Beattie. 1985. *Aviation Noise Effects*. US Department of Transportation, Federal Aviation Administration Report No. FAA-EE-85-2.

Ollerhead, J.B., C.J. Jones, R.E. Cadoux, A. Woodley, B.J. Atkinson, J.A. Horne, F. Pankhurst, L. Reyner, K.I. Hume, F. Van, A. Watson, I.D. Diamond, P. Egger, D. Holmes, and J. McKean. 1992. *Report of a Field Study of Aircraft Noise and Sleep Disturbance*. Commissioned by the UK Department of Transport for the 36 UK Department of Safety, Environment and Engineering, London, England: Civil Aviation Authority. December.

Pearsons, K.S., D.S. Barber, and B.G. Tabachnick. 1989. *Analyses of the Predictability of Noise-Induced Sleep Disturbance*. US Air Force Report HSD-TR-89-029. October.

Plotkin, K.J., B.H. Sharp, T. Connor, R. Bassarab, I. Flindell, and D. Schreckenberg. 2011. *Updating and Supplementing the Day-Night Average Sound Level (DNL)*. Wyle Report 11-04, DOT/FAA/AEE/2011-03. June.

Rosenblith, W.A., K.N. Stevens, and Staff of Bolt, Beranek, and Newman. 1953. *Handbook of Acoustic Noise Control, Vol. 2, Noise and Man*. US Air Force Report WADC TR-52-204.

Schreckenberg, D., and R. Schuemer. 2010. *The Impact of Acoustical, Operational and Non-Auditory Factors on Short-Term Annoyance Due to Aircraft Noise*. 39th International Congress on Noise Control Engineering (Inter-Noise 2010), Noise and Sustainability, Lisbon, Portugal. 13 - 16 June 2010.

Schultz, T.J. 1978. *Synthesis of Social Surveys on Noise Annoyance*. Journal of the Acoustical Society of America 64(2):377-405. August.

Sharp, B., T. Connor, D. McLaughlin, C. Clark, S. Stansfeld, and J. Hervey. 2013. *Assessing Aircraft Noise Conditions Affecting Student Learning*, ACRP Web Document 16, http://www.trb.org/Aviation1/Blurbs/170328.aspx Airport Cooperative Research Program, Transportation Research Board, Washington, DC.

Sharp, B.H., and K.J. Plotkin. 1984. *Selection of Noise Criteria for School Classrooms*. Wyle Research Technical Note TN 84-2 for the Port Authority of New York and New Jersey. October.

Smith, D.G., D.H. Ellis, and T.H. Johnston. 1988. *Raptors and Aircraft*, In R.L Glinski, B. Gron-Pendelton, M.B. Moss, M.N. LeFranc, Jr., B.A. Millsap, and S.W. Hoffman, eds., Proceedings of the Southwest Raptor Management Symposium, National Wildlife Federation, Washington, DC, pp. 360-367.

Stansfeld, S.A., and C. Clark. 2015. *Health Effects of Noise Exposure in Children*. Current Environmental Health Reports 2(2):171-178.

Stansfeld, S.A., B. Berglund, and C. Clark, I. Lopez-Barrio, P. Fischer, E. Öhrström, M.M. Haines, J. Head, S. Hygge, and I. van Kamp, B.F. Berry, on Behalf of the RANCH Study Team. 2005. *Aircraft and Road Traffic Noise and Children's Cognition and Health: A Cross-National Study*. Lancet 365:1942-1949.

Stevens, K.N., W.A. Rosenblith, and R.H. Bolt. 1953. *Neighborhood Reaction to Noise: A Survey and Correlation of Case Histories (A).* Journal of the Acoustical Society of America 25:833.

Stusnick, E., K.A. Bradley, J.A. Molino, and G. DeMiranda. 1992. *The Effect of Onset Rate on Aircraft Noise Annoyance, Volume 2: Rented Home Experiment*. Wyle Laboratories Research Report WR 92-3. March.

UKDfES. 2003. *Building Bulletin 93, Acoustic Design of Schools - A Design Guide*. London: The Stationary Office.

USEPA. 1974. *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*. USEPA Report 550/9-74-004. March.

USEPA. 1978. *Protective Noise Levels*. Office of Noise Abatement and Control, Washington, DC. USEPA Report 550/9-79-100. November.

USEPA. 1990. Office of Air Quality Planning and Standards. *Draft New Source Review Workshop Manual: Prevention of Significant Deterioration and Nonattainment Permitting.* October.

Wesler, J.E. 1986. *Priority Selection of Schools for Soundproofing*. Wyle Research Technical Note TN 96-8 for the Port Authority of New York and New Jersey. October.

WHO. 1999. *Guidelines for Community Noise*. Berglund, B., T. Lindvall, and D. Schwela, eds.

Wyle Laboratories. 1970. *Supporting Information for the Adopted Noise Regulations for California Airports*. Wyle Report WCR 70-3(R).

This page intentionally left blank

Appendix B-2

Noise Modeling

This page intentionally left blank

B.1 NOISE MODELING

The following sections describe input data used in the noise modeling process. These data were developed in coordination with the Air Force Air Combat Command (ACC), Air Force Civil Engineer Center (AFCEC), and Joint Base Pearl Harbor-Hickam (JBPHH) personnel.

B.1.1 Airfield Operations

The first step in estimating the effects of the contract ADAIR action was to determine the baseline operations at JBPHH. This was done using information from field personnel to scale the 2007 operations. The 2007 study was based on 299,994 civilian operations and 24,180 military operations at the airfield. The average civilian and military operations counted by the tower from 2014 to 2017 are 292,530 and 19,366, respectively. **Table B-5** contains the baseline operations that reflect the scaling of the 2007 modeling by the average operations along with the information gathered from personnel during the site visit.

The contract ADAIR operations are meant to follow the operations of the 19th and 199th Fighter Squadrons with allowance for proficiency and maintenance flights. The contract ADAIR operation count of 3,100 includes 28 sorties for maintenance and flight proficiency for the contract ADAIR pilots. This entails the contract ADAIR aircraft being flown to the contractor's maintenance facility.

Table B-6 contains the operations to be modeled for the baseline as well as the contract ADAIR aircraft operations. The 19th and 199th Fighter Squadrons would fly together with the contract ADAIR aircraft.

A SORTIE IS A SINGLE FLIGHT, BY ONE AIRCRAFT, FROM TAKEOFF TO LANDING, WHILE A SORTIE-OPERATION IS THE USE OF ONE AIRSPACE UNIT 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.

This page intentionally left blank

Table B-5
Baseline Operations at Joint Base Pearl Harbor-Hickam

	Aircraft Category	Aircraft Type	Modeled Aircraft Type (if different)	AB Departure			Standard / MIL Departure			Overhead Arrivals			Straight In Arrivals			Total Annual Operation		
				Day (0700- 2200)	Night (2200- 0700)	Total	Day (0700- 2200)	Night (2200- 0700)	Total	Day (0700- 2200)	Night (2200- 0700)	Total	Day (0700- 2200)	Night (2200- 0700)	Total	Day (0700- 2200)	Night (2200- 0700)	Total
Based	Military	F-22		692	-	692	2769	-	2769	3115	-	3115	336	10	346	6912	10	6922
		C-17		-	-	-	547	548	1095	-	-	-	547	548	1095	1094	1096	2190
		C-37	Gulfstream IV	-	-	-	144	0	144	-	-	-	122	22	144	266	22	288
		C-40	B-737	-	-	-	144	0	144	-	-	-	122	22	144	266	22	288
		KC-135R		-	-	-	417	0	417	-	-	-	404	13	417	821	13	834
	Gen Aviation	B-737-QN9 (Q)		-	-	-	10839	5710	16549	-	-	-	11606	4943	16549	22445	10653	33098
		B-747-100 (QN)		-	-	-	11681	2391	14072	-	-	-	13227	845	14072	24908	3236	28144
		B-757-200-RR		-	-	-	3893	1098	4991	-	-	-	4441	550	4991	8334	1648	9982
		B-767-CF6		-	-	-	24074	3094	27168	-	-	-	24099	3069	27168	48173	6163	54336
		BEECH BARON 58P		-	-	-	11675	76	11751	-	-	-	11675	76	11751	23350	152	23502
		CL-601		-	-	-	5941	735	6676	-	-	-	6275	401	6676	12216	1136	13352
		DC-10-30		-	-	-	13369	-	13369	-	-	-	12701	668	13369	26070	668	26738
		DC-9-30QN9 (Q)		-	-	-	19777	-	19777	-	-	-	19777	-	19777	39554	-	39554
		DHC-830*		-	-	-	2794	656	3450	-	-	-	3278	172	3450	6072	828	6900
		GASEPF FIX		-	-	-	25799	261	26060	-	-	-	25799	261	26060	51598	522	52120
		MD-81		-	-	-	1612	790	2402	-	-	-	2402	-	2402	4014	790	4804
	Based Totals			**692**	**-**	**692**	**135475**	**15359**	**150834**	**3115**	**-**	**3115**	**136811**	**11600**	**148411**	**276093**	**26959**	**303052**
Transient	Sentry Aloha Exercises	F-15	F-15E	-	-	-	333	0	333	300	0	300	23	10	33	656	10	666
		F-16	F-16C	-	-	-	333	0	333	300	0	300	23	10	33	656	10	666
		F-18G	F-18E/F	-	-	-	333	0	333	300	0	300	23	10	33	656	10	666
	NAVUPS	AV-8B		-	-	-	39	0	39	-	-	-	39	0	39	78	0	78
		F-15	F-15E	-	-	-	31	0	31	-	-	-	31	0	31	62	0	62
		F-16	F-16C	-	-	-	345	0	345	-	-	-	345	0	345	690	0	690
		F-18A		-	-	-	125	0	125	-	-	-	125	0	125	250	0	250
		F-18E/F		-	-	-	125	0	125	-	-	-	125	0	125	250	0	250
		F-22		-	-	-	102	0	102	-	-	-	102	0	102	204	0	204
		F-35		-	-	-	16	0	16	-	-	-	16	0	16	32	0	32
		KC-135R		-	-	-	392	0	392	-	-	-	392	0	392	784	0	784
		KC-10A		-	-	-	392	0	392	-	-	-	392	0	392	784	0	784
		Surveillance Aircraft	E-4 - B-747-100	-	-	-	341	0	341	-	-	-	341	0	341	682	0	682
		C-5	C-5M	-	-	-	191	0	191	-	-	-	191	0	191	382	0	382
		C-17		-	-	-	821	0	821	-	-	-	821	0	821	1642	0	1642
		C-27	DHC-830	-	-	-	14	0	14	-	-	-	14	0	14	28	0	28
		C-32	B-757	-	-	-	44	0	44	-	-	-	44	0	44	88	0	88
		C-130	C-130H&N&P	-	-	-	396	0	396	-	-	-	396	0	396	792	0	792
		Helos	UH-60	-	-	-	34	0	34	-	-	-	34	0	34	68	0	68
	Transient Totals			**-**	**-**	**-**	**4407**	**-**	**4407**	**900**	**-**	**900**	**3477**	**30**	**3507**	**8784**	**30**	**8814**
Military Totals				692	-	692	8428	548	8976	4015	0	4015	5008	645	5653	18143	1193	19336
Civilian Totals				-	-	-	131454	14811	146265	-	-	-	135280	10985	146265	266734	25796	292530
Grand Totals				**692**	**-**	**692**	**139882**	**15359**	**155241**	**4015**	**-**	**4015**	**140288**	**11630**	**151918**	**284877**	**26989**	**311866**

Note:
This table represents operations at the airfield. Every operation is an aircraft departing (wheels up) or arriving (wheels down).

Table B-6
Baseline Training Operations at Joint Base Pearl Harbor-Hickam Plus Contract Adversary Air Operations

	Aircraft Category	Aircraft Type	Modeled Aircraft Type (if different)	AB Departure			Standard / MIL Departure			Overhead Arrivals			Straight In Arrivals			Total Annual Operations		
				Day (0700- 2200)	Night (2200- 0700)	Total	Day (0700- 2200)	Night (2200- 0700)	Total	Day (0700- 2200)	Night (2200- 0700)	Total	Day (0700- 2200)	Night (2200- 0700)	Total	Day (0700- 2200)	Night (2200- 0700)	Total
Based	Military	F-22		692	-	692	2769	-	2769	3115	-	3115	336	10	346	6912	10	6922
		C-17		-	-	-	547	548	1095	-	-	-	547	548	1095	1094	1096	2190
		C-37	Gulfstream IV	-	-	-	144	0	144	-	-	-	122	22	144	266	22	288
		C-40	B-737	-	-	-	144	0	144	-	-	-	122	22	144	266	22	288
		KC-135R		-	-	-	417	0	417	-	-	-	404	13	417	821	13	834
	ADAIR	Category C	See Note (2)	3100	0	3100	0	0	-	2790	0	2790	217	93	310	6107	93	6200
	Gen Aviation	B-737-QN9 (Q)		-	-	-	10839	5710	16549	-	-	-	11606	4943	16549	22445	10653	33098
		B-747-100 (QN)		-	-	-	11681	2391	14072	-	-	-	13227	845	14072	24908	3236	28144
		B-757-200-RR		-	-	-	3893	1098	4991	-	-	-	4441	550	4991	8334	1648	9982
		B-767-CF6		-	-	-	24074	3094	27168	-	-	-	24099	3069	27168	48173	6163	54336
		BEECH BARON 58P		-	-	-	11675	76	11751	-	-	-	11675	76	11751	23350	152	23502
		CL-601		-	-	-	5941	735	6676	-	-	-	6275	401	6676	12216	1136	13352
		DC-10-30		-	-	-	13369	-	13369	-	-	-	12701	668	13369	26070	668	26738
		DC-9-30QN9 (Q)		-	-	-	19777	-	19777	-	-	-	19777	-	19777	39554	-	39554
		DHC-830*		-	-	-	2794	656	3450	-	-	-	3278	172	3450	6072	828	6900
		GASEPF FIX		-	-	-	25799	261	26060	-	-	-	25799	261	26060	51598	522	52120
		MD-81		-	-	-	1612	790	2402	-	-	-	2402	-	2402	4014	790	4804
	Based Totals			**3792**	**-**	**3792**	**135475**	**15359**	**150834**	**5905**	**-**	**5905**	**137028**	**11693**	**148721**	**282200**	**27052**	**309252**
Transient	Sentry Aloha Exercises	F-15	F-15E	-	-	-	333	0	333	300	0	300	23	10	33	656	10	666
		F-16	F-16C	-	-	-	333	0	333	300	0	300	23	10	33	656	10	666
		F-18G	F-18E/F	-	-	-	333	0	333	300	0	300	23	10	33	656	10	666
	NAVUPS	AV-8B		-	-	-	39	0	39	-	-	-	39	0	39	78	0	78
		F-15	F-15E	-	-	-	31	0	31	-	-	-	31	0	31	62	0	62
		F-16	F-16C	-	-	-	345	0	345	-	-	-	345	0	345	690	0	690
		F-18A		-	-	-	125	0	125	-	-	-	125	0	125	250	0	250
		F-18E/F		-	-	-	125	0	125	-	-	-	125	0	125	250	0	250
		F-22		-	-	-	102	0	102	-	-	-	102	0	102	204	0	204
		F-35		-	-	-	16	0	16	-	-	-	16	0	16	32	0	32
		KC-135R		-	-	-	392	0	392	-	-	-	392	0	392	784	0	784
		KC-10A		-	-	-	392	0	392	-	-	-	392	0	392	784	0	784
		Surveillance Aircraft	E-4 - B-747-100	-	-	-	341	0	341	-	-	-	341	0	341	682	0	682
		C-5	C-5M	-	-	-	191	0	191	-	-	-	191	0	191	382	0	382
		C-17		-	-	-	821	0	821	-	-	-	821	0	821	1642	0	1642
		C-27	DHC-830	-	-	-	14	0	14	-	-	-	14	0	14	28	0	28
		C-32	B-757	-	-	-	44	0	44	-	-	-	44	0	44	88	0	88
		C-130	C-130H&N&P	-	-	-	396	0	396	-	-	-	396	0	396	792	0	792
		Helos	UH-60	-	-	-	34	0	34	-	-	-	34	0	34	68	0	68
	Transient Totals			**-**	**-**	**-**	**4407**	**-**	**4407**	**900**	**-**	**900**	**3477**	**30**	**3507**	**8784**	**30**	**8814**
Military Totals				3792	-	3792	8428	548	8976	6805	0	6805	5225	738	5963	24250	1286	25536
Civilian Totals				-	-	-	131454	14811	146265	-	-	-	135280	10985	146265	266734	25796	292530
Grand Totals				**3792**	**-**	**3792**	**139882**	**15359**	**155241**	**6805**	**-**	**6805**	**140505**	**11723**	**152228**	**290984**	**27082**	**318066**

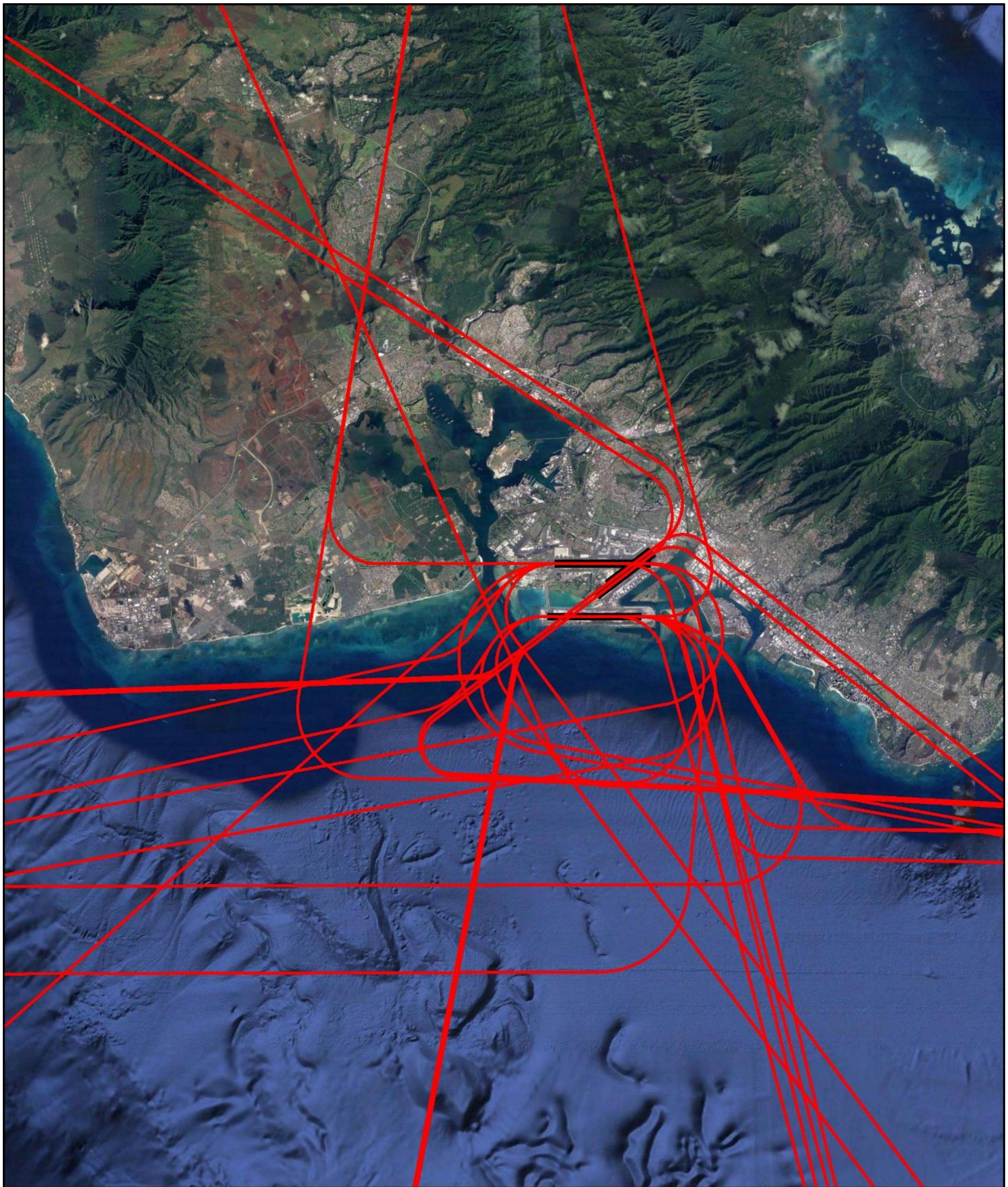
Notes:
(1) This table represents operations at the airfield. Every operation is an aircraft departing (wheels up) or arriving (wheels down).
(2) ADAIR operations apply only to the Proposed Action scenario to be modeled as F18E/F, F16C, or F16A for High, Medium, and Low Noise Category C Proposed Action Scenarios, respectively.

B.1.2 Runway and Flight Track Use

This section describes the flight tracks used by the aircraft operating out of JBPHH 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) and **Figure B-14** (arrivals). Closed Pattern operations are not routinely performed at JBPHH.

Table B-7
Runway Usage for Based Aircraft at Joint Base Pearl Harbor-Hickam

Operation Type	Runway ID	Based Military								Transient Military		Civilian	
		199 & 19 FS F-22		535th C-17		208th KC-135R		65th AS C-37&40					
		Day (0700-2200)	Night (2200-0700)	Day (0700-2200)	Night (2200-0700)	Day (0700-2200)	Night (2200-0700)	Day (0700-2200)	Night (2200-0700)	Day (0700-2200)	Night (2200-0700)	Day (0700-2200)	Night (2200-0700)
Departure	04L	-	-	-	-	-	-	-	-			15.64%	5.19%
	04R	-	-	-	-	-	-	-	-			15.64%	5.19%
	08L	-	-	-	-	-	-	5.0%	5.0%			29.02%	39.85%
	08R	98.0%	98.0%	95.0%	95.0%	100.0%	100.0%	95.0%	95.0%	91.00%	91.00%	28.87%	39.16%
	22L	-	-	-	-	-	-	-	-			1.93%	0.64%
	22R	-	-	-	-	-	-	-	-			1.93%	0.64%
	26L	-	-	-	-	-	-	-	-	9.00%	9.00%	3.42%	4.15%
	26R	2.0%	2.0%	5.0%	5.0%	-	-	-	-			3.54%	5.18%
Arrival	04L	-	-	-	-	-	-	-	-			15.47%	3.68%
	04R	2.5%	80.0%	-	95.0%	2.5%	96.0%	0.0%	100.0%		90.00%	15.47%	3.68%
	08L	95.0%	10.0%	99.0%	0.0%	97.5%	2.0%	94.1%	0.0%	91.00%		29.03%	40.82%
	08R	-	-	-	-	-	-	-	-			29.03%	40.82%
	22L	-	-	-	-	-	-	-	-			1.91%	0.46%
	22R	-	-	-	-	-	-	-	-			1.91%	0.46%
	26L	2.5%	10.0%	1.0%	5.0%	5.0%	2.0%	5.9%	0.0%	9.00%	10.00%	3.59%	5.04%
	26R	-	-	-	-	-	-	-	-			3.59%	5.04%



Joint Base Pearl Harbor-Hickam
Departure Flight Tracks

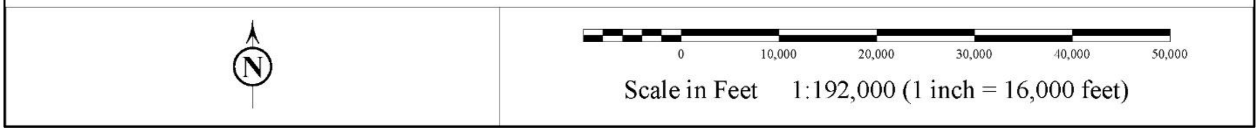


Figure B-13. Departure Flight Tracks at Joint Base Pearl Harbor-Hickam.

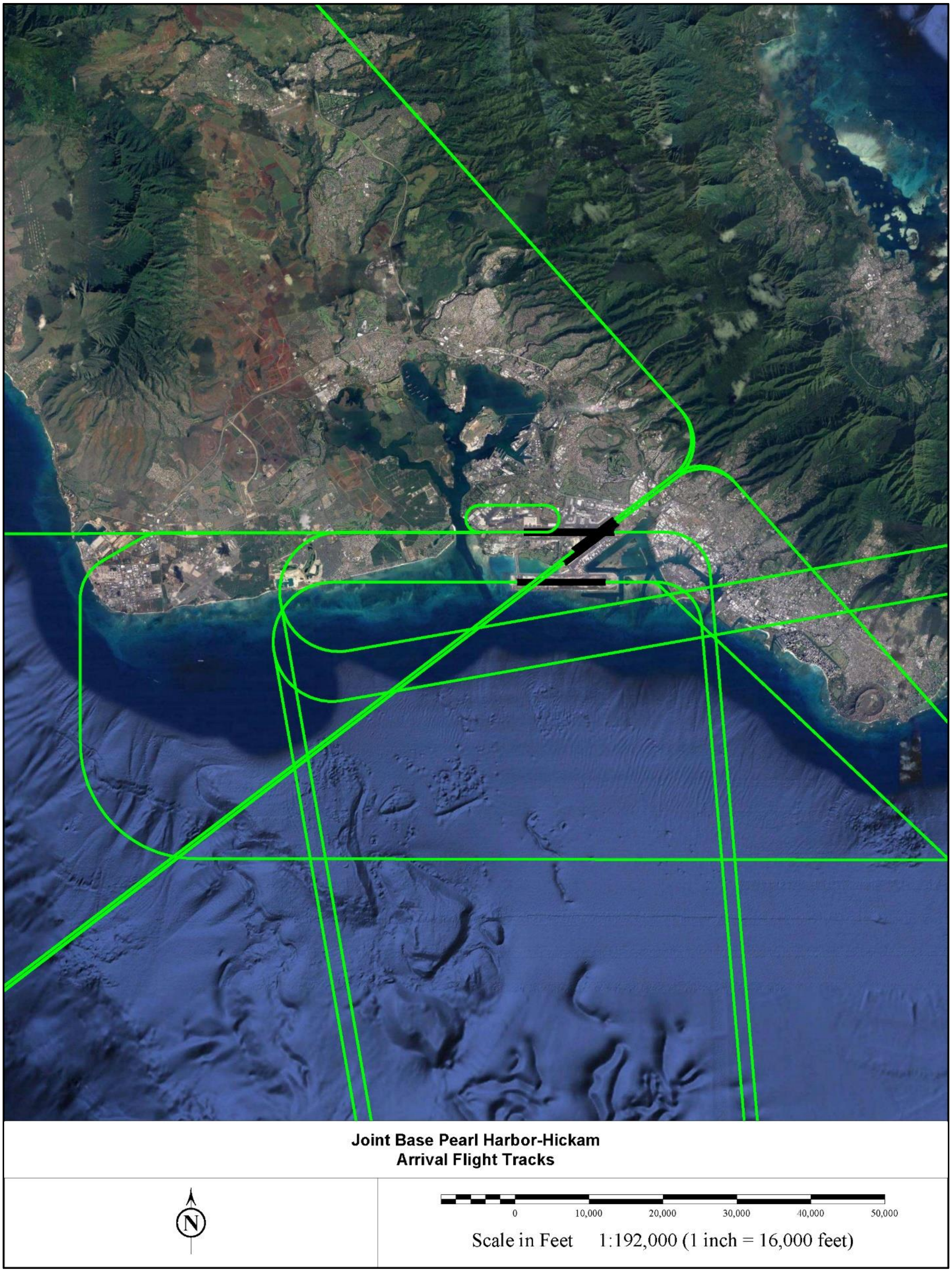


Figure B-14. Arrival Flight Tracks at Joint Base Pearl Harbor-Hickam.

B.1.3 Flight Profiles and Aircraft

The ADAIR program would locate contractor aircraft at JBPHH with the appropriate capabilities to respond to the needs of the fighters at the base. 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 JBPHH could be provided by Category C aircraft. All three scenarios for Category C will be modeled separately in the final analysis for JBPHH.

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)

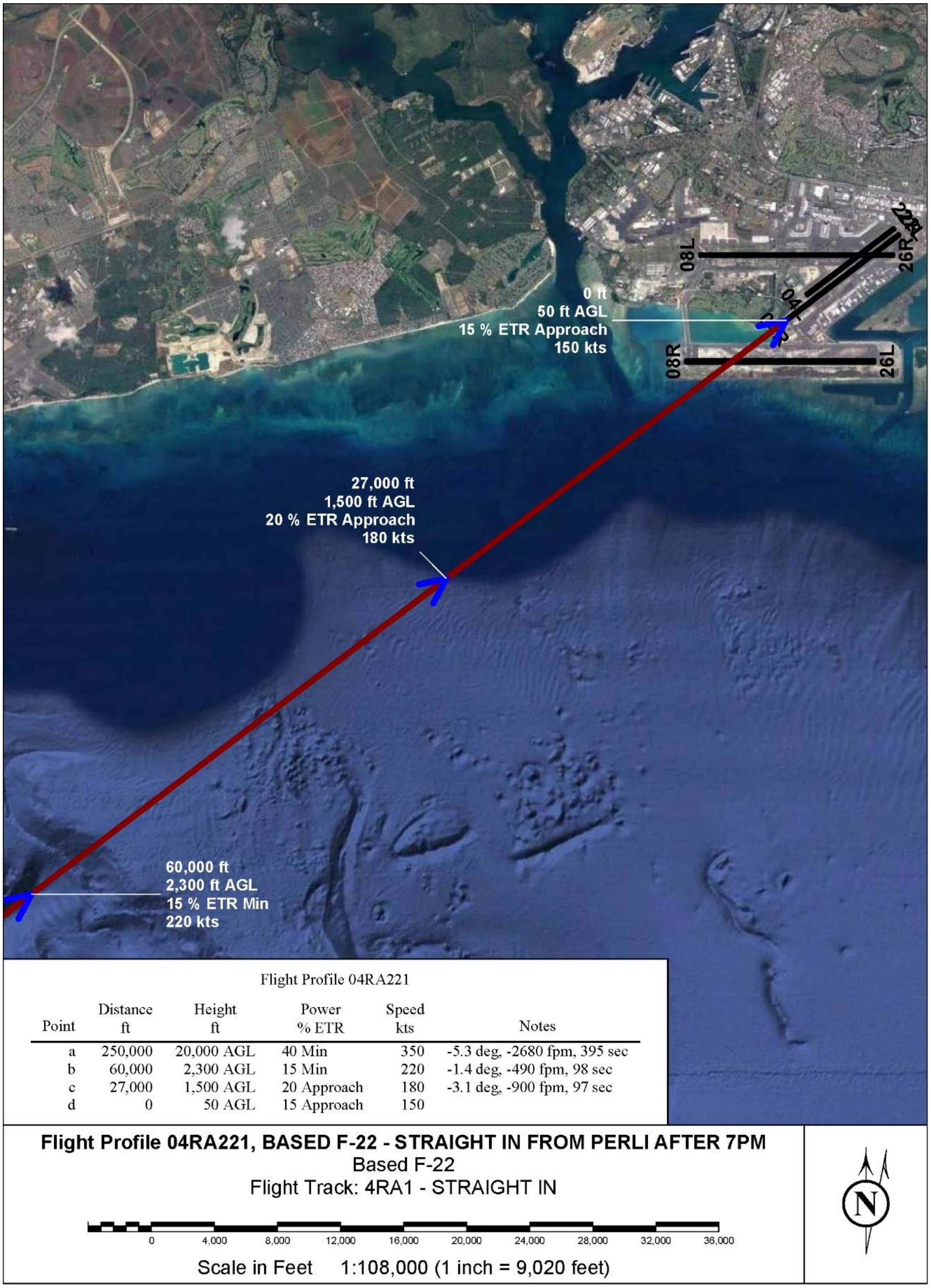
The Category C aircraft will be modeled as the F-16A for the Low Noise Scenario, the F-16C for the Medium Noise Scenario, and the F-18E/F for the High Noise Scenario. Because it is unknown which aircraft type or combination thereof that the contractor will bring to JBPHH, each scenario will be modeled separately as if it were the only aircraft in the 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 will be used for all flight tracks that conform to that maneuver type. For example, all overhead break arrival tracks will utilize the representative profile for modeling that maneuver.

It is understood that visiting squadrons participating in large field exercises, known as Sentry Aloha, will fly patterns at the airfield and spend time in the Warning Areas in the same way performed by the F-22 squadrons.

B.1.3.1 Based Aircraft Representative Flight Profiles

B.1.3.1.1 Flight Profiles for the 19th and 199th Fighter Squadrons' F-22s

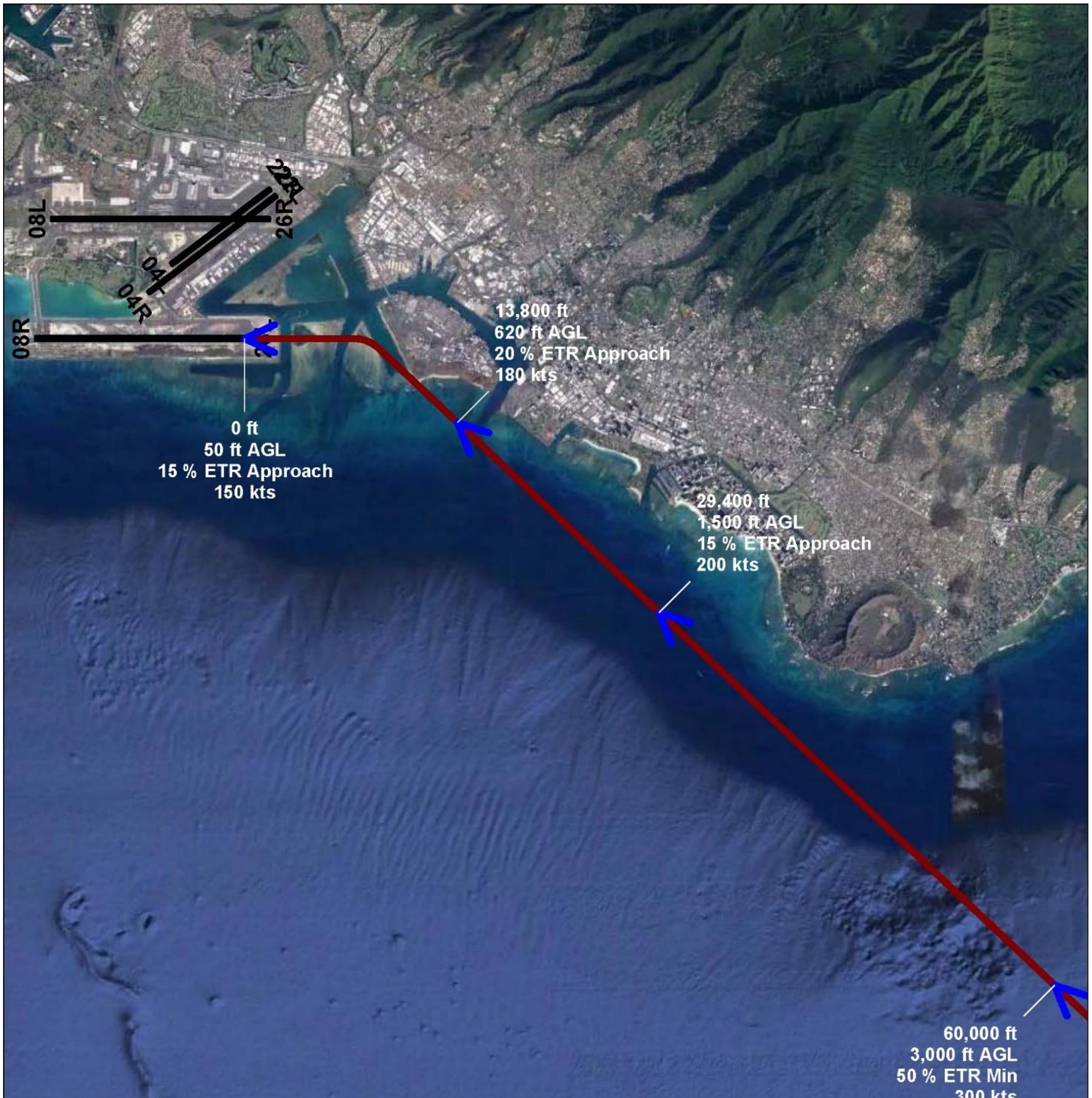


Flight Profile 04RA221

Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	250,000	20,000 AGL	40 Min	350	-5.3 deg, -2680 fpm, 395 sec
b	60,000	2,300 AGL	15 Min	220	-1.4 deg, -490 fpm, 98 sec
c	27,000	1,500 AGL	20 Approach	180	-3.1 deg, -900 fpm, 97 sec
d	0	50 AGL	15 Approach	150	

Flight Profile 04RA221, BASED F-22 - STRAIGHT IN FROM PERLI AFTER 7PM
Based F-22
Flight Track: 4RA1 - STRAIGHT IN

Scale in Feet 1:108,000 (1 inch = 9,020 feet)



Flight Profile 26LA221

Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	250,000	20,000 AGL	40 Min	350	-5.1 deg, -2930 fpm, 346 sec
b	60,000	3,000 AGL	50 Min	300	-2.8 deg, -1240 fpm, 73 sec
c	29,400	1,500 AGL	15 Approach	200	-3.2 deg, -1080 fpm, 49 sec
d	13,800	620 AGL	20 Approach	180	-2.4 deg, -690 fpm, 50 sec
e	0	50 AGL	15 Approach	150	

Flight Profile 26LA221, BASED F-22 - KONA WINDS STRAIGHT IN ARRIVAL

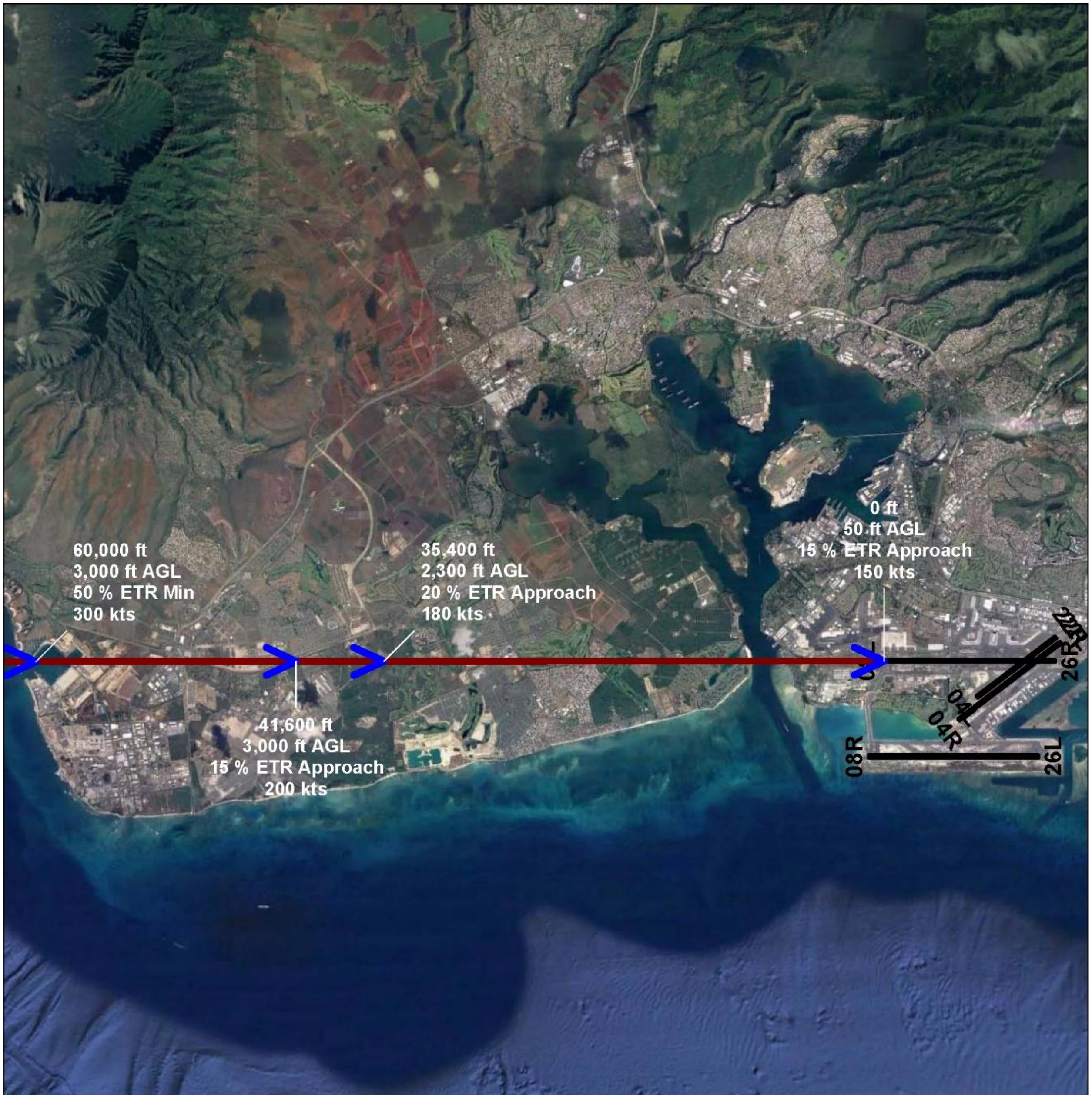
Based F-22

Flight Track: 6LA1 - KONA WINDS

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000

Scale in Feet 1:113,000 (1 inch = 9,430 feet)

N



Flight Profile 08LA221

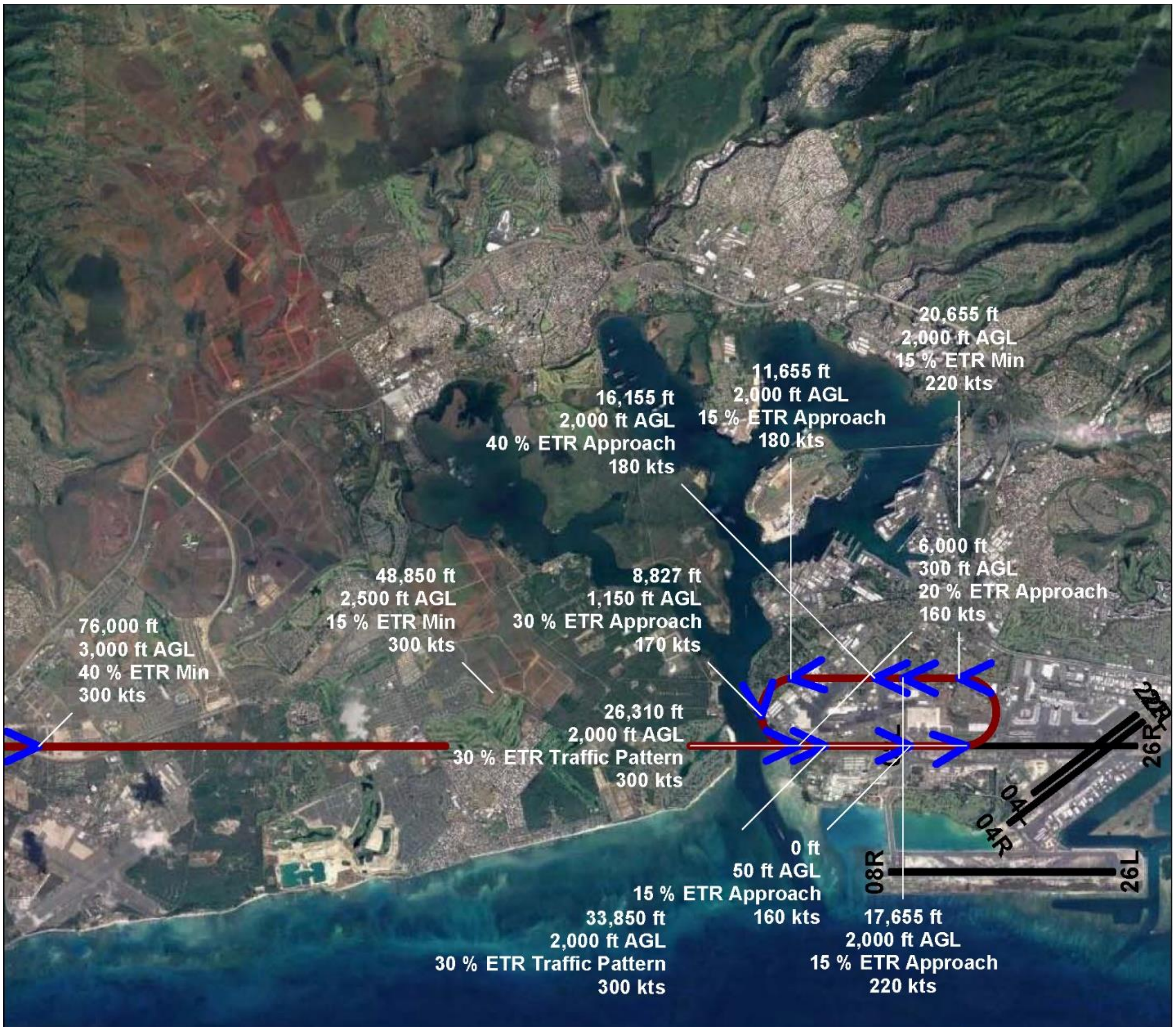
Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	250,000	20,000 AGL	40 Min	350	-5.1 deg, -2930 fpm, 346 sec
b	60,000	3,000 AGL	50 Min	300	0.0 deg, 0 fpm, 44 sec
c	41,600	3,000 AGL	15 Approach	200	-6.4 deg, -2160 fpm, 19 sec
d	35,400	2,300 AGL	20 Approach	180	-3.6 deg, -1060 fpm, 127 sec
e	0	50 AGL	15 Approach	150	

Flight Profile 08LA221, BASED F-22 - STRAIGHT IN ARRIVAL
Based F-22
Flight Track: 8LA1 - BOOKE ARRIVAL 14 DME STRAIGHT IN

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 1:142,000 (1 inch = 11,800 feet)

N



Flight Profile 08LA222

Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	200,000	10,000 AGL	50 Min	350	
b	76,000	3,000 AGL	40 Min	300	
c	48,850	2,500 AGL	15 Min	300	
d	33,850	2,000 AGL	30 Traffic Pattern	300	Level off
e	26,310	2,000 AGL	30 Traffic Pattern	300	Break
f	20,655	2,000 AGL	15 Min	220	Begin Downwind
g	17,655	2,000 AGL	15 Approach	220	Gear down
h	16,155	2,000 AGL	40 Approach	180	Increase Power
i	11,655	2,000 AGL	15 Approach	180	End Downwind, Descend from 2000 ft
j	8,827	1,150 AGL	30 Approach	170	90 Position
k	6,000	300 AGL	20 Approach	160	Begin 1 NM Final
l	0	50 AGL	15 Approach	160	Threshold crossing

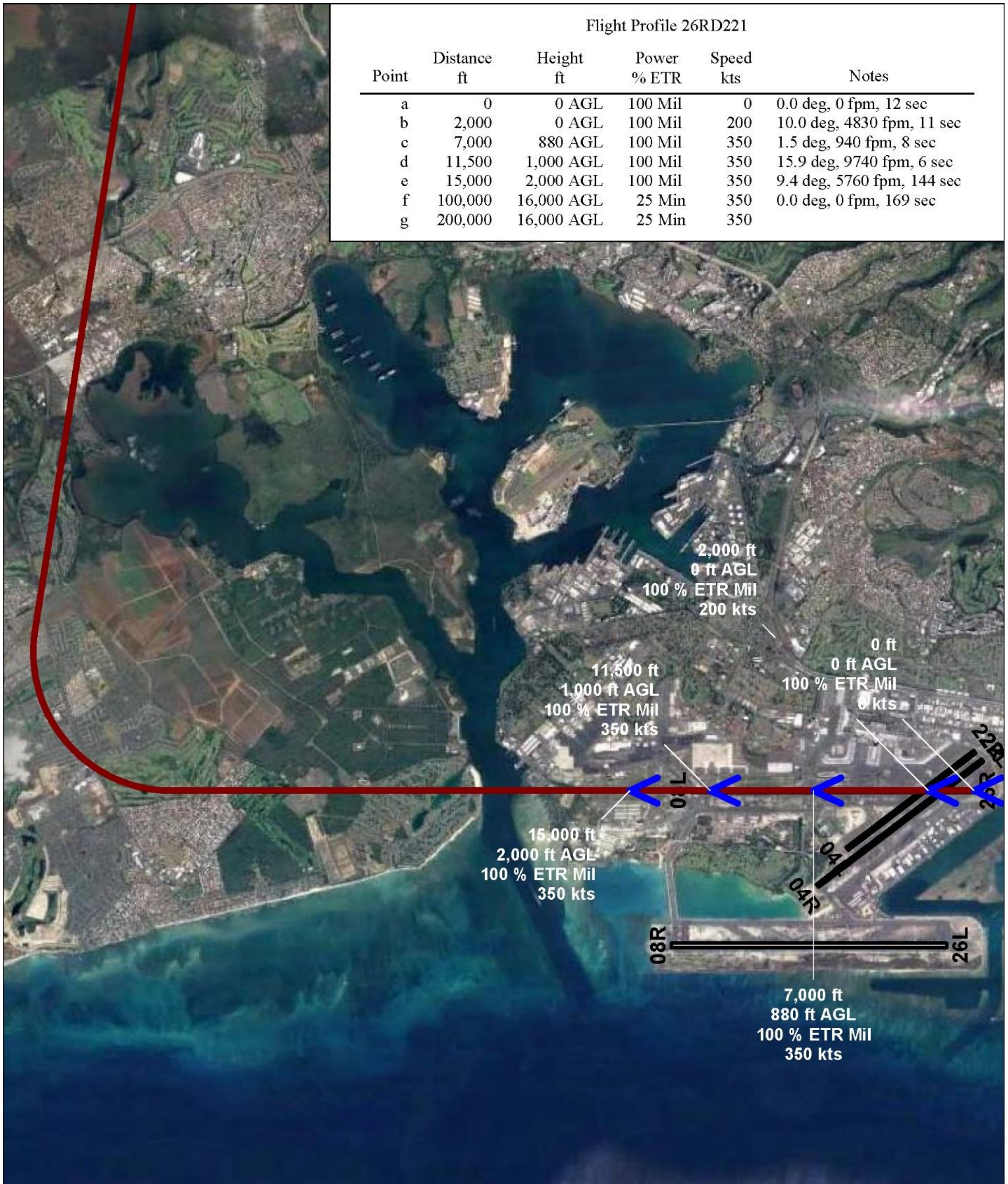
Flight Profile 08LA222, BASED F-22 - OVERHEAD ARRIVAL
Based F-22
Flight Track: 8LAP - PITCHOUT

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000

Scale in Feet 1:115,000 (1 inch = 9,620 feet)

Flight Profile 26RD221

Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	0	0 AGL	100 Mil	0	0.0 deg, 0 fpm, 12 sec
b	2,000	0 AGL	100 Mil	200	10.0 deg, 4830 fpm, 11 sec
c	7,000	880 AGL	100 Mil	350	1.5 deg, 940 fpm, 8 sec
d	11,500	1,000 AGL	100 Mil	350	15.9 deg, 9740 fpm, 6 sec
e	15,000	2,000 AGL	100 Mil	350	9.4 deg, 5760 fpm, 144 sec
f	100,000	16,000 AGL	25 Min	350	0.0 deg, 0 fpm, 169 sec
g	200,000	16,000 AGL	25 Min	350	



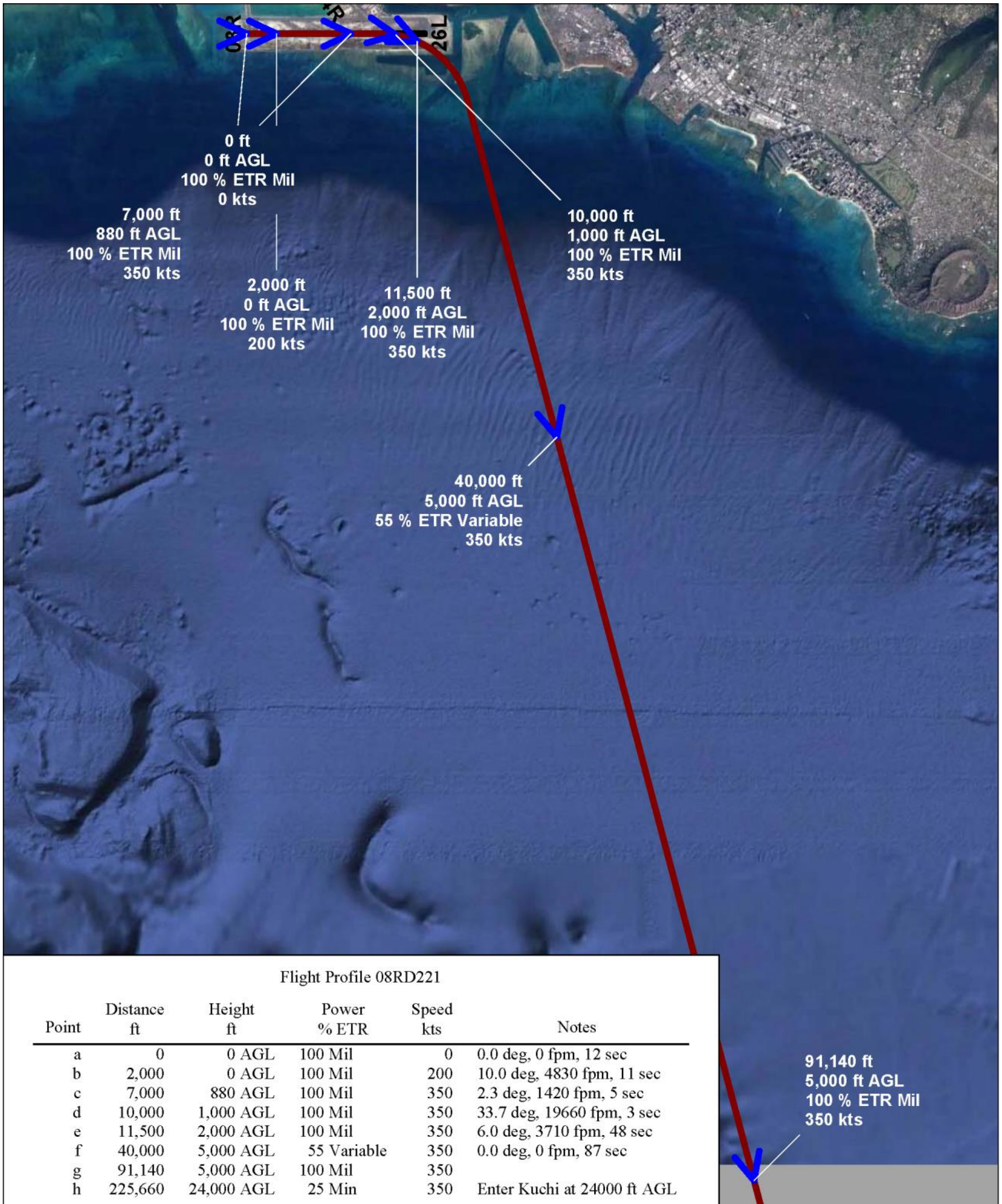
Flight Profile 26RD221, BASED F-22 - DEPARTURE TO NORTH -- UNRESTRICTED CLIMB

Based F-22

Flight Track: 6ED2 - MELLO 3 FROM TAXIWAY ECHO

0 4,000 8,000 12,000 16,000 20,000 24,000

Scale in Feet 1:80,500 (1 inch = 6,710 feet)



Flight Profile 08RD221

Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	0	0 AGL	100 Mil	0	0.0 deg, 0 fpm, 12 sec
b	2,000	0 AGL	100 Mil	200	10.0 deg, 4830 fpm, 11 sec
c	7,000	880 AGL	100 Mil	350	2.3 deg, 1420 fpm, 5 sec
d	10,000	1,000 AGL	100 Mil	350	33.7 deg, 19660 fpm, 3 sec
e	11,500	2,000 AGL	100 Mil	350	6.0 deg, 3710 fpm, 48 sec
f	40,000	5,000 AGL	55 Variable	350	0.0 deg, 0 fpm, 87 sec
g	91,140	5,000 AGL	100 Mil	350	
h	225,660	24,000 AGL	25 Min	350	Enter Kuchi at 24000 ft AGL

Flight Profile 08RD221, BASED F-22 - DEPARTURE TO THE SOUTH (CAPPED)

Based F-22

Flight Track: 8RD5 - SOUTH DEPART TO KUCHI

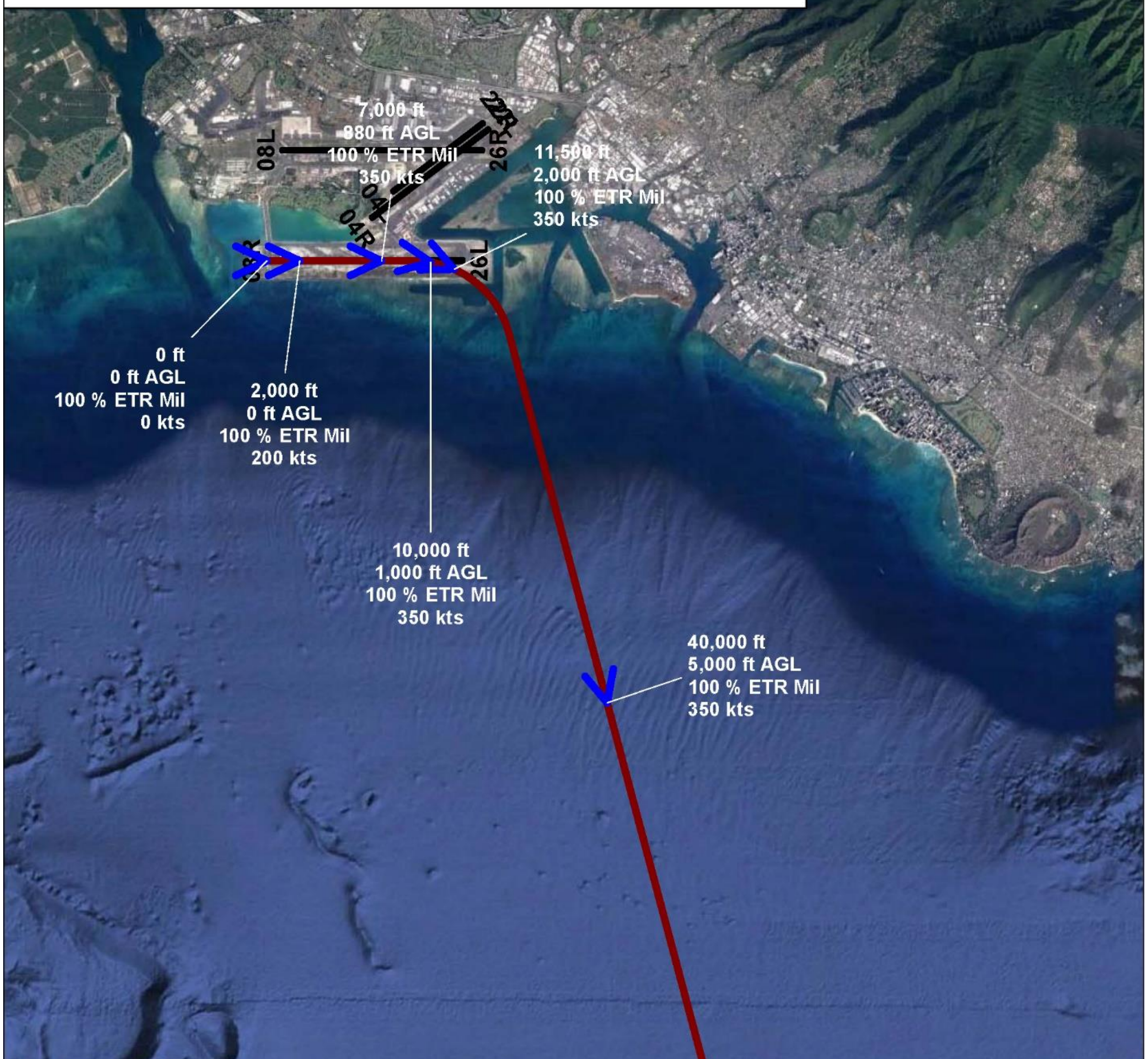
0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000

Scale in Feet 1:123,000 (1 inch = 10,200 feet)

N

Flight Profile 08RD222

Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	0	0 AGL	100 Mil	0	0.0 deg, 0 fpm, 12 sec
b	2,000	0 AGL	100 Mil	200	10.0 deg, 4830 fpm, 11 sec
c	7,000	880 AGL	100 Mil	350	2.3 deg, 1420 fpm, 5 sec
d	10,000	1,000 AGL	100 Mil	350	33.7 deg, 19660 fpm, 3 sec
e	11,500	2,000 AGL	100 Mil	350	6.0 deg, 3710 fpm, 48 sec
f	40,000	5,000 AGL	100 Mil	350	
g	134,380	16,000 AGL	55 Variable	350	7.2 deg, 4420 fpm, 108 sec
h	198,100	24,000 AGL	25 Min	350	Enter Kuchi at 24000



Flight Profile 08RD222, BASED F-22 - DEPARTURE TO THE SOUTH -- UNRESTRICTED CLIMB

Based F-22

Flight Track: 8RD5 - SOUTH DEPART TO KUCHI

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 1:129,000 (1 inch = 10,700 feet)

N

Flight Profile 08RD223

Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	0	0 AGL	150 Max A/B	0	2.9 deg, 510 fpm, 12 sec
b	2,000	100 AGL	150 A/B Est	200	2.9 deg, 1640 fpm, 15 sec
c	10,000	500 AGL	150 A/B Est	450	72.1 deg, 38550 fpm, 7 sec
d	15,000	16,000 AGL	50 Min	350	0.0 deg, 0 fpm, 232 sec
e	151,900	16,000 AGL	100 Mil	350	7.5 deg, 4630 fpm, 103 sec
f	212,660	24,000 AGL	50 Min	350	

Flight Profile 08RD223, BASED F-22 - HANG 10 DEPARTURE TO THE SOUTH AB
Based F-22
Flight Track: 8RD5 - SOUTH DEPART TO KUCHI

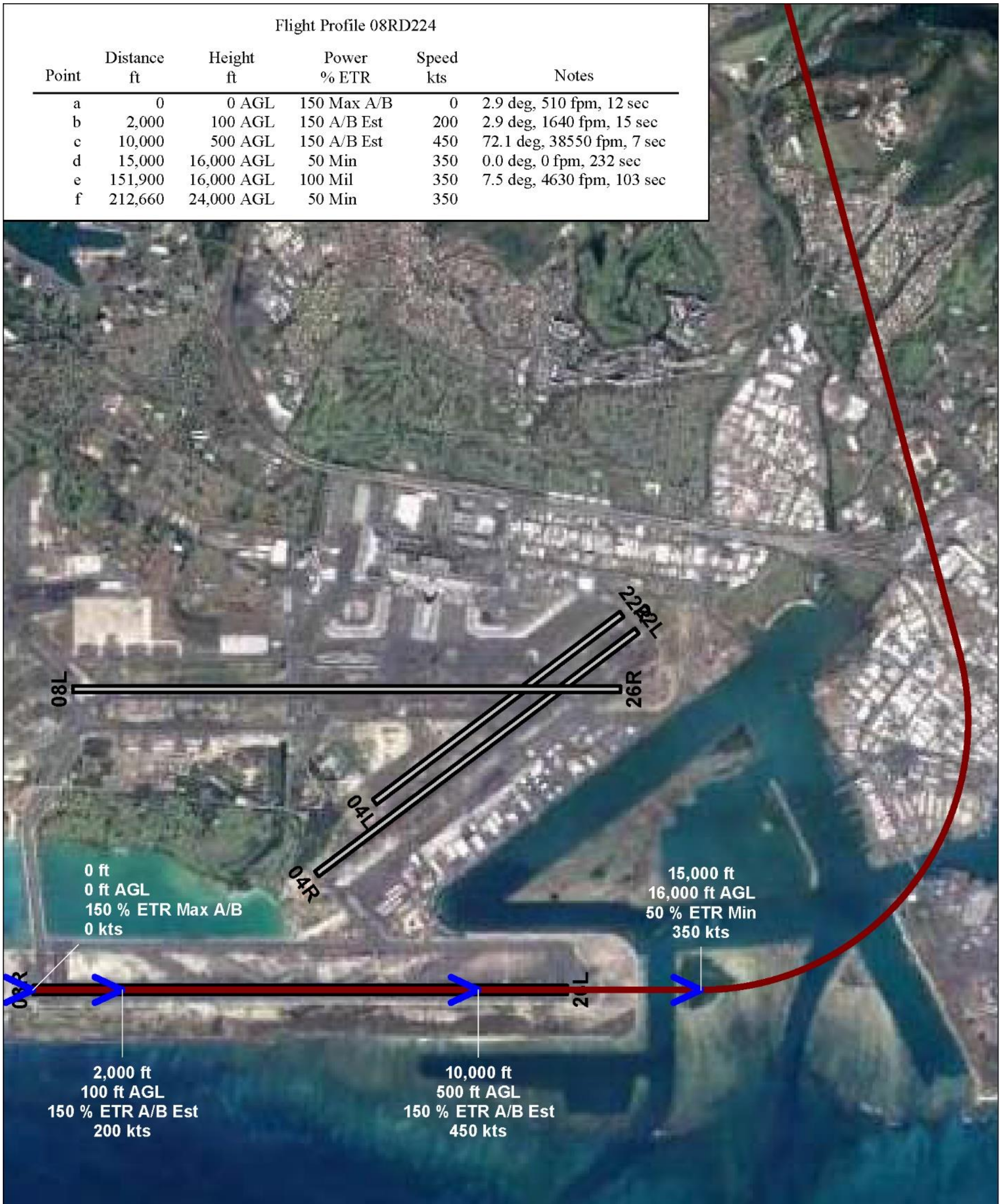
0 2,000 4,000 6,000 8,000 10,000

Scale in Feet 1:34,100 (1 inch = 2,840 feet)

N

Flight Profile 08RD224

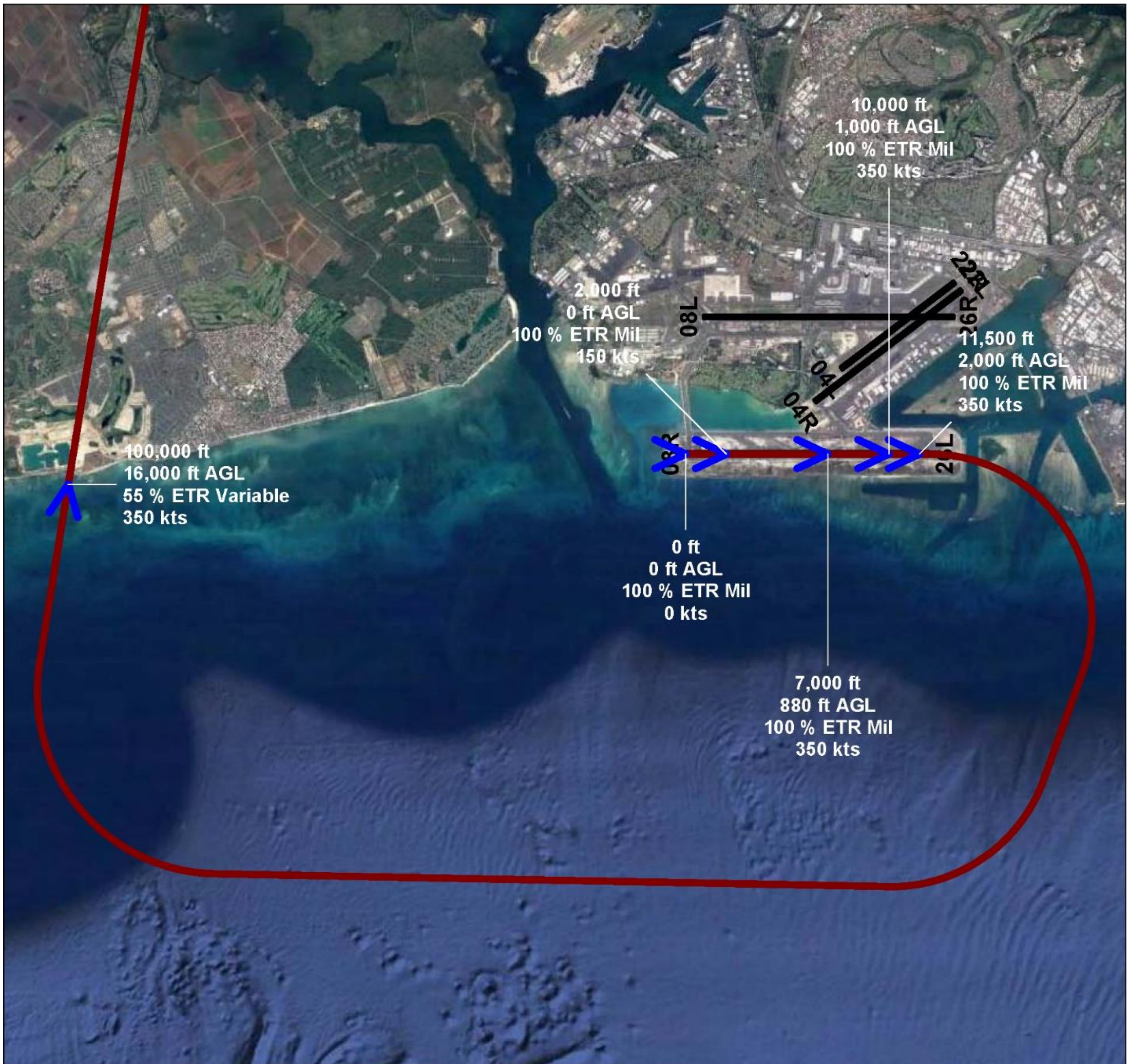
Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	0	0 AGL	150 Max A/B	0	2.9 deg, 510 fpm, 12 sec
b	2,000	100 AGL	150 A/B Est	200	2.9 deg, 1640 fpm, 15 sec
c	10,000	500 AGL	150 A/B Est	450	72.1 deg, 38550 fpm, 7 sec
d	15,000	16,000 AGL	50 Min	350	0.0 deg, 0 fpm, 232 sec
e	151,900	16,000 AGL	100 Mil	350	7.5 deg, 4630 fpm, 103 sec
f	212,660	24,000 AGL	50 Min	350	



Flight Profile 08RD224, BASED F-22 - HANG 10 DEPARTURE TO NORTH AB
Based F-22
Flight Track: 8RD8 - HANG 10 TO 355

0 2,000 4,000 6,000 8,000 10,000 12,000

Scale in Feet 1:41,200 (1 inch = 3,440 feet)



Flight Profile 08RD225

Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	0	0 AGL	100 Mil	0	0.0 deg, 0 fpm, 16 sec
b	2,000	0 AGL	100 Mil	150	10.0 deg, 4390 fpm, 12 sec
c	7,000	880 AGL	100 Mil	350	2.3 deg, 1420 fpm, 5 sec
d	10,000	1,000 AGL	100 Mil	350	33.7 deg, 19660 fpm, 3 sec
e	11,500	2,000 AGL	100 Mil	350	9.0 deg, 5540 fpm, 150 sec
f	100,000	16,000 AGL	55 Variable	350	0.0 deg, 0 fpm, 254 sec
g	250,000	16,000 AGL	55 Variable	350	

Flight Profile 08RD225, BASED F-22 - DEPARTURE TO SOUTH THEN NORTH - UNRESTRICTED CLIMB

Based F-22

Flight Track: 8RD9 - NORTH

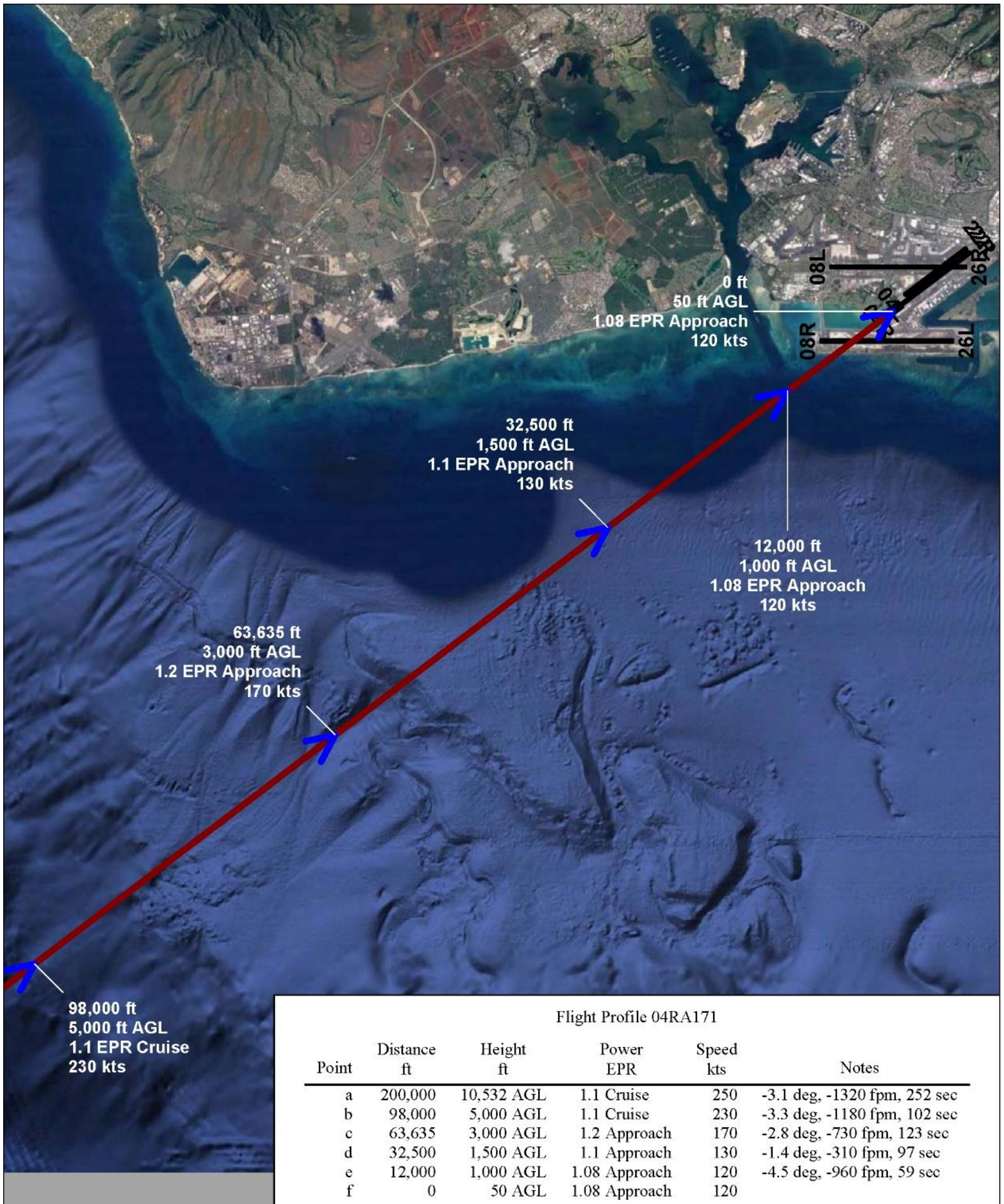
0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000

Scale in Feet 1:102,000 (1 inch = 8,500 feet)

N

B.1.3.1.2 Flight Profiles for the 535th and 204th Airlift Squadrons' C-17s

There are two departure profiles: mission (greater than 400,000 pounds) and training (less than 400,000 pounds) sorties. On every departure track the ratio of mission to training departures will be 1:1. All arrival profiles are shown due to minor differences.



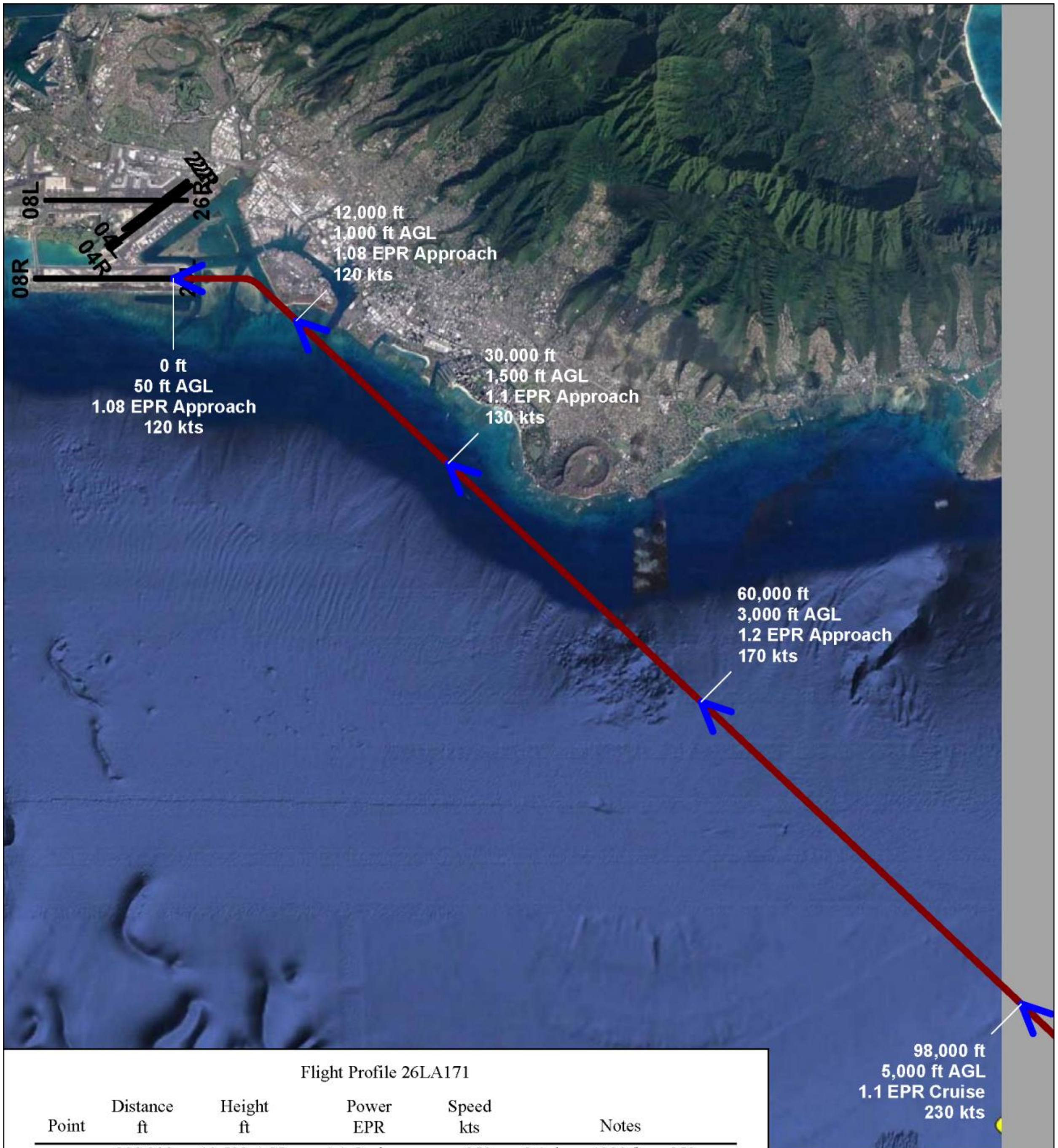
Flight Profile 04RA171

Point	Distance ft	Height ft	Power EPR	Speed kts	Notes
a	200,000	10,532 AGL	1.1 Cruise	250	-3.1 deg, -1320 fpm, 252 sec
b	98,000	5,000 AGL	1.1 Cruise	230	-3.3 deg, -1180 fpm, 102 sec
c	63,635	3,000 AGL	1.2 Approach	170	-2.8 deg, -730 fpm, 123 sec
d	32,500	1,500 AGL	1.1 Approach	130	-1.4 deg, -310 fpm, 97 sec
e	12,000	1,000 AGL	1.08 Approach	120	-4.5 deg, -960 fpm, 59 sec
f	0	50 AGL	1.08 Approach	120	

Flight Profile 04RA171, BASED C-17 ARRIVAL
Based C-17
Flight Track: 4RA1 - STRAIGHT IN

0 10,000 20,000 30,000 40,000 50,000

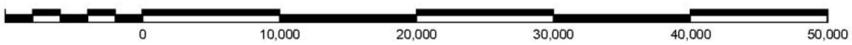
Scale in Feet 1:168,000 (1 inch = 14,000 feet)



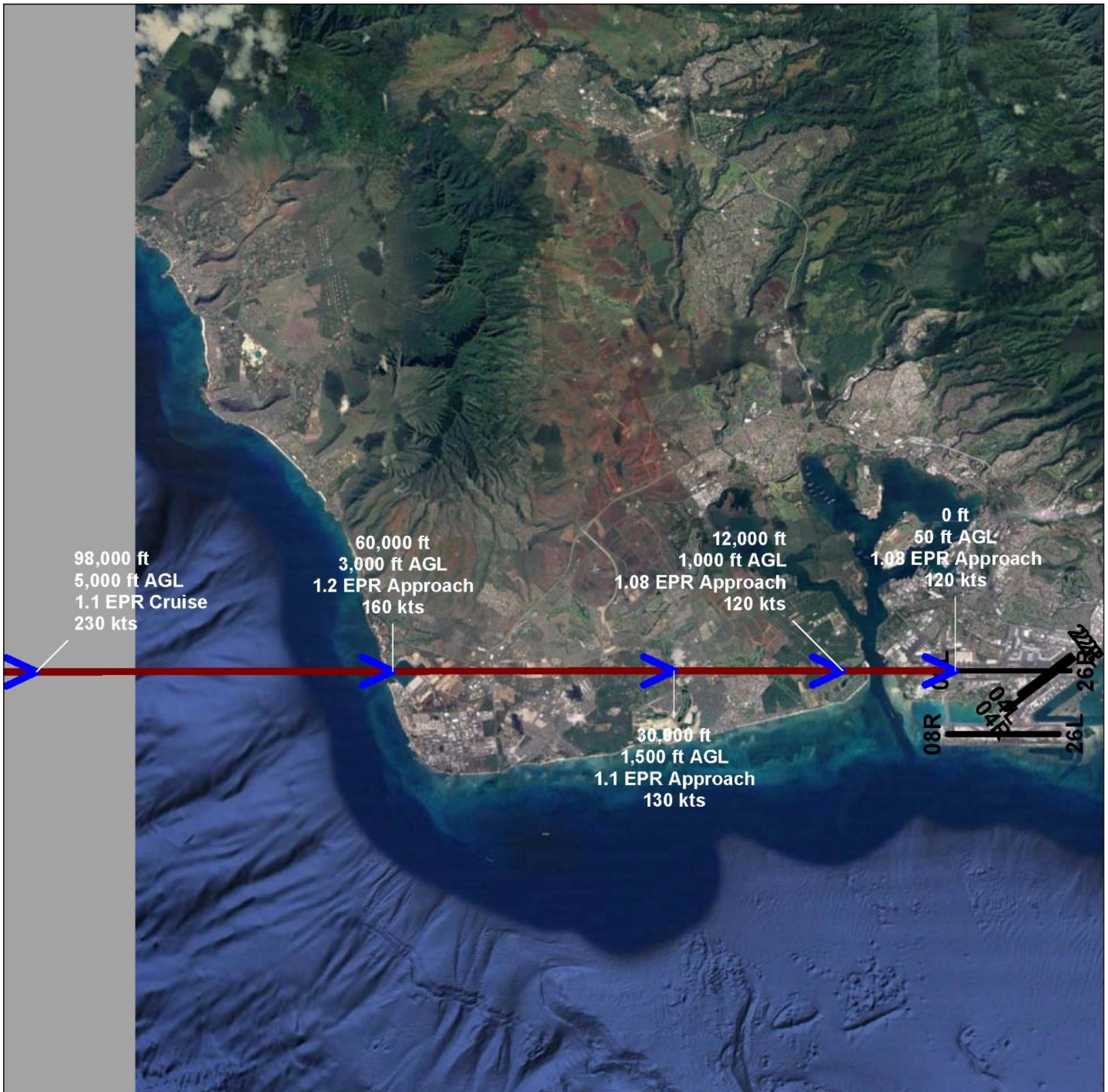
Flight Profile 26LA171

Point	Distance ft	Height ft	Power EPR	Speed kts	Notes
a	200,000	10,532 AGL	1.1 Cruise	250	-3.1 deg, -1320 fpm, 252 sec
b	98,000	5,000 AGL	1.1 Cruise	230	-3.0 deg, -1060 fpm, 113 sec
c	60,000	3,000 AGL	1.2 Approach	170	-2.9 deg, -760 fpm, 118 sec
d	30,000	1,500 AGL	1.1 Approach	130	-1.6 deg, -350 fpm, 85 sec
e	12,000	1,000 AGL	1.08 Approach	120	-4.5 deg, -960 fpm, 59 sec
f	0	50 AGL	1.08 Approach	120	

Flight Profile 26LA171, BASED C-17 ARRIVAL
Based C-17
Flight Track: 6LA1 - KONA WINDS



Scale in Feet 1:168,000 (1 inch = 14,000 feet)



Flight Profile 08LA172

Point	Distance ft	Height ft	Power EPR	Speed kts	Notes
a	200,000	10,532 AGL	1.1 Cruise	250	-3.1 deg, -1320 fpm, 252 sec
b	98,000	5,000 AGL	1.1 Cruise	230	-3.0 deg, -1040 fpm, 115 sec
c	60,000	3,000 AGL	1.2 Approach	160	-2.9 deg, -730 fpm, 123 sec
d	30,000	1,500 AGL	1.1 Approach	130	-1.6 deg, -350 fpm, 85 sec
e	12,000	1,000 AGL	1.08 Approach	120	-4.5 deg, -960 fpm, 59 sec
f	0	50 AGL	1.08 Approach	120	

Flight Profile 08LA172, BASED C-17 ARRIVAL FROM WEST

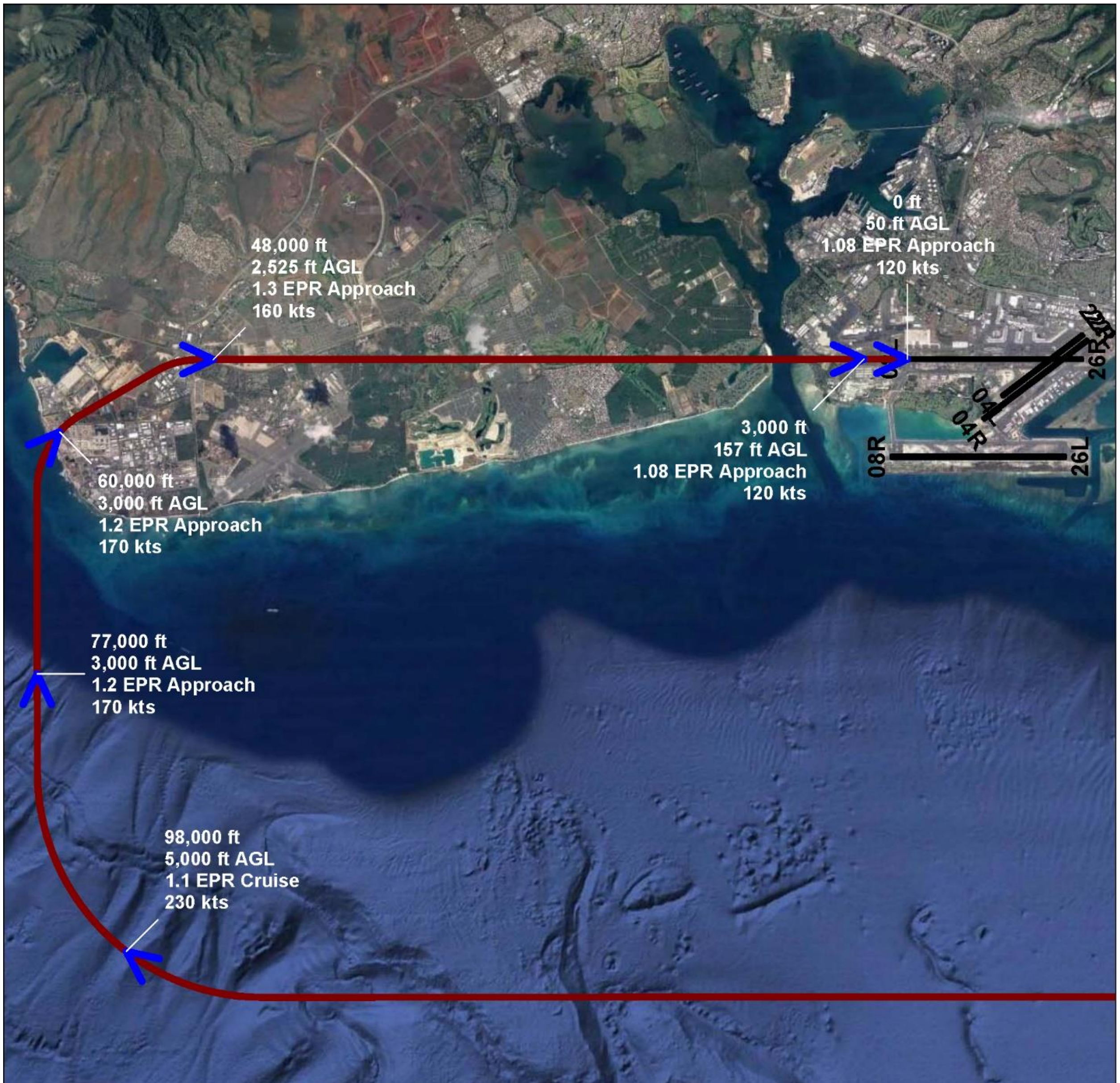
Based C-17

Flight Track: 8LA1 - BOOKE ARRIVAL 14 DME STRAIGHT IN

0 10,000 20,000 30,000 40,000 50,000 60,000 70,000

Scale in Feet 1:217,000 (1 inch = 18,000 feet)

N



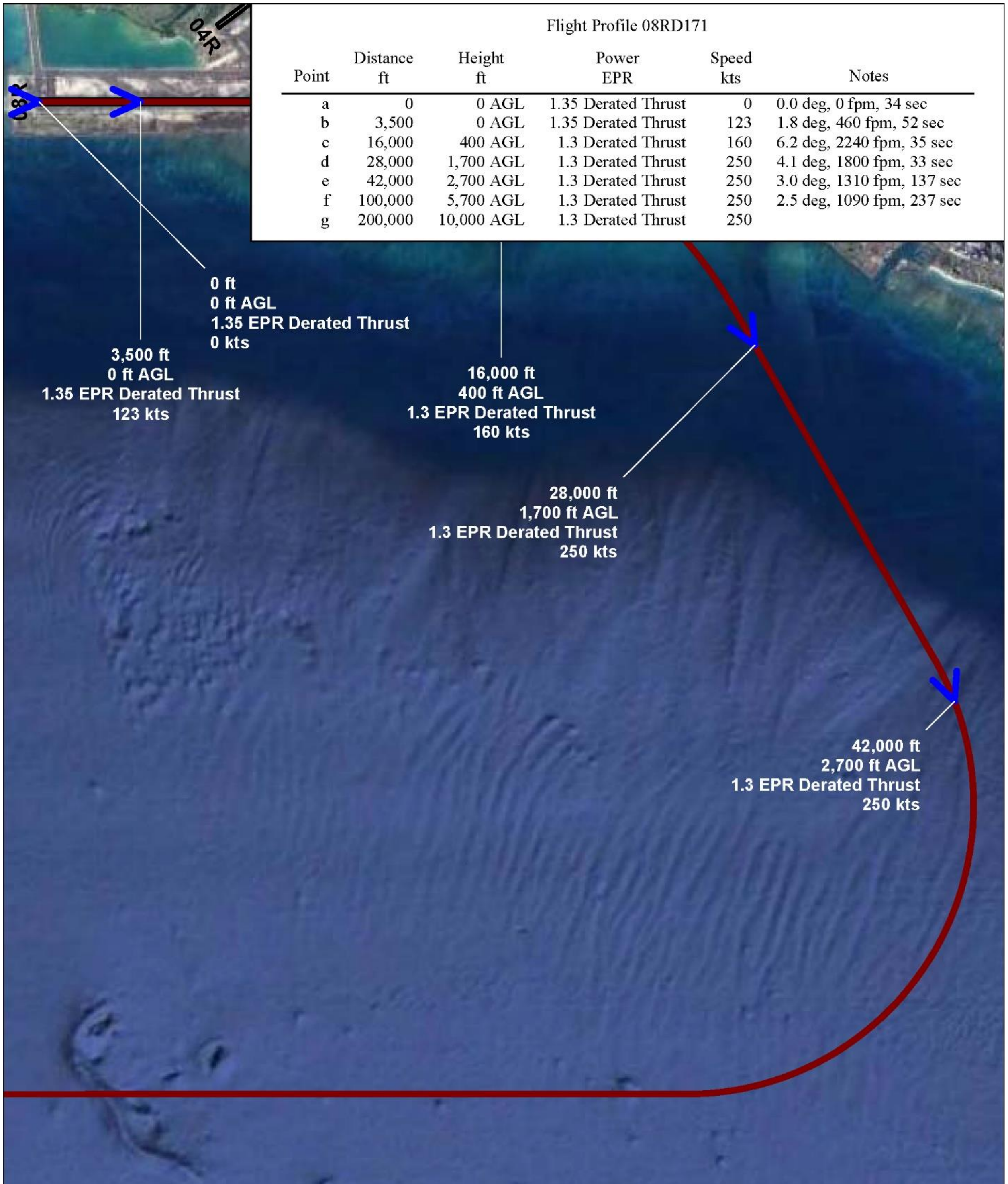
Flight Profile 08LA171

Point	Distance ft	Height ft	Power EPR	Speed kts	Notes
a	200,000	10,532 AGL	1.1 Cruise	230	-3.1 deg, -1260 fpm, 263 sec
b	98,000	5,000 AGL	1.1 Cruise	230	-5.4 deg, -1920 fpm, 62 sec
c	77,000	3,000 AGL	1.2 Approach	170	0.0 deg, 0 fpm, 59 sec
d	60,000	3,000 AGL	1.2 Approach	170	-2.3 deg, -660 fpm, 43 sec
e	48,000	2,525 AGL	1.3 Approach	160	-3.0 deg, -740 fpm, 190 sec
f	3,000	157 AGL	1.08 Approach	120	-2.0 deg, -430 fpm, 15 sec
g	0	50 AGL	1.08 Approach	120	

Flight Profile 08LA171, BASED C-17 ARRIVAL FROM EAST
Based C-17
Flight Track: 8LA6 - ARRIVAL FROM EAST INTO 8 MILE FINAL

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 1:142,000 (1 inch = 11,800 feet)



Flight Profile 08RD171

Point	Distance ft	Height ft	Power EPR	Speed kts	Notes
a	0	0 AGL	1.35 Derated Thrust	0	0.0 deg, 0 fpm, 34 sec
b	3,500	0 AGL	1.35 Derated Thrust	123	1.8 deg, 460 fpm, 52 sec
c	16,000	400 AGL	1.3 Derated Thrust	160	6.2 deg, 2240 fpm, 35 sec
d	28,000	1,700 AGL	1.3 Derated Thrust	250	4.1 deg, 1800 fpm, 33 sec
e	42,000	2,700 AGL	1.3 Derated Thrust	250	3.0 deg, 1310 fpm, 137 sec
f	100,000	5,700 AGL	1.3 Derated Thrust	250	2.5 deg, 1090 fpm, 237 sec
g	200,000	10,000 AGL	1.3 Derated Thrust	250	

Flight Profile 08RD171, BASED C-17 DEPARTURE - REPRESENTATIVE TRAINING SORTIE < 400 klbs

Based C-17

Flight Track: 8RD1 - KELOA

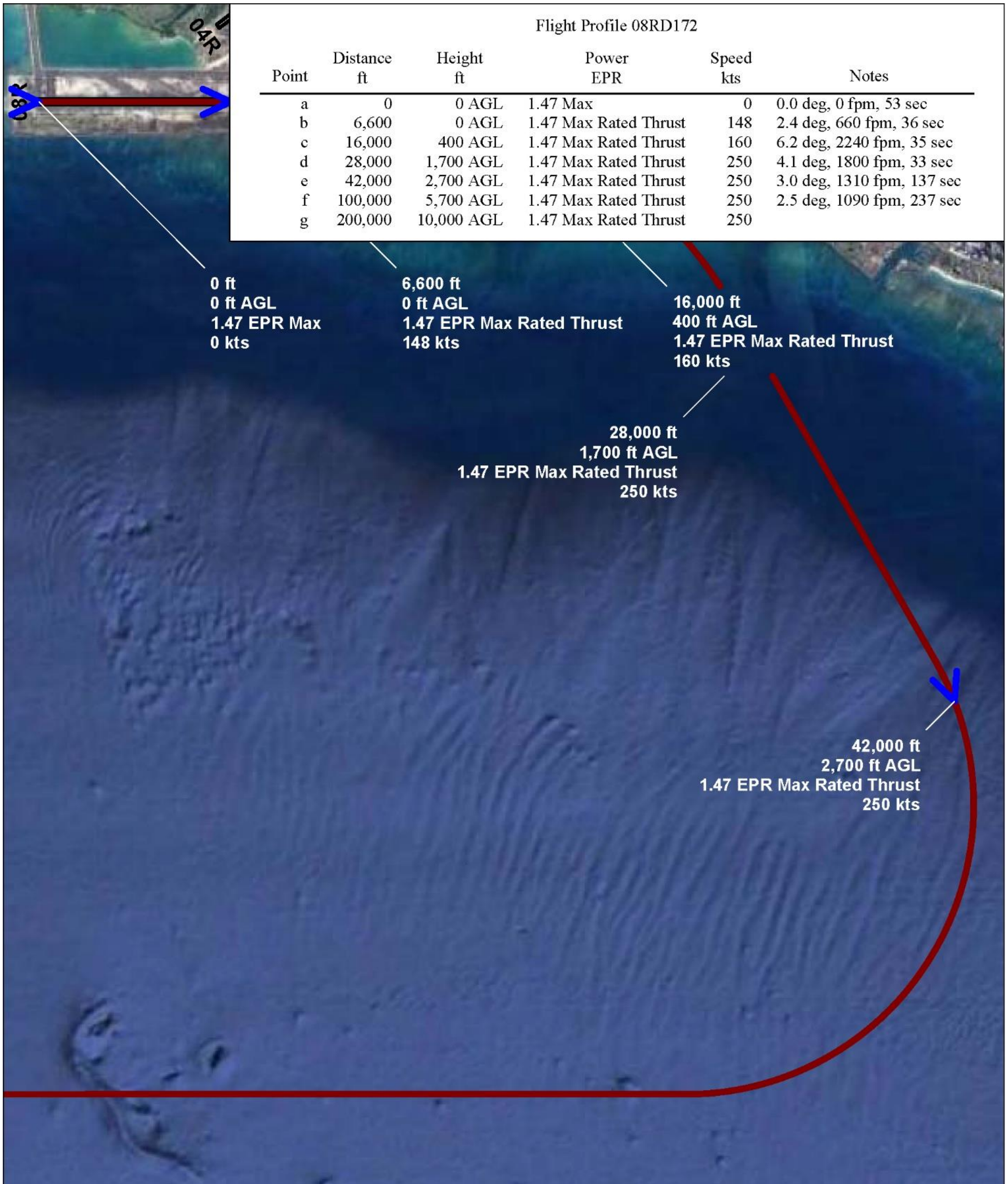
0 4,000 8,000 12,000 16,000 20,000

Scale in Feet 1:63,700 (1 inch = 5,310 feet)

N

Flight Profile 08RD172

Point	Distance ft	Height ft	Power EPR	Speed kts	Notes
a	0	0 AGL	1.47 Max	0	0.0 deg, 0 fpm, 53 sec
b	6,600	0 AGL	1.47 Max Rated Thrust	148	2.4 deg, 660 fpm, 36 sec
c	16,000	400 AGL	1.47 Max Rated Thrust	160	6.2 deg, 2240 fpm, 35 sec
d	28,000	1,700 AGL	1.47 Max Rated Thrust	250	4.1 deg, 1800 fpm, 33 sec
e	42,000	2,700 AGL	1.47 Max Rated Thrust	250	3.0 deg, 1310 fpm, 137 sec
f	100,000	5,700 AGL	1.47 Max Rated Thrust	250	2.5 deg, 1090 fpm, 237 sec
g	200,000	10,000 AGL	1.47 Max Rated Thrust	250	



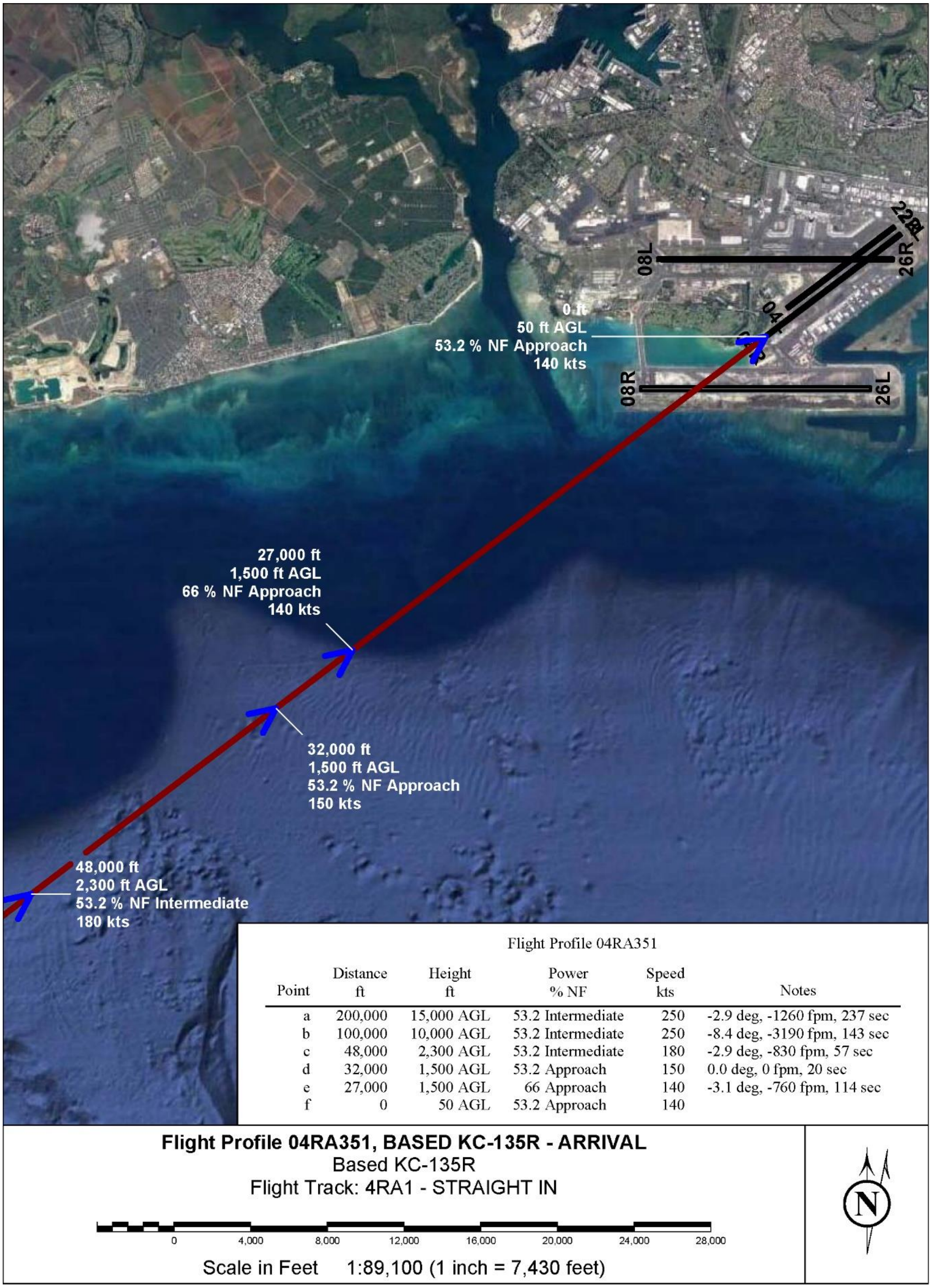
Flight Profile 08RD172, BASED C-17 DEPARTURE - REPRESENTATIVE MISSION SORTIE > 400 klbs

Based C-17

Flight Track: 8RD1 - KELOA

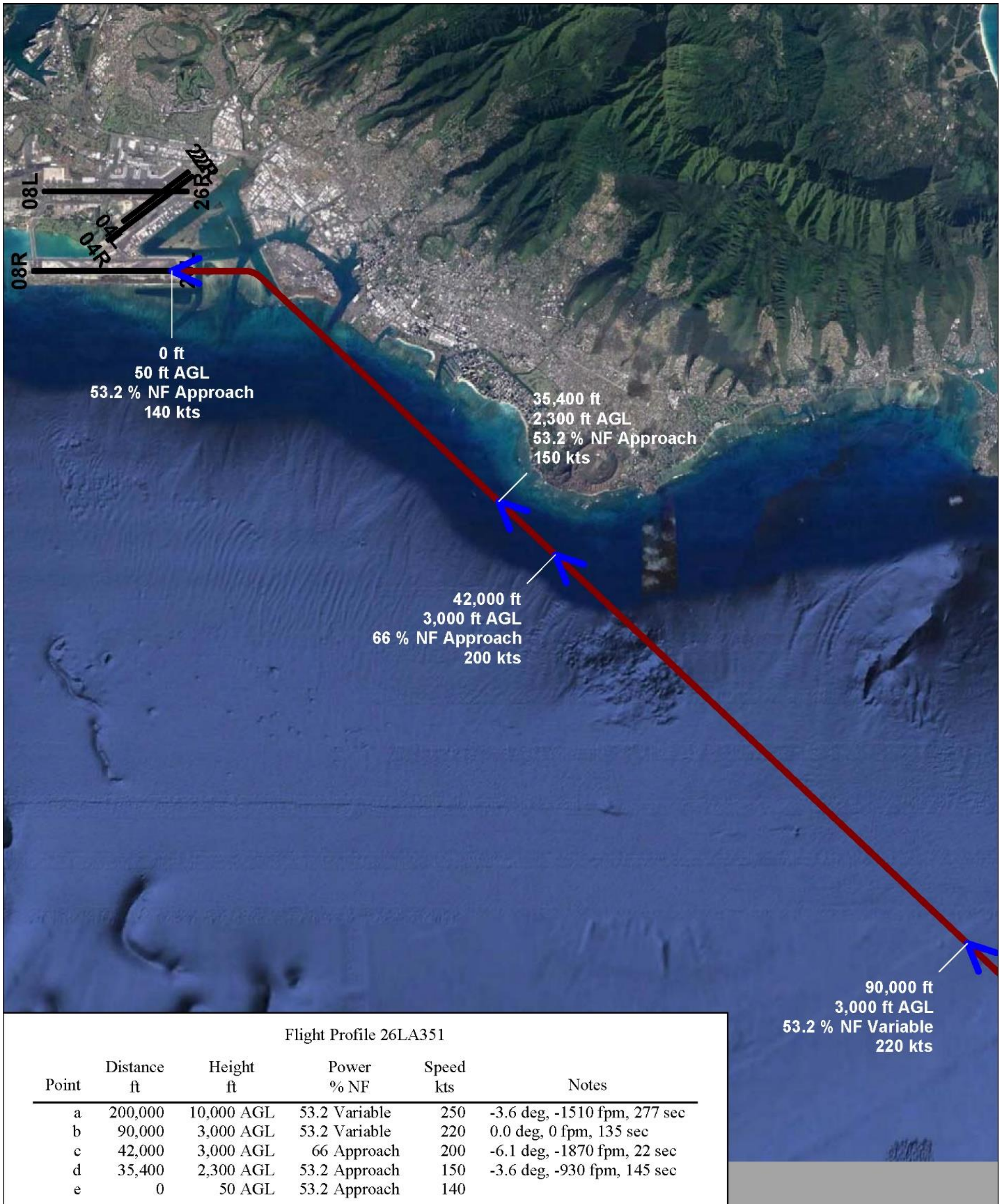
Scale in Feet 1:63,700 (1 inch = 5,310 feet)

B.1.3.1.3 Flight Profiles for the 203d Air Refueling Squadron’s KC-135Rs



Flight Profile 04RA351

Point	Distance ft	Height ft	Power % NF	Speed kts	Notes
a	200,000	15,000 AGL	53.2 Intermediate	250	-2.9 deg, -1260 fpm, 237 sec
b	100,000	10,000 AGL	53.2 Intermediate	250	-8.4 deg, -3190 fpm, 143 sec
c	48,000	2,300 AGL	53.2 Intermediate	180	-2.9 deg, -830 fpm, 57 sec
d	32,000	1,500 AGL	53.2 Approach	150	0.0 deg, 0 fpm, 20 sec
e	27,000	1,500 AGL	66 Approach	140	-3.1 deg, -760 fpm, 114 sec
f	0	50 AGL	53.2 Approach	140	

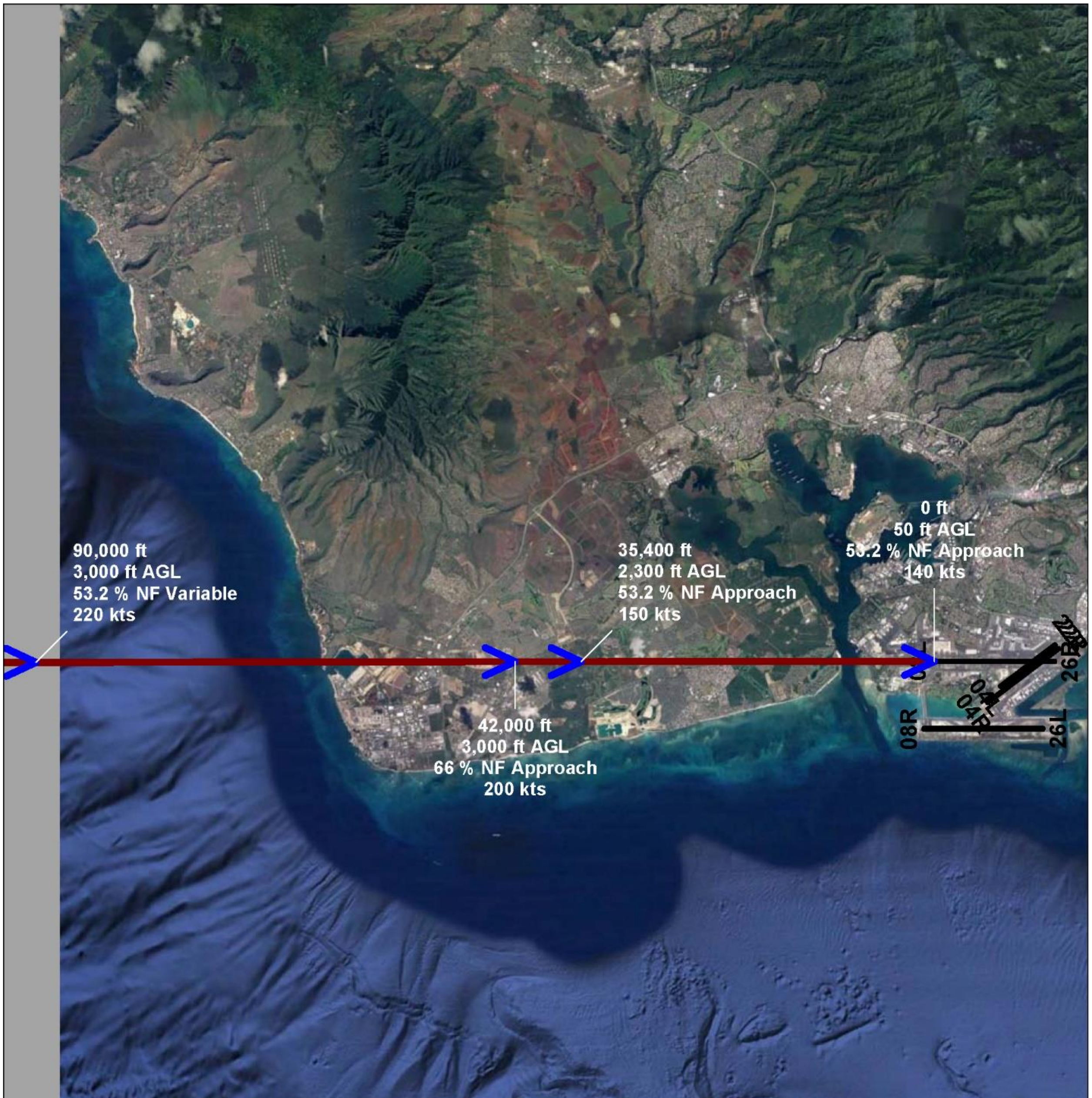


Flight Profile 26LA351

Point	Distance ft	Height ft	Power % NF	Speed kts	Notes
a	200,000	10,000 AGL	53.2 Variable	250	-3.6 deg, -1510 fpm, 277 sec
b	90,000	3,000 AGL	53.2 Variable	220	0.0 deg, 0 fpm, 135 sec
c	42,000	3,000 AGL	66 Approach	200	-6.1 deg, -1870 fpm, 22 sec
d	35,400	2,300 AGL	53.2 Approach	150	-3.6 deg, -930 fpm, 145 sec
e	0	50 AGL	53.2 Approach	140	

Flight Profile 26LA351, BASED KC-135R - KONA WINDS ARRIVAL
Based KC-135R
Flight Track: 6LA1 - KONA WINDS

Scale in Feet 1:156,000 (1 inch = 13,000 feet)



Flight Profile 08LA351

Point	Distance ft	Height ft	Power % NF	Speed kts	Notes
a	200,000	10,000 AGL	53.2 Variable	250	-3.6 deg, -1510 fpm, 277 sec
b	90,000	3,000 AGL	53.2 Variable	220	0.0 deg, 0 fpm, 135 sec
c	42,000	3,000 AGL	66 Approach	200	-6.1 deg, -1870 fpm, 22 sec
d	35,400	2,300 AGL	53.2 Approach	150	-3.6 deg, -930 fpm, 145 sec
e	0	50 AGL	53.2 Approach	140	

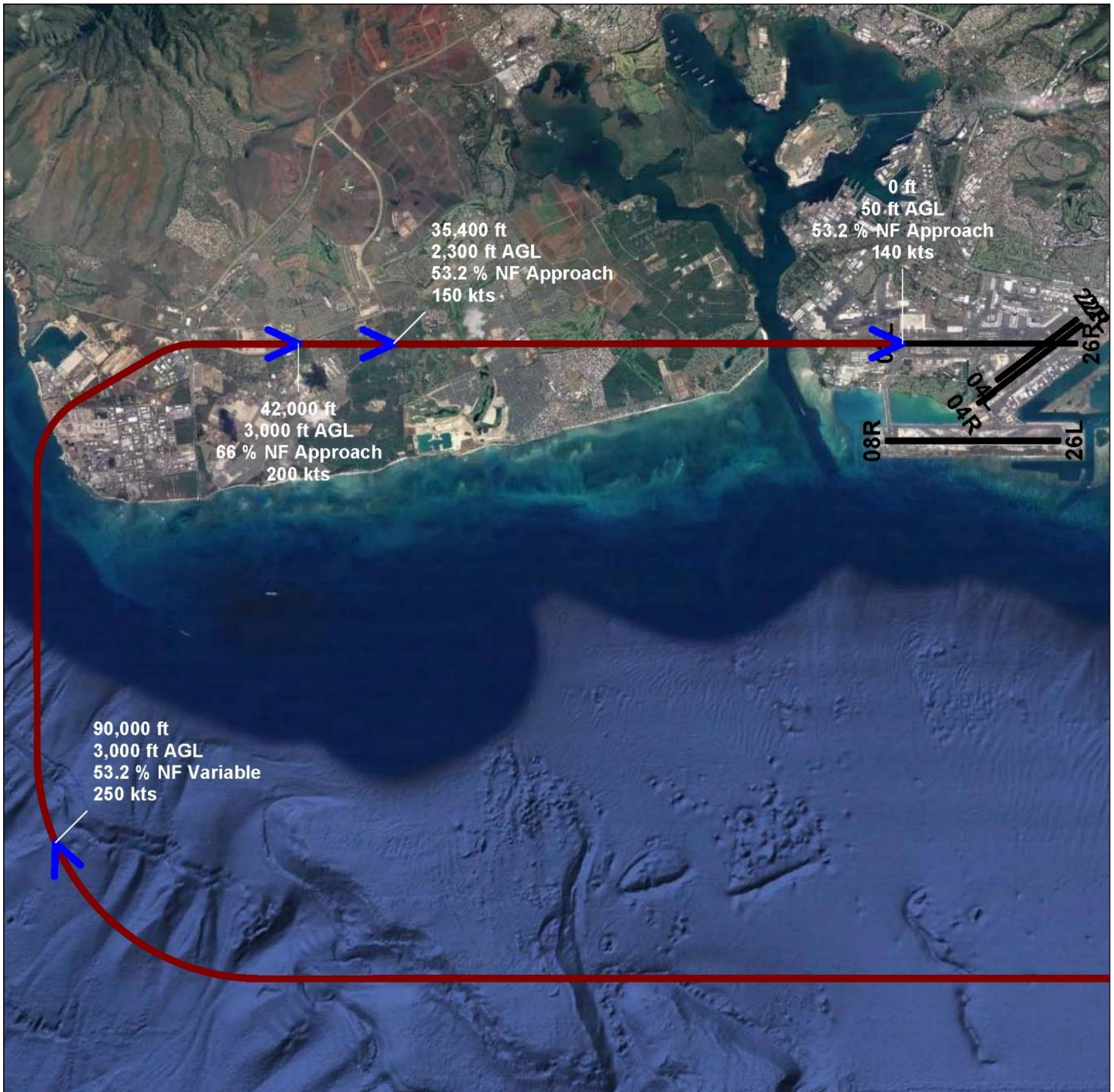
Flight Profile 08LA351, BASED KC-135R - ARRIVAL FROM WEST

Based KC-135R

Flight Track: 8LA1 - BOOKE ARRIVAL 14 DME STRAIGHT IN

0 10,000 20,000 30,000 40,000 50,000 60,000

Scale in Feet 1:200,000 (1 inch = 16,700 feet)



Flight Profile 08LA352

Point	Distance ft	Height ft	Power % NF	Speed kts	Notes
a	200,000	10,000 AGL	53.2 Variable	250	-3.6 deg, -1610 fpm, 261 sec
b	90,000	3,000 AGL	53.2 Variable	250	0.0 deg, 0 fpm, 126 sec
c	42,000	3,000 AGL	66 Approach	200	-6.1 deg, -1870 fpm, 22 sec
d	35,400	2,300 AGL	53.2 Approach	150	-3.6 deg, -930 fpm, 145 sec
e	0	50 AGL	53.2 Approach	140	

Flight Profile 08LA352, BASED KC-135R - ARRIVAL FROM EAST INTO 8 MILE FINAL

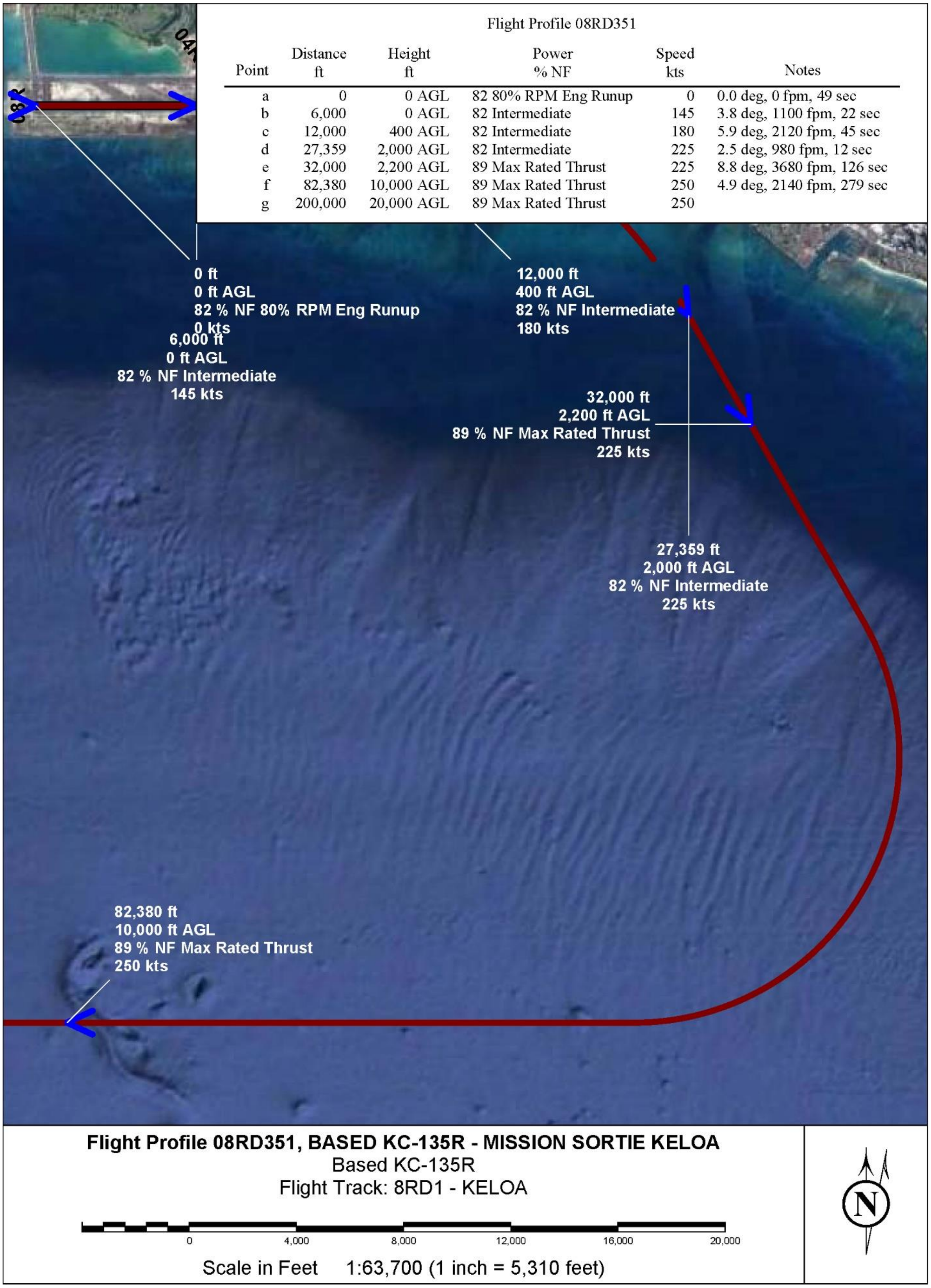
Based KC-135R

Flight Track: 8LA6 - ARRIVAL FROM EAST INTO 8 MILE FINAL

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 1:142,000 (1 inch = 11,800 feet)

N

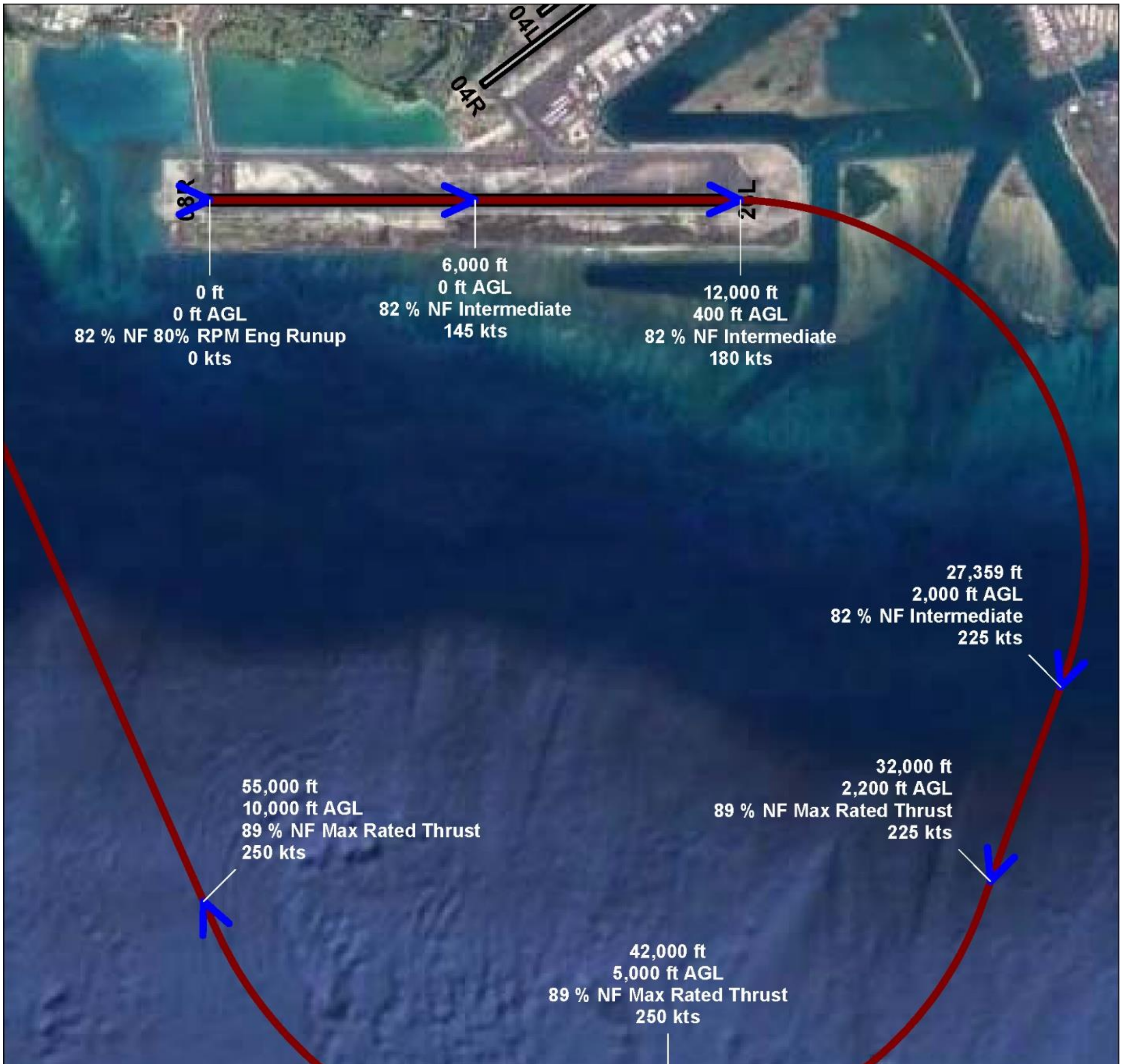


Flight Profile 08RD351

Point	Distance ft	Height ft	Power % NF	Speed kts	Notes
a	0	0 AGL	82 80% RPM Eng Runup	0	0.0 deg, 0 fpm, 49 sec
b	6,000	0 AGL	82 Intermediate	145	3.8 deg, 1100 fpm, 22 sec
c	12,000	400 AGL	82 Intermediate	180	5.9 deg, 2120 fpm, 45 sec
d	27,359	2,000 AGL	82 Intermediate	225	2.5 deg, 980 fpm, 12 sec
e	32,000	2,200 AGL	89 Max Rated Thrust	225	8.8 deg, 3680 fpm, 126 sec
f	82,380	10,000 AGL	89 Max Rated Thrust	250	4.9 deg, 2140 fpm, 279 sec
g	200,000	20,000 AGL	89 Max Rated Thrust	250	

Flight Profile 08RD351, BASED KC-135R - MISSION SORTIE KELOA
Based KC-135R
Flight Track: 8RD1 - KELOA

Scale in Feet 1:63,700 (1 inch = 5,310 feet)



Flight Profile 08RD352

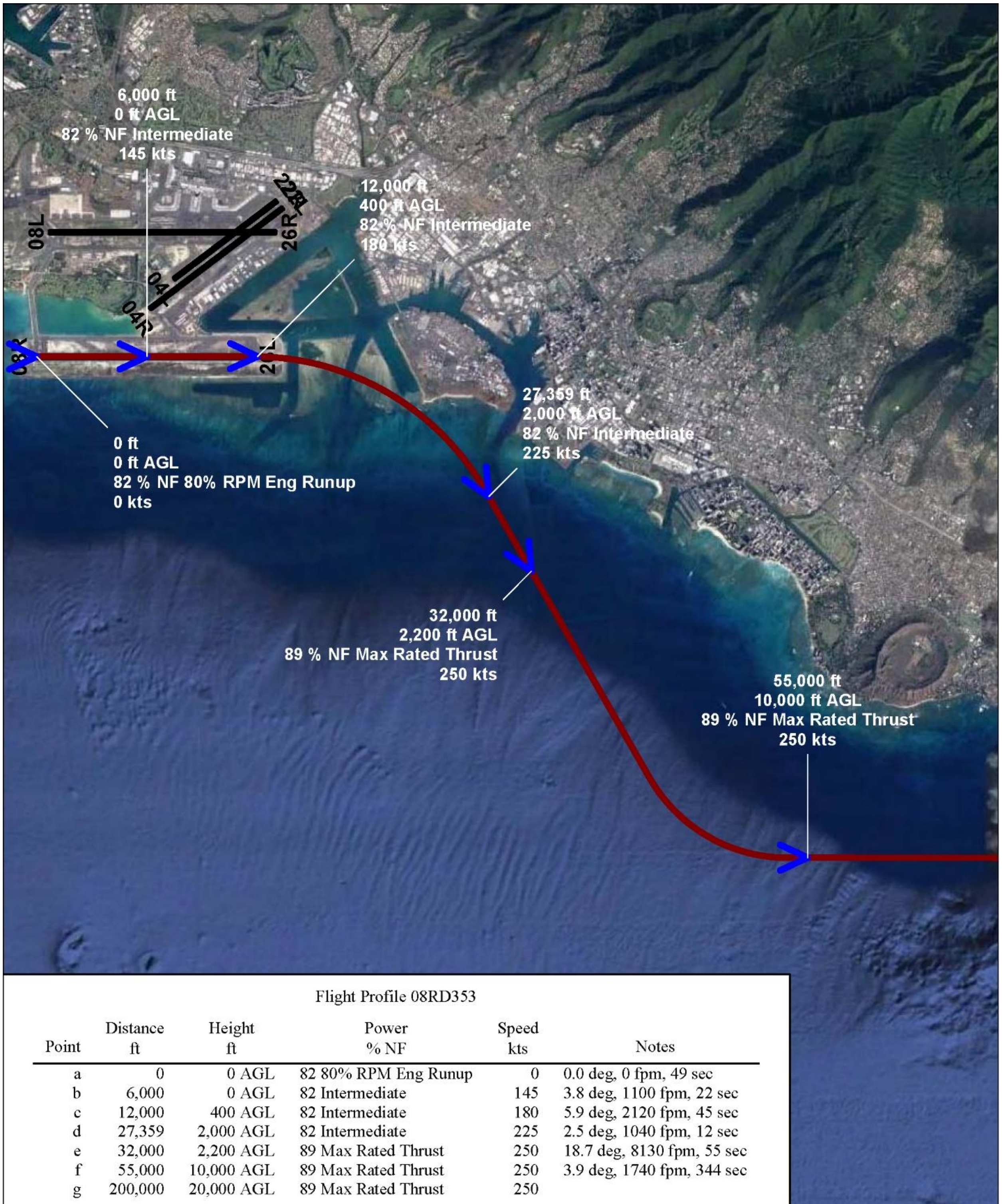
Point	Distance ft	Height ft	Power % NF	Speed kts	Notes
a	0	0 AGL	82 80% RPM Eng Runup	0	0.0 deg, 0 fpm, 49 sec
b	6,000	0 AGL	82 Intermediate	145	3.8 deg, 1100 fpm, 22 sec
c	12,000	400 AGL	82 Intermediate	180	5.9 deg, 2120 fpm, 45 sec
d	27,359	2,000 AGL	82 Intermediate	225	2.5 deg, 980 fpm, 12 sec
e	32,000	2,200 AGL	89 Max Rated Thrust	225	15.6 deg, 6480 fpm, 25 sec
f	42,000	5,000 AGL	89 Max Rated Thrust	250	21.0 deg, 9090 fpm, 31 sec
g	55,000	10,000 AGL	89 Max Rated Thrust	250	2.4 deg, 1050 fpm, 344 sec
h	200,000	16,000 AGL	89 Max Rated Thrust	250	

Flight Profile 08RD352, BASED KC-135R - MELLO TO NORTH TRAINING SORTIE
Based KC-135R
Flight Track: 8RD2 - MELLO

0 2,000 4,000 6,000 8,000 10,000 12,000 14,000

Scale in Feet 1:46,600 (1 inch = 3,880 feet)

N



Flight Profile 08RD353

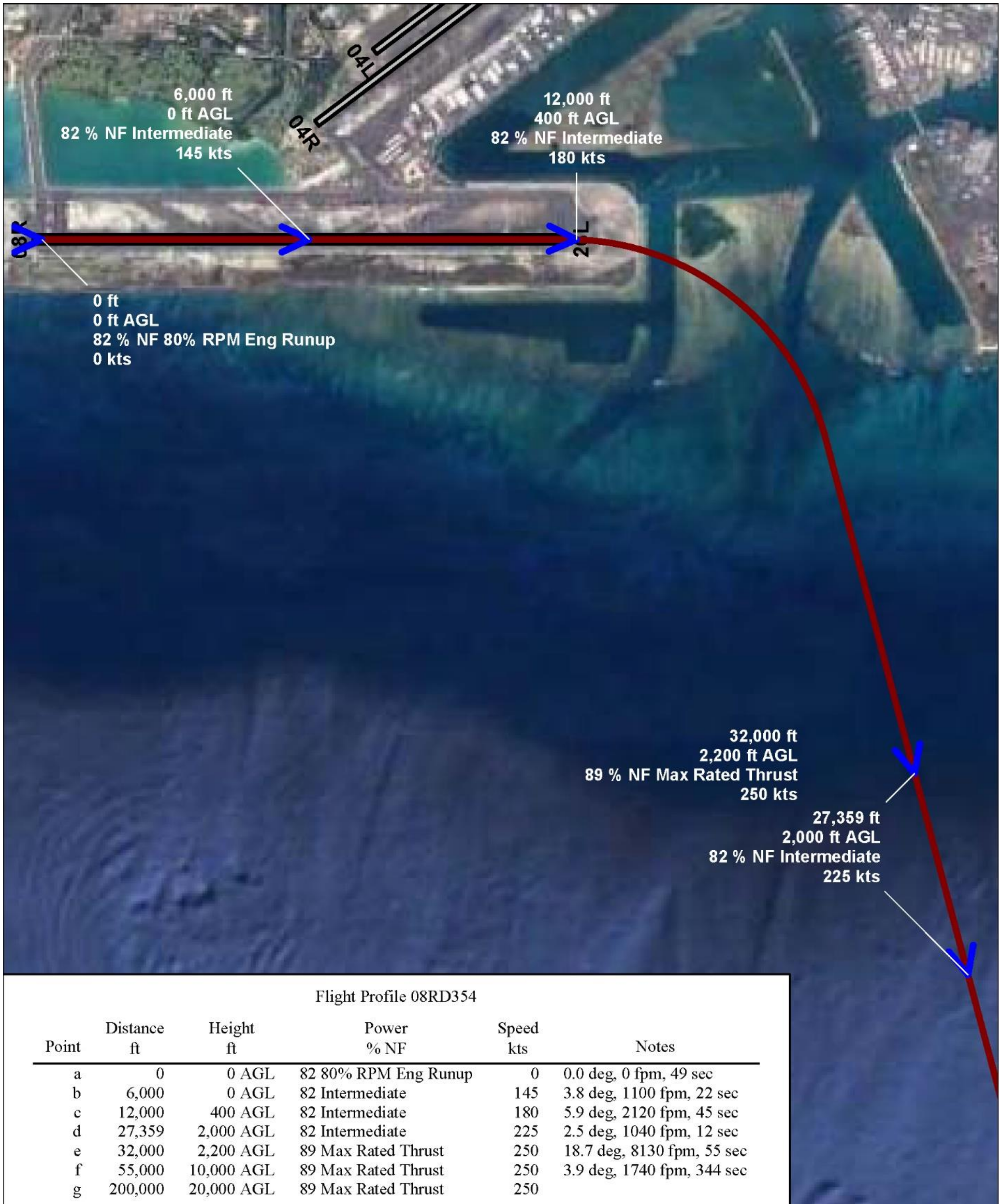
Point	Distance ft	Height ft	Power % NF	Speed kts	Notes
a	0	0 AGL	82 80% RPM Eng Runup	0	0.0 deg, 0 fpm, 49 sec
b	6,000	0 AGL	82 Intermediate	145	3.8 deg, 1100 fpm, 22 sec
c	12,000	400 AGL	82 Intermediate	180	5.9 deg, 2120 fpm, 45 sec
d	27,359	2,000 AGL	82 Intermediate	225	2.5 deg, 1040 fpm, 12 sec
e	32,000	2,200 AGL	89 Max Rated Thrust	250	18.7 deg, 8130 fpm, 55 sec
f	55,000	10,000 AGL	89 Max Rated Thrust	250	3.9 deg, 1740 fpm, 344 sec
g	200,000	20,000 AGL	89 Max Rated Thrust	250	

Flight Profile 08RD353, BASED KC-135R - MOLOKAI MKK4 TRAINING OPS

Based KC-135R

Flight Track: 8RD3 - MKK4

Scale in Feet 1:99,800 (1 inch = 8,310 feet)



Flight Profile 08RD354

Point	Distance ft	Height ft	Power % NF	Speed kts	Notes
a	0	0 AGL	82 80% RPM Eng Runup	0	0.0 deg, 0 fpm, 49 sec
b	6,000	0 AGL	82 Intermediate	145	3.8 deg, 1100 fpm, 22 sec
c	12,000	400 AGL	82 Intermediate	180	5.9 deg, 2120 fpm, 45 sec
d	27,359	2,000 AGL	82 Intermediate	225	2.5 deg, 1040 fpm, 12 sec
e	32,000	2,200 AGL	89 Max Rated Thrust	250	18.7 deg, 8130 fpm, 55 sec
f	55,000	10,000 AGL	89 Max Rated Thrust	250	3.9 deg, 1740 fpm, 344 sec
g	200,000	20,000 AGL	89 Max Rated Thrust	250	

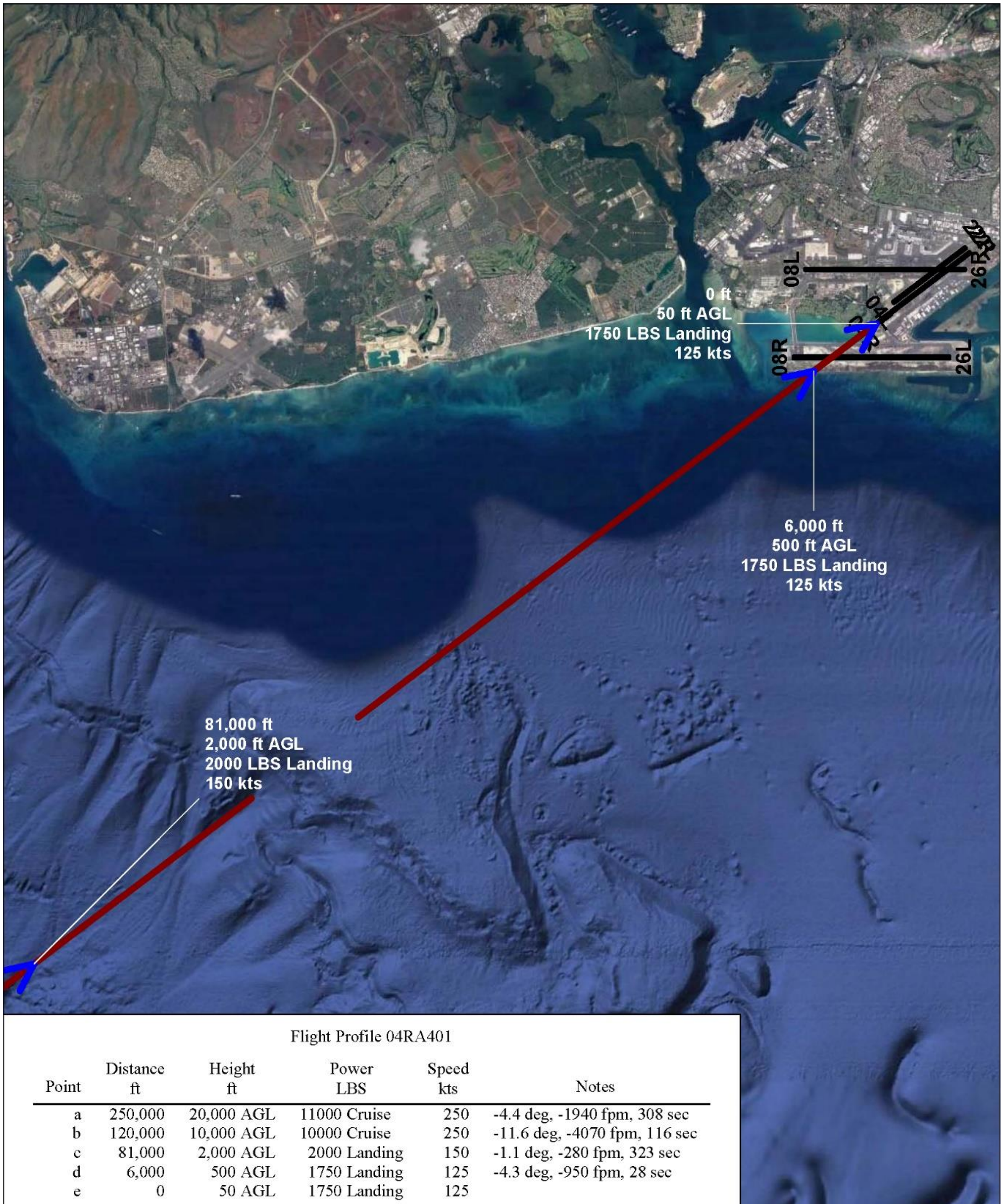
Flight Profile 08RD354, BASED KC-135R - (ALANA 3) TO LANAI TRAINING OPS
Based KC-135R
Flight Track: 8RD4 - LANAI

0 2,000 4,000 6,000 8,000 10,000 12,000

Scale in Feet 1:41,200 (1 inch = 3,430 feet)

N

B.1.3.1.4 Flight Profiles for the 65th Airlift Squadron's C-37 (GIV) and C-40 (B-737)



Flight Profile 04RA401

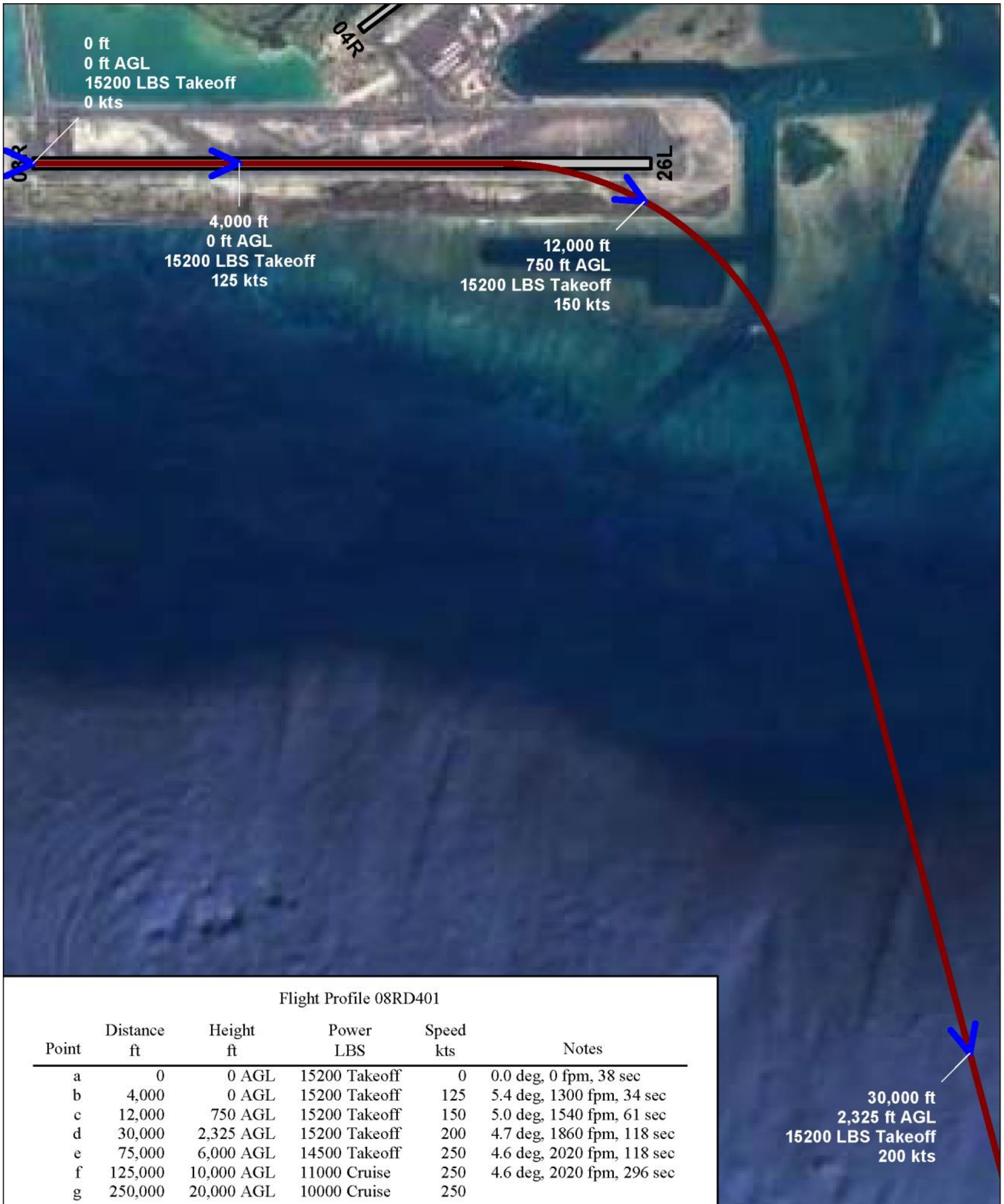
Point	Distance ft	Height ft	Power LBS	Speed kts	Notes
a	250,000	20,000 AGL	11000 Cruise	250	-4.4 deg, -1940 fpm, 308 sec
b	120,000	10,000 AGL	10000 Cruise	250	-11.6 deg, -4070 fpm, 116 sec
c	81,000	2,000 AGL	2000 Landing	150	-1.1 deg, -280 fpm, 323 sec
d	6,000	500 AGL	1750 Landing	125	-4.3 deg, -950 fpm, 28 sec
e	0	50 AGL	1750 Landing	125	

Flight Profile 04RA401, BASED C-40 - REPRESENTATIVE ARRIVAL
Based B-737-QN9 (Q)
Flight Track: 4RA1 - STRAIGHT IN

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 1:141,000 (1 inch = 11,800 feet)

N



Flight Profile 08RD401

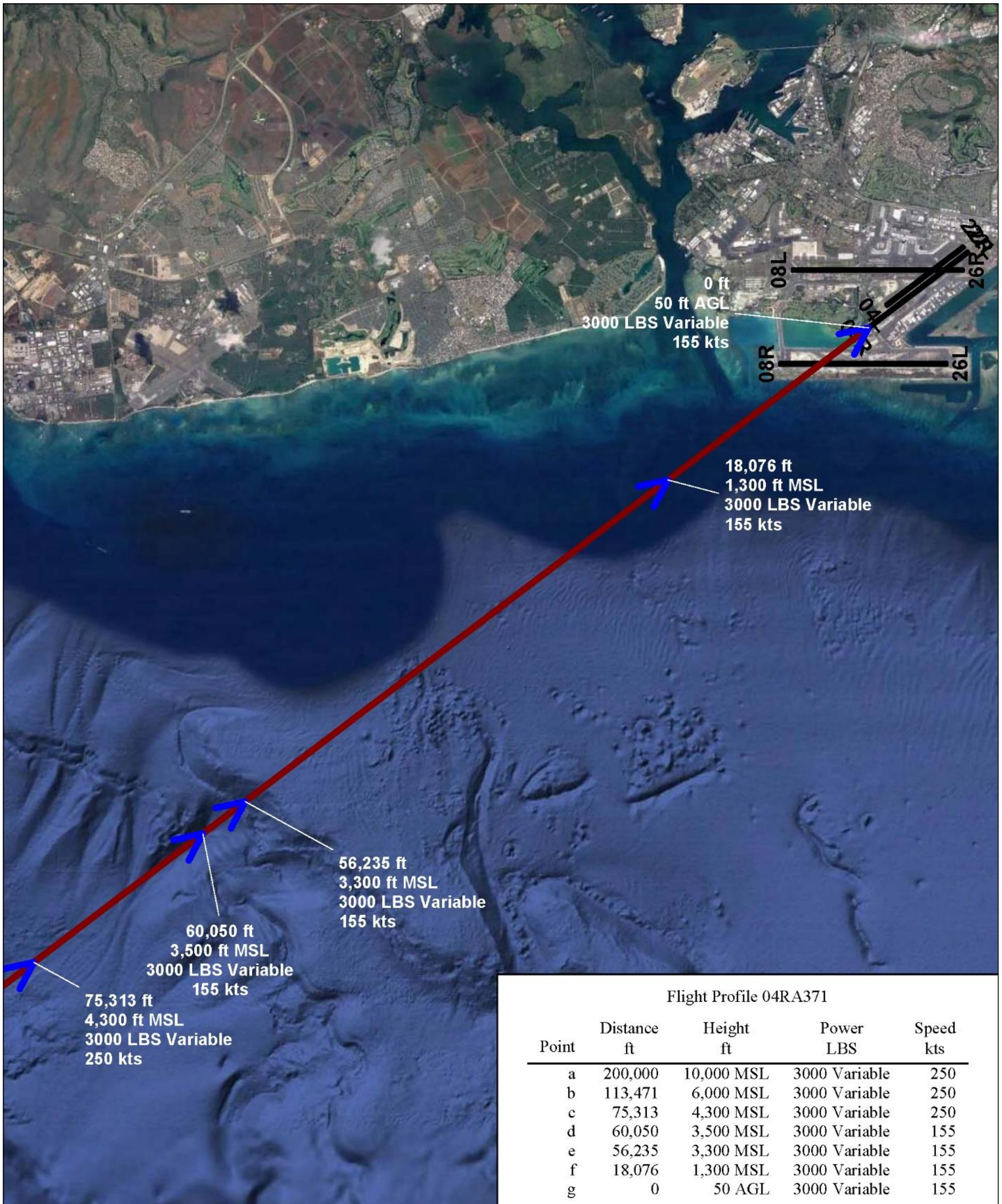
Point	Distance ft	Height ft	Power LBS	Speed kts	Notes
a	0	0 AGL	15200 Takeoff	0	0.0 deg, 0 fpm, 38 sec
b	4,000	0 AGL	15200 Takeoff	125	5.4 deg, 1300 fpm, 34 sec
c	12,000	750 AGL	15200 Takeoff	150	5.0 deg, 1540 fpm, 61 sec
d	30,000	2,325 AGL	15200 Takeoff	200	4.7 deg, 1860 fpm, 118 sec
e	75,000	6,000 AGL	14500 Takeoff	250	4.6 deg, 2020 fpm, 118 sec
f	125,000	10,000 AGL	11000 Cruise	250	4.6 deg, 2020 fpm, 296 sec
g	250,000	20,000 AGL	10000 Cruise	250	

Flight Profile 08RD401, BASED C-40 - REPRESENTATIVE DEPARTURE
Based B-737-QN9 (Q)
Flight Track: 8RD5 - SOUTH DEPART TO KUCHI

0 2,000 4,000 6,000 8,000 10,000

Scale in Feet 1:35,700 (1 inch = 2,980 feet)

N



Flight Profile 04RA371

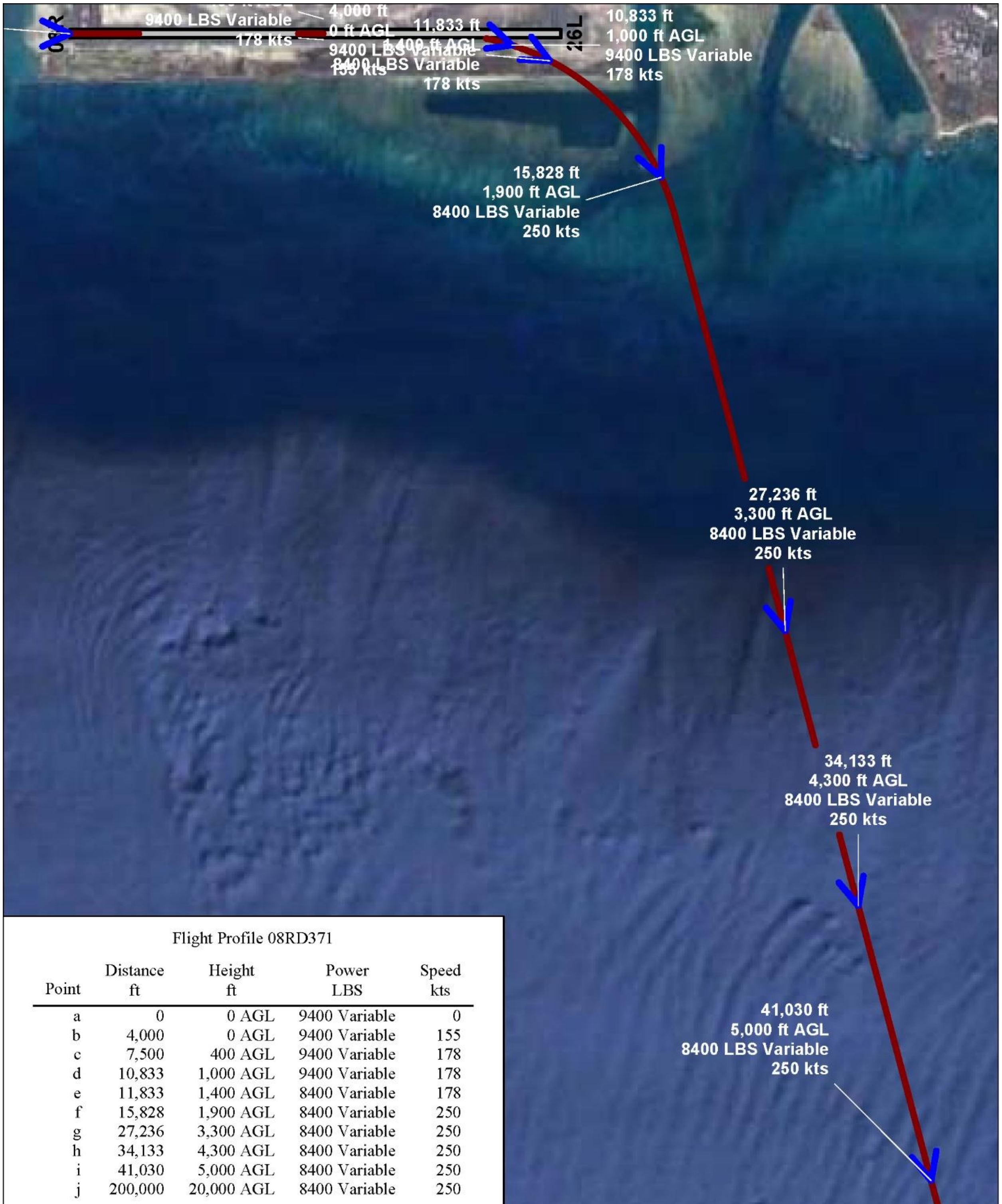
Point	Distance ft	Height ft	Power LBS	Speed kts
a	200,000	10,000 MSL	3000 Variable	250
b	113,471	6,000 MSL	3000 Variable	250
c	75,313	4,300 MSL	3000 Variable	250
d	60,050	3,500 MSL	3000 Variable	155
e	56,235	3,300 MSL	3000 Variable	155
f	18,076	1,300 MSL	3000 Variable	155
g	0	50 AGL	3000 Variable	155

Flight Profile 04RA371, BASED C-37 - REPRESENTATIVE ARRIVAL
Based GIV*
Flight Track: 4RA1 - STRAIGHT IN

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 1:132,000 (1 inch = 11,000 feet)

N



Flight Profile 08RD371

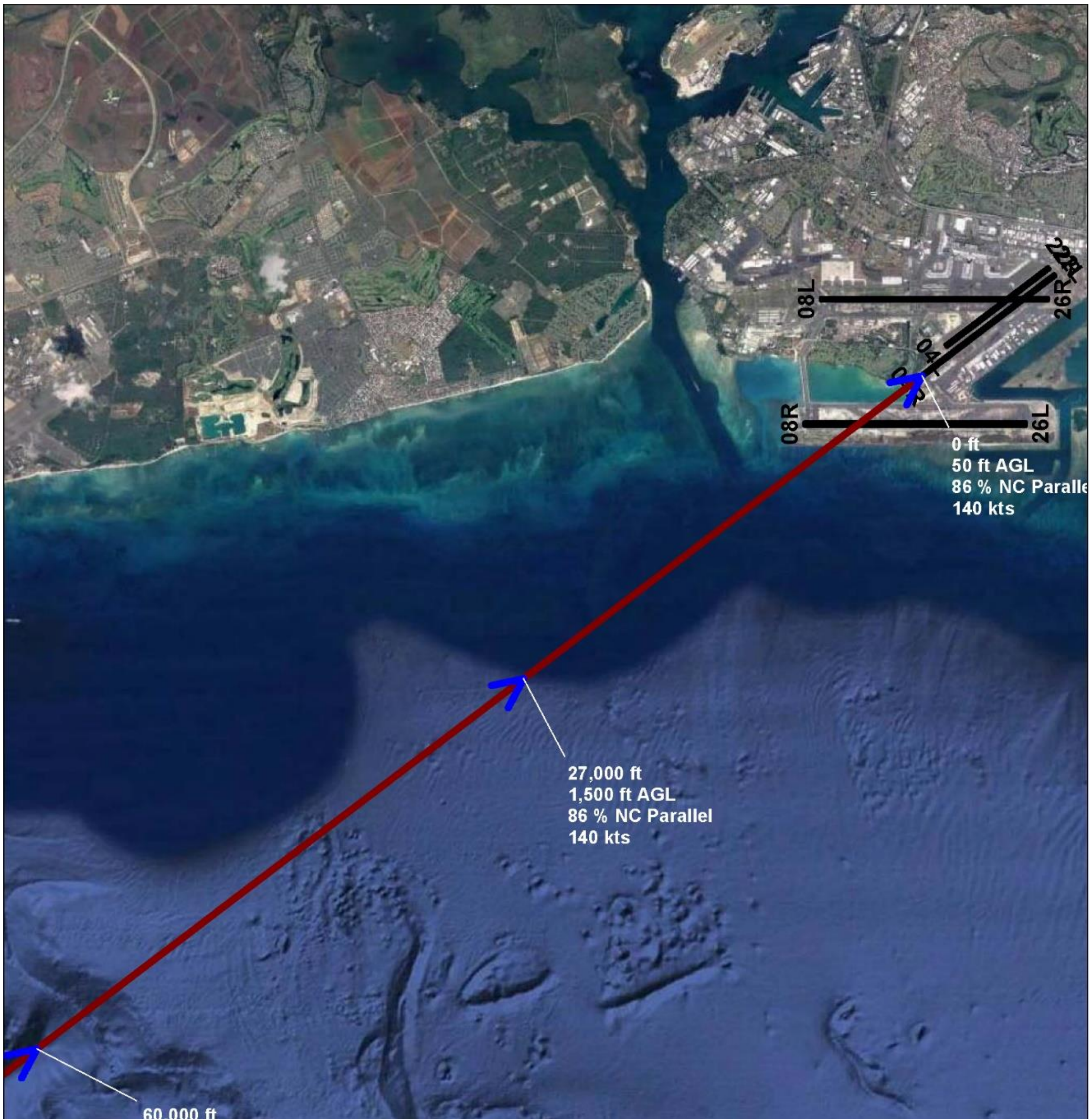
Point	Distance ft	Height ft	Power LBS	Speed kts
a	0	0 AGL	9400 Variable	0
b	4,000	0 AGL	9400 Variable	155
c	7,500	400 AGL	9400 Variable	178
d	10,833	1,000 AGL	9400 Variable	178
e	11,833	1,400 AGL	8400 Variable	178
f	15,828	1,900 AGL	8400 Variable	250
g	27,236	3,300 AGL	8400 Variable	250
h	34,133	4,300 AGL	8400 Variable	250
i	41,030	5,000 AGL	8400 Variable	250
j	200,000	20,000 AGL	8400 Variable	250

Flight Profile 08RD371, BASED C-37 - REPRESENTATIVE DEPARTURE
Based GIV*
Flight Track: 8RD5 - SOUTH DEPART TO KUCHI

Scale in Feet 1:44,900 (1 inch = 3,740 feet)

B.1.3.2 Contract ADAIR Aircraft Representative Flight Profiles

B.1.3.2.1 Contract ADAIR High Noise Eurofighter Typhoon (F-18E/F Surrogate)



Flight Profile 04RAHI1

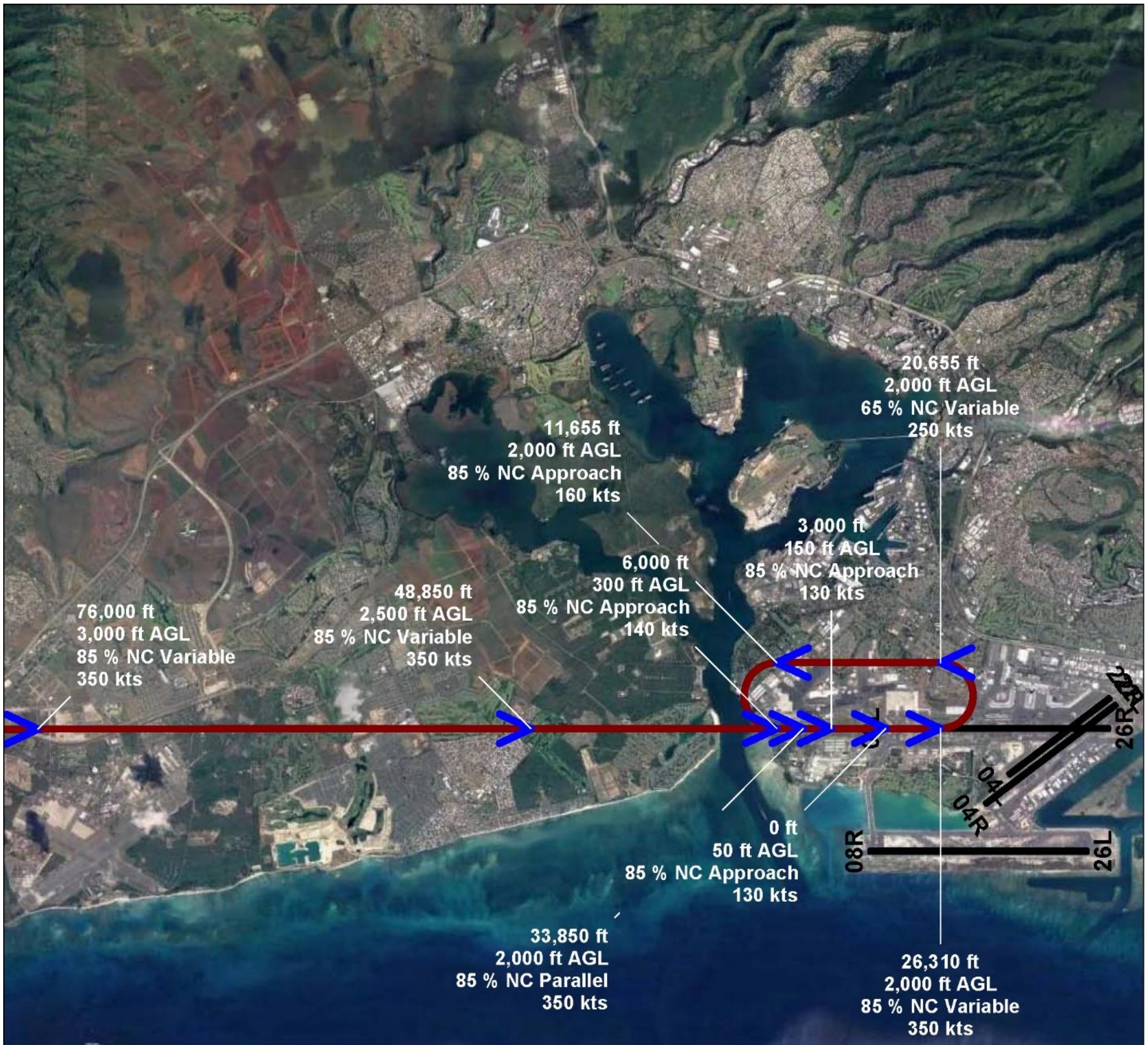
Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	250,000	20,000 AGL	85 Variable	200	-5.3 deg, -1880 fpm, 563 sec
b	60,000	2,300 AGL	85 Variable	200	-1.4 deg, -420 fpm, 115 sec
c	27,000	1,500 AGL	86 Parallel	140	-3.1 deg, -760 fpm, 114 sec
d	0	50 AGL	86 Parallel	140	

Flight Profile 04RAHI1, ADAIR HIGH NOISE - STRAIGHT IN ARRIVAL
ADAIR CAT C High Noise
Flight Track: 4RA1 - STRAIGHT IN

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000

Scale in Feet 1:108,000 (1 inch = 9,020 feet)

N



Flight Profile 08LAHI2

Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	200,000	10,000 AGL	65 Variable	350	-3.2 deg, -2000 fpm, 210 sec
b	76,000	3,000 AGL	85 Variable	350	-1.1 deg, -650 fpm, 46 sec
c	48,850	2,500 AGL	85 Variable	350	-1.9 deg, -1180 fpm, 25 sec
d	33,850	2,000 AGL	85 Parallel	350	0.0 deg, 0 fpm, 13 sec
e	26,310	2,000 AGL	85 Variable	350	0.0 deg, 0 fpm, 11 sec
f	20,655	2,000 AGL	65 Variable	250	0.0 deg, 0 fpm, 26 sec
g	11,655	2,000 AGL	85 Approach	160	-16.7 deg, -4370 fpm, 22 sec
h	6,000	300 AGL	85 Approach	140	-2.9 deg, -680 fpm, 13 sec
i	3,000	150 AGL	85 Approach	130	-1.9 deg, -440 fpm, 14 sec
j	0	50 AGL	85 Approach	130	

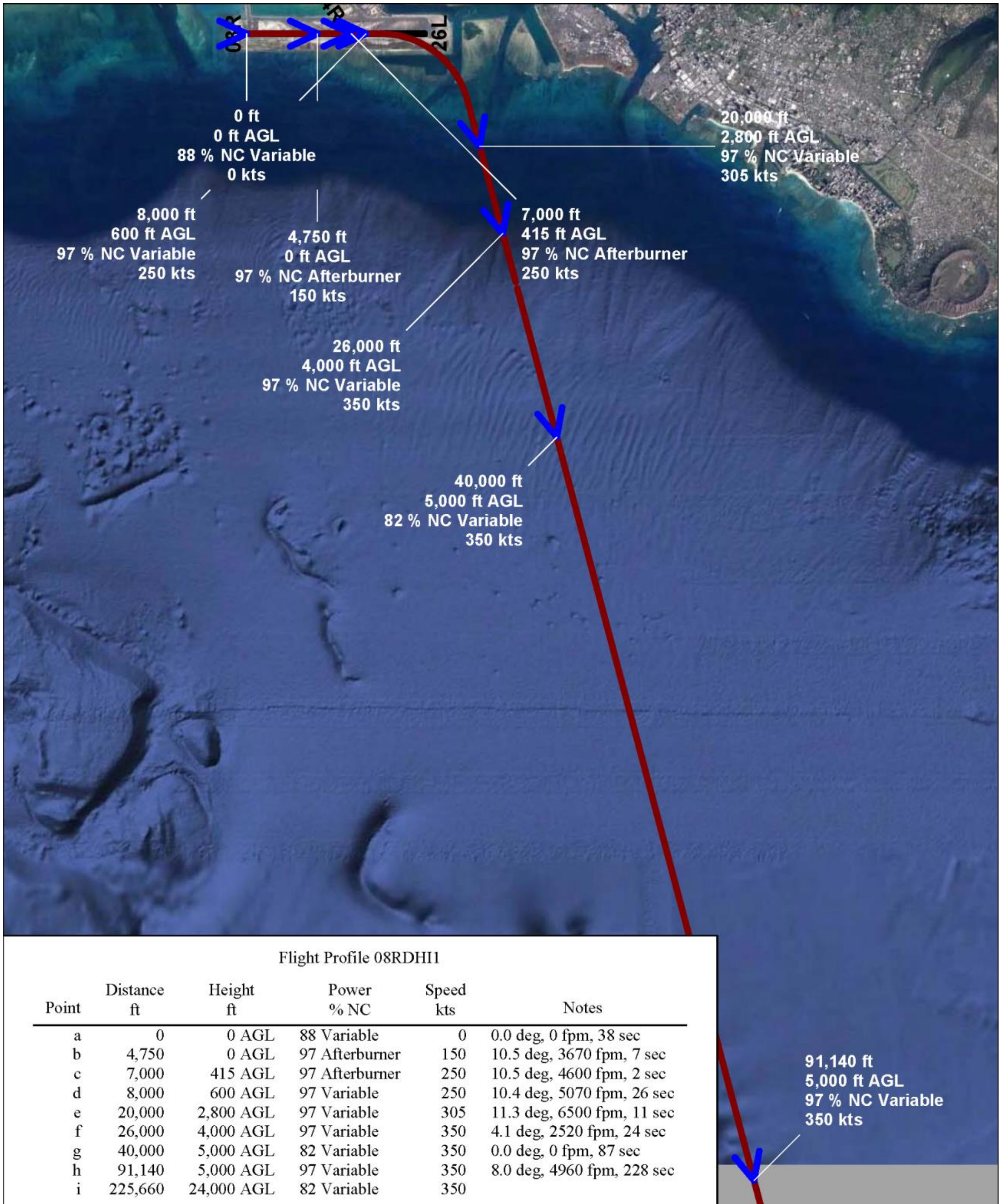
Flight Profile 08LAHI2, ADAIR HIGH NOISE - OH ARRIVAL

ADAIR CAT C High Noise

Flight Track: 8LAP - PITCHOUT

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000

Scale in Feet 1:116,000 (1 inch = 9,650 feet)



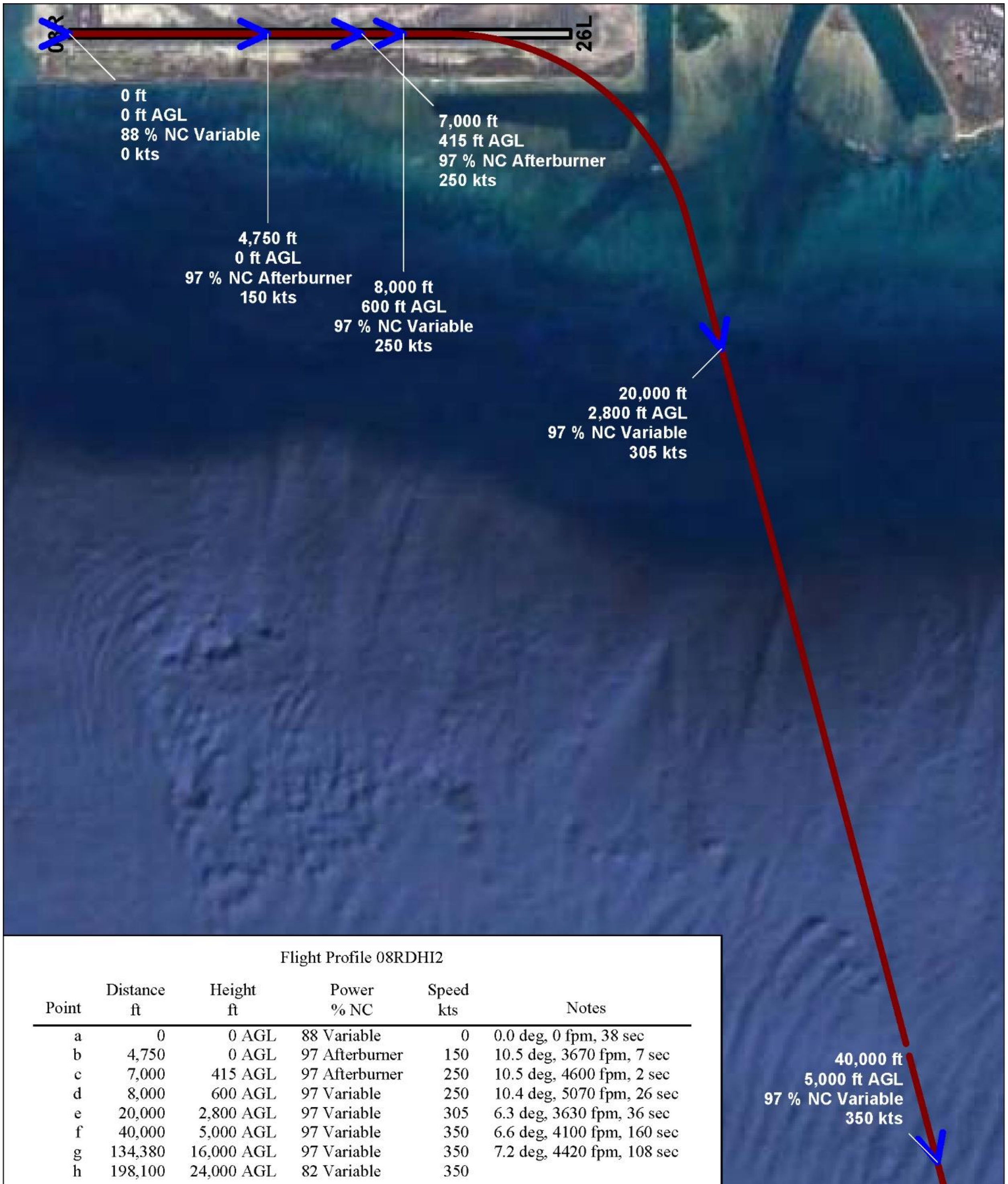
Flight Profile 08RDHI1

Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	0	0 AGL	88 Variable	0	0.0 deg, 0 fpm, 38 sec
b	4,750	0 AGL	97 Afterburner	150	10.5 deg, 3670 fpm, 7 sec
c	7,000	415 AGL	97 Afterburner	250	10.5 deg, 4600 fpm, 2 sec
d	8,000	600 AGL	97 Variable	250	10.4 deg, 5070 fpm, 26 sec
e	20,000	2,800 AGL	97 Variable	305	11.3 deg, 6500 fpm, 11 sec
f	26,000	4,000 AGL	97 Variable	350	4.1 deg, 2520 fpm, 24 sec
g	40,000	5,000 AGL	82 Variable	350	0.0 deg, 0 fpm, 87 sec
h	91,140	5,000 AGL	97 Variable	350	8.0 deg, 4960 fpm, 228 sec
i	225,660	24,000 AGL	82 Variable	350	

Flight Profile 08RDHI1, ADAIR HIGH NOISE - DEPARTURE - (CAPPED)
ADAIR CAT C High Noise
Flight Track: 8RD5 - SOUTH DEPART TO KUCHI

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000

Scale in Feet 1:123,000 (1 inch = 10,200 feet)



Flight Profile 08RDHI2

Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	0	0 AGL	88 Variable	0	0.0 deg, 0 fpm, 38 sec
b	4,750	0 AGL	97 Afterburner	150	10.5 deg, 3670 fpm, 7 sec
c	7,000	415 AGL	97 Afterburner	250	10.5 deg, 4600 fpm, 2 sec
d	8,000	600 AGL	97 Variable	250	10.4 deg, 5070 fpm, 26 sec
e	20,000	2,800 AGL	97 Variable	305	6.3 deg, 3630 fpm, 36 sec
f	40,000	5,000 AGL	97 Variable	350	6.6 deg, 4100 fpm, 160 sec
g	134,380	16,000 AGL	97 Variable	350	7.2 deg, 4420 fpm, 108 sec
h	198,100	24,000 AGL	82 Variable	350	

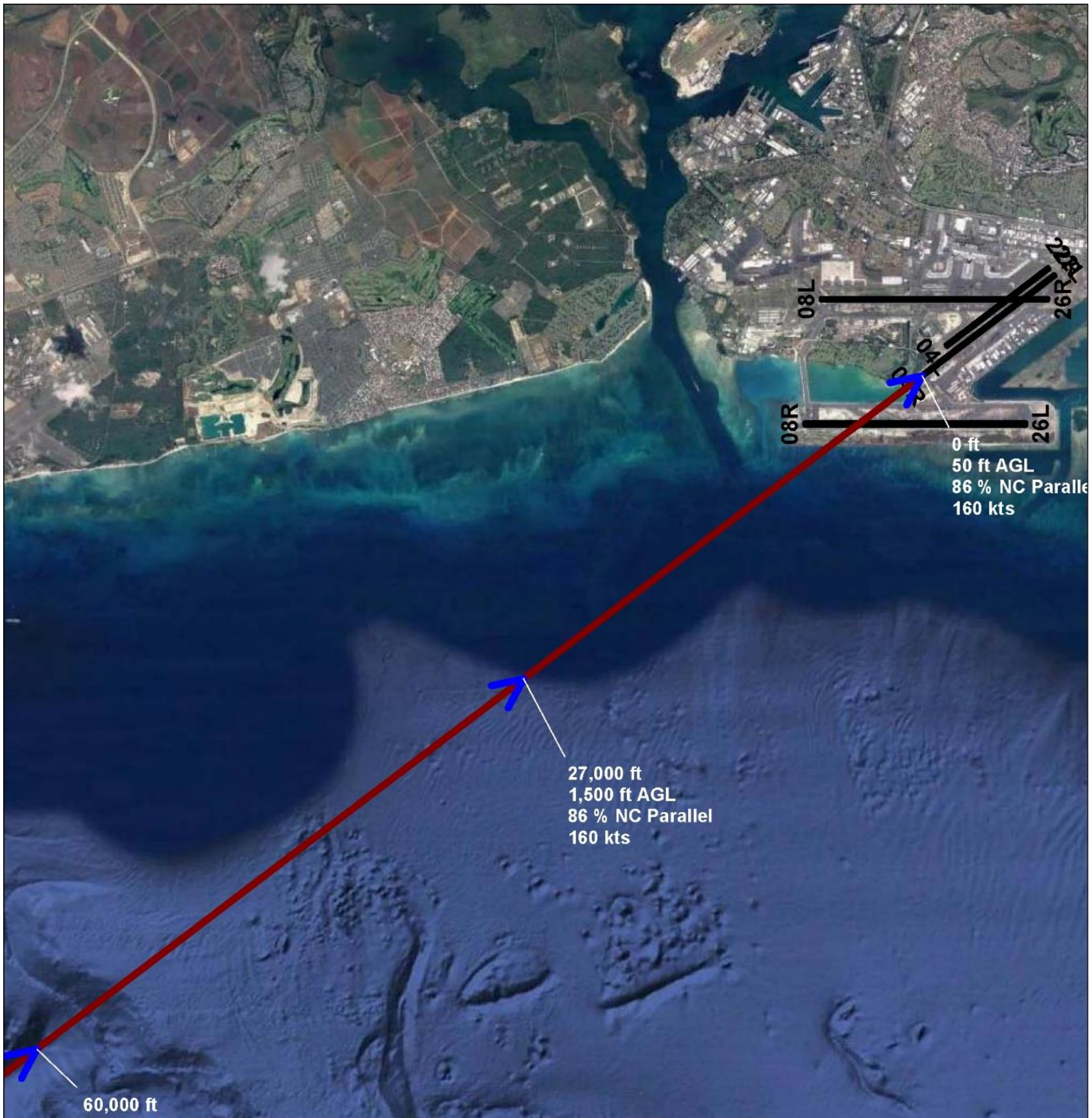
Flight Profile 08RDHI2, ADAIR HIGH NOISE - DEPARTURE - UNRESTRICTED CLIMB

ADAIR CAT C High Noise

Flight Track: 8RD5 - SOUTH DEPART TO KUCHI

Scale in Feet 1:44,200 (1 inch = 3,690 feet)

B.1.3.2.2 Contract ADAIR Medium Noise Dassault Mirage (F-16C F100 PW220 Surrogate)



Flight Profile 04RAMD1

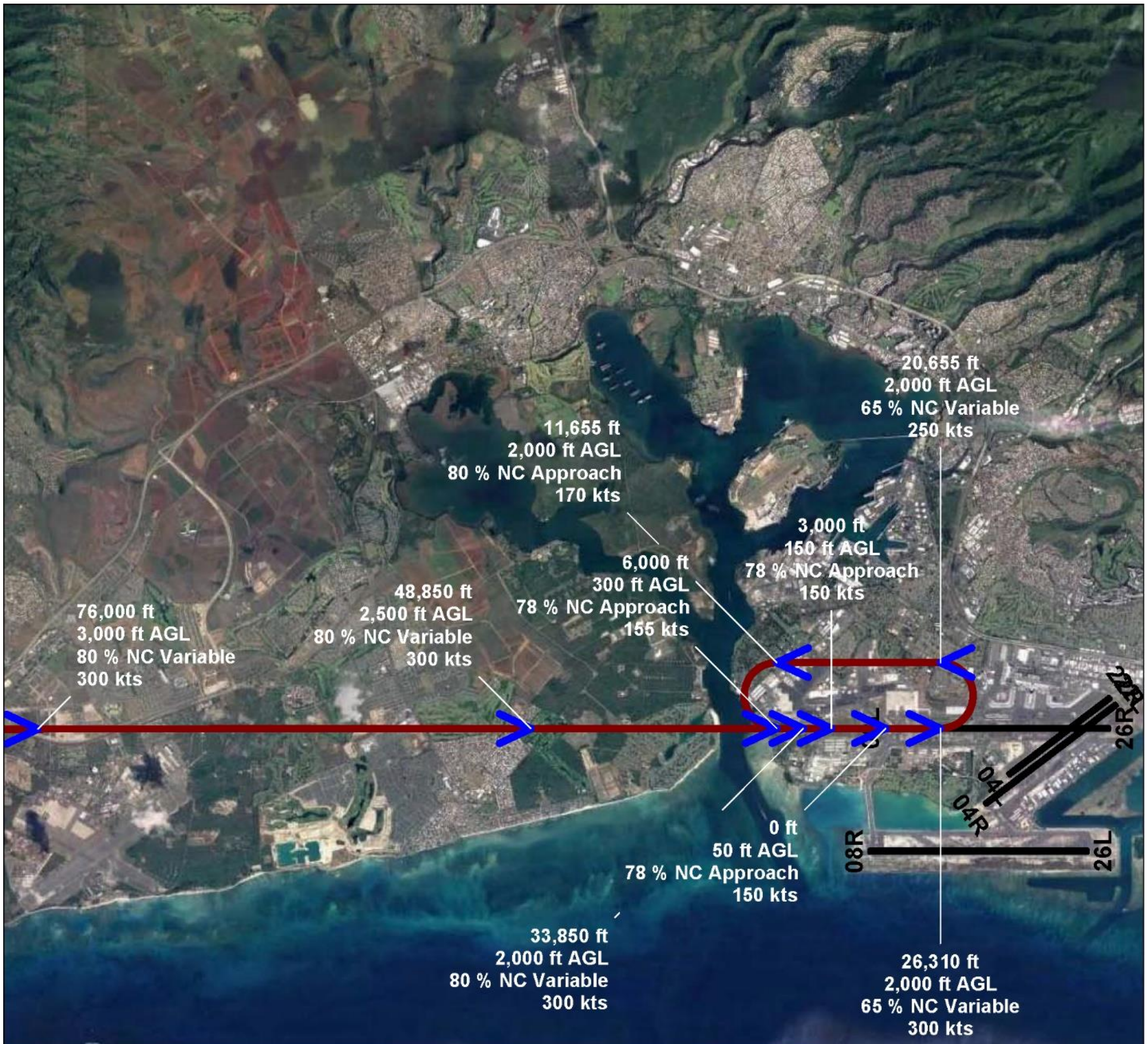
Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	250,000	20,000 AGL	82 Variable	200	-5.3 deg, -1880 fpm, 563 sec
b	60,000	2,300 AGL	82 Variable	200	-1.4 deg, -440 fpm, 109 sec
c	27,000	1,500 AGL	86 Parallel	160	-3.1 deg, -870 fpm, 100 sec
d	0	50 AGL	86 Parallel	160	

Flight Profile 04RAMD1, ADAIR MED NOISE - STRAIGHT IN ARRIVAL
ADAIR CAT C Medium Noise
Flight Track: 4RA1 - STRAIGHT IN

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000

Scale in Feet 1:108,000 (1 inch = 9,020 feet)

N



Flight Profile 08LAMD2

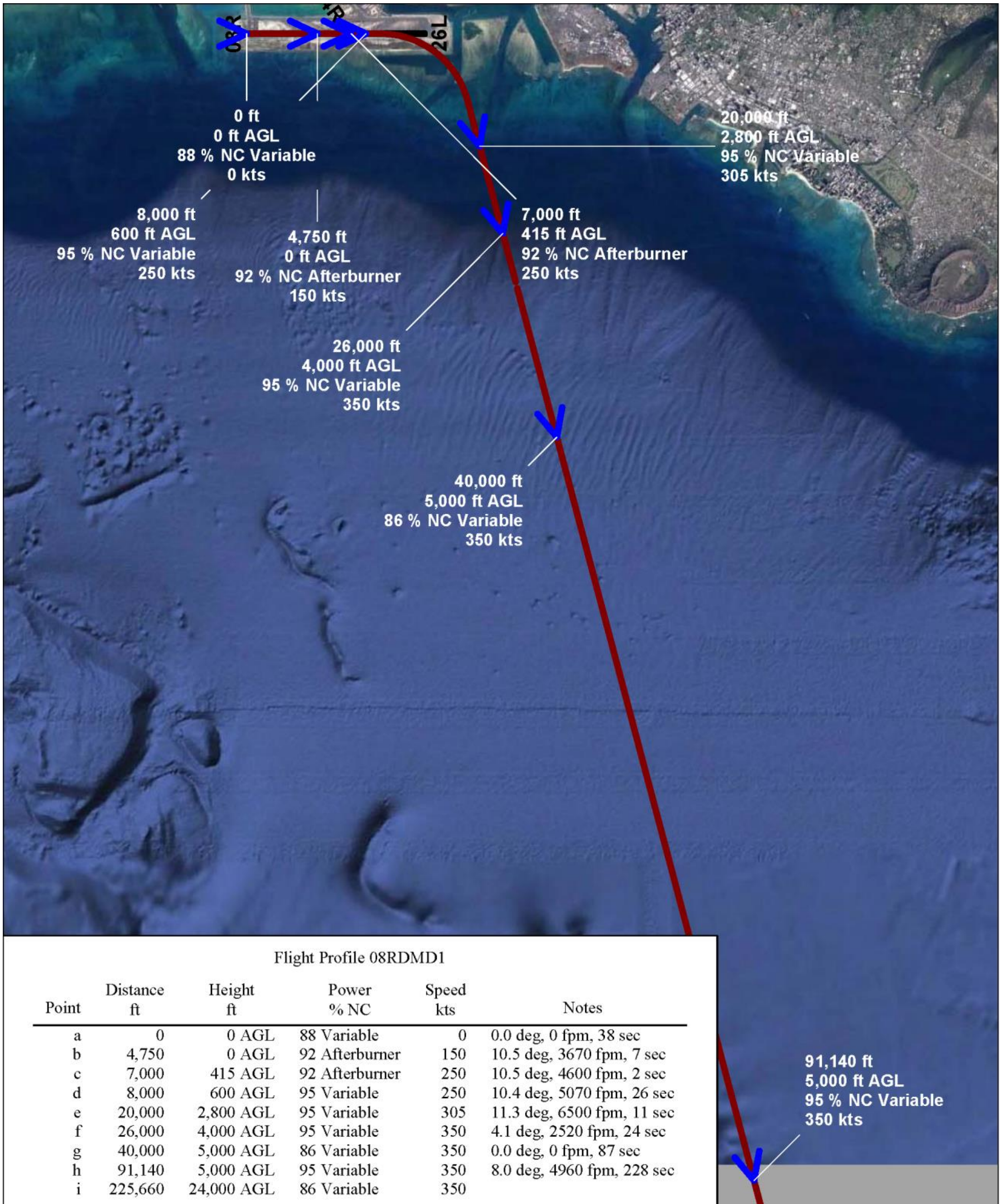
Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	200,000	10,000 AGL	65 Variable	300	-3.2 deg, -1710 fpm, 245 sec
b	76,000	3,000 AGL	80 Variable	300	-1.1 deg, -560 fpm, 54 sec
c	48,850	2,500 AGL	80 Variable	300	-1.9 deg, -1010 fpm, 30 sec
d	33,850	2,000 AGL	80 Variable	300	0.0 deg, 0 fpm, 15 sec
e	26,310	2,000 AGL	65 Variable	300	0.0 deg, 0 fpm, 12 sec
f	20,655	2,000 AGL	65 Variable	250	0.0 deg, 0 fpm, 25 sec
g	11,655	2,000 AGL	80 Approach	170	-16.7 deg, -4740 fpm, 21 sec
h	6,000	300 AGL	78 Approach	155	-2.9 deg, -770 fpm, 12 sec
i	3,000	150 AGL	78 Approach	150	-1.9 deg, -510 fpm, 12 sec
j	0	50 AGL	78 Approach	150	

Flight Profile 08LAMD2, ADAIR MED NOISE - OH ARRIVAL
ADAIR CAT C Medium Noise
Flight Track: 8LAP - PITCHOUT

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000

Scale in Feet 1:116,000 (1 inch = 9,650 feet)

N



Flight Profile 08RDMD1

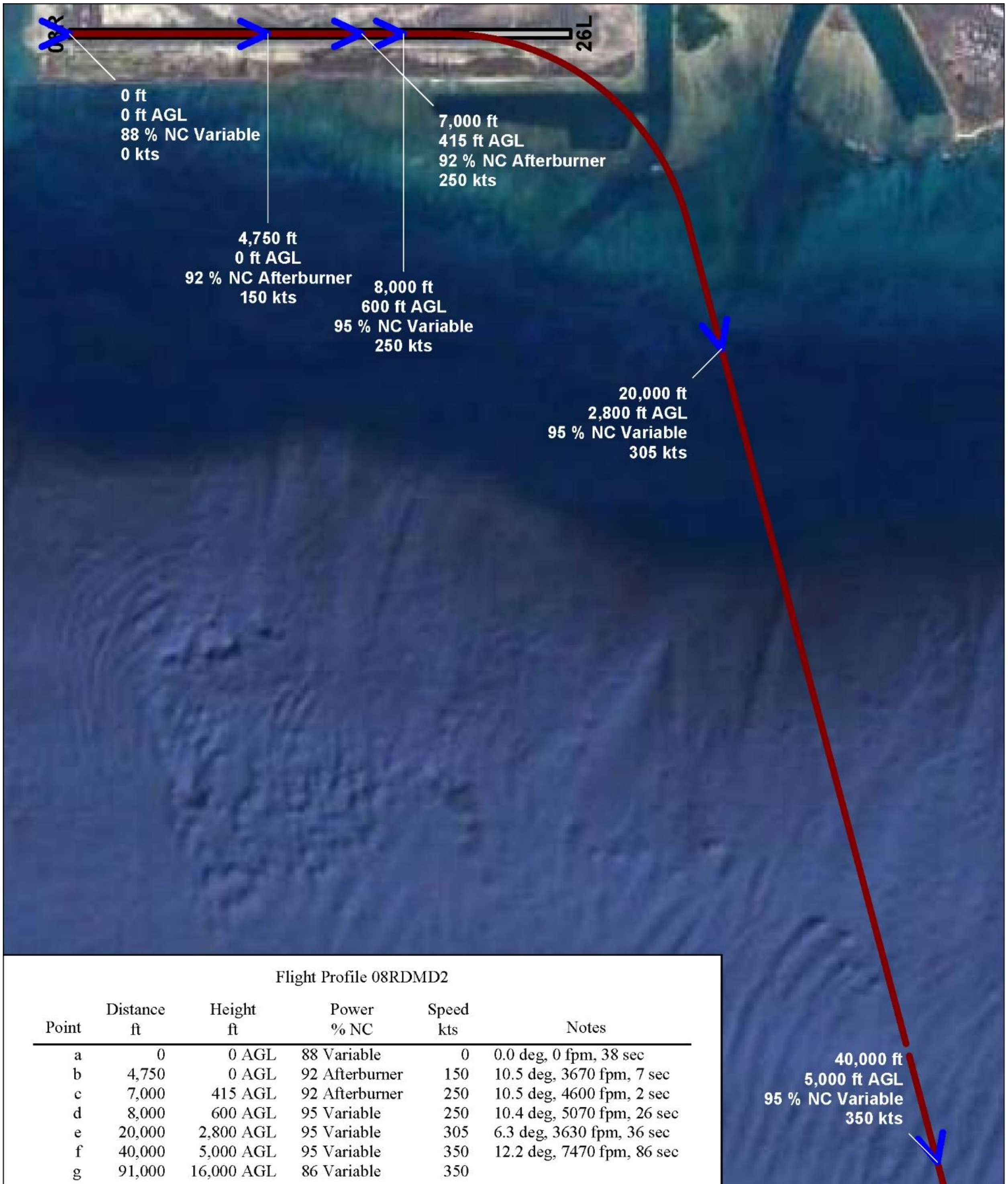
Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	0	0 AGL	88 Variable	0	0.0 deg, 0 fpm, 38 sec
b	4,750	0 AGL	92 Afterburner	150	10.5 deg, 3670 fpm, 7 sec
c	7,000	415 AGL	92 Afterburner	250	10.5 deg, 4600 fpm, 2 sec
d	8,000	600 AGL	95 Variable	250	10.4 deg, 5070 fpm, 26 sec
e	20,000	2,800 AGL	95 Variable	305	11.3 deg, 6500 fpm, 11 sec
f	26,000	4,000 AGL	95 Variable	350	4.1 deg, 2520 fpm, 24 sec
g	40,000	5,000 AGL	86 Variable	350	0.0 deg, 0 fpm, 87 sec
h	91,140	5,000 AGL	95 Variable	350	8.0 deg, 4960 fpm, 228 sec
i	225,660	24,000 AGL	86 Variable	350	

Flight Profile 08RDMD1, ADAIR MED NOISE - DEPARTURE - (CAPPED)
ADAIR CAT C Medium Noise
Flight Track: 8RD5 - SOUTH DEPART TO KUCHI

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000

Scale in Feet 1:123,000 (1 inch = 10,200 feet)

N



Flight Profile 08RDMD2

Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	0	0 AGL	88 Variable	0	0.0 deg, 0 fpm, 38 sec
b	4,750	0 AGL	92 Afterburner	150	10.5 deg, 3670 fpm, 7 sec
c	7,000	415 AGL	92 Afterburner	250	10.5 deg, 4600 fpm, 2 sec
d	8,000	600 AGL	95 Variable	250	10.4 deg, 5070 fpm, 26 sec
e	20,000	2,800 AGL	95 Variable	305	6.3 deg, 3630 fpm, 36 sec
f	40,000	5,000 AGL	95 Variable	350	12.2 deg, 7470 fpm, 86 sec
g	91,000	16,000 AGL	86 Variable	350	

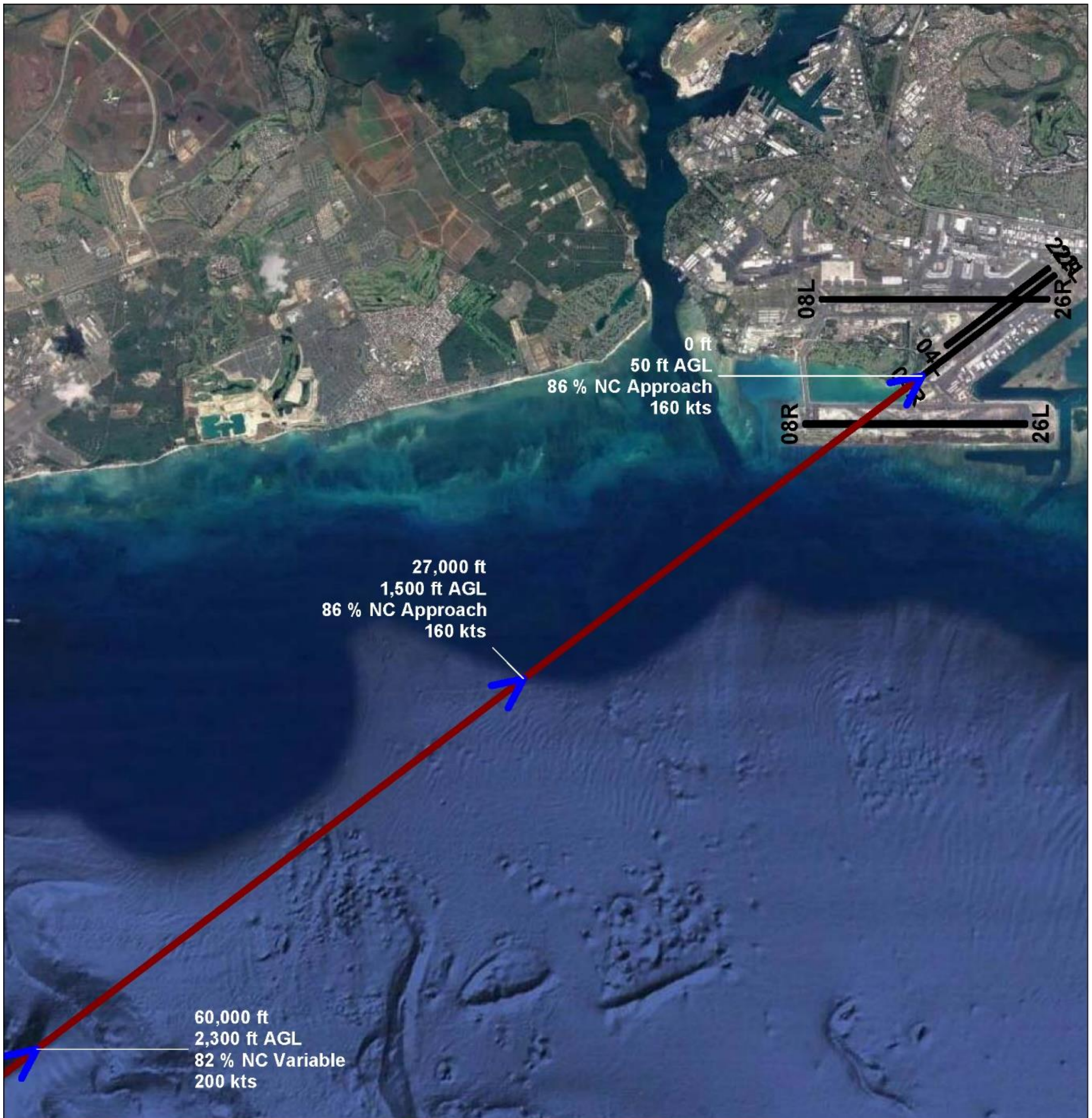
Flight Profile 08RDMD2, ADAIR MED NOISE - DEPARTURE - UNRESTRICTED CLIMB

ADAIR CAT C Medium Noise

Flight Track: 8RD5 - SOUTH DEPART TO KUCHI

Scale in Feet 1:44,200 (1 inch = 3,690 feet)

B.1.3.2.3 Contract ADAIR Low Noise FAS 39 Gripen (F-16A Surrogate)



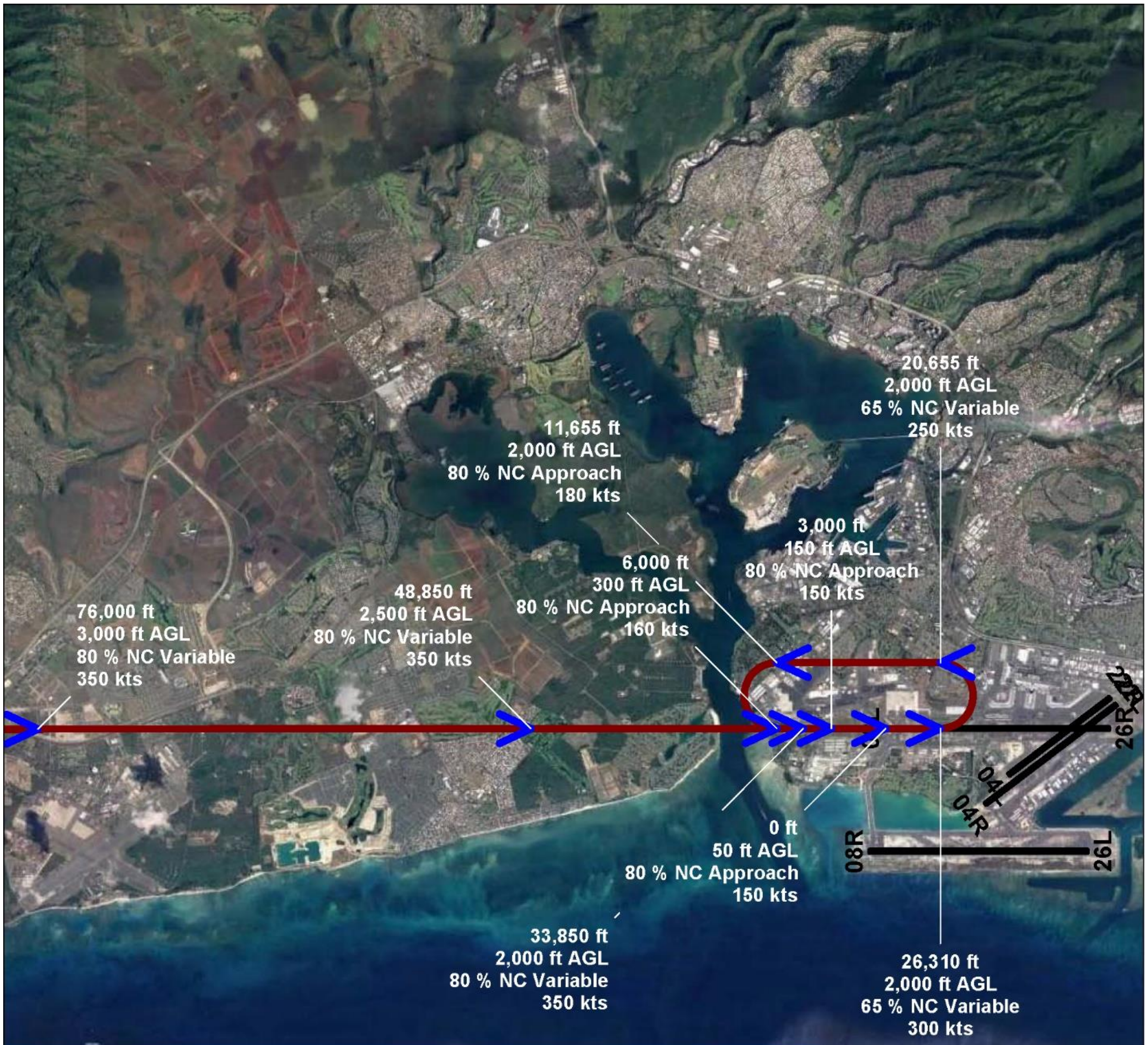
Flight Profile 04RALW1

Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	250,000	20,000 AGL	82 Variable	200	-5.3 deg, -1880 fpm, 563 sec
b	60,000	2,300 AGL	82 Variable	200	-1.4 deg, -440 fpm, 109 sec
c	27,000	1,500 AGL	86 Approach	160	-3.1 deg, -870 fpm, 100 sec
d	0	50 AGL	86 Approach	160	

Flight Profile 04RALW1, ADAIR LOW NOISE - STRAIGHT IN ARRIVAL
ADAIR CAT C Low Noise
Flight Track: 4RA1 - STRAIGHT IN

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000

Scale in Feet 1:108,000 (1 inch = 9,020 feet)



Flight Profile 08LALW2

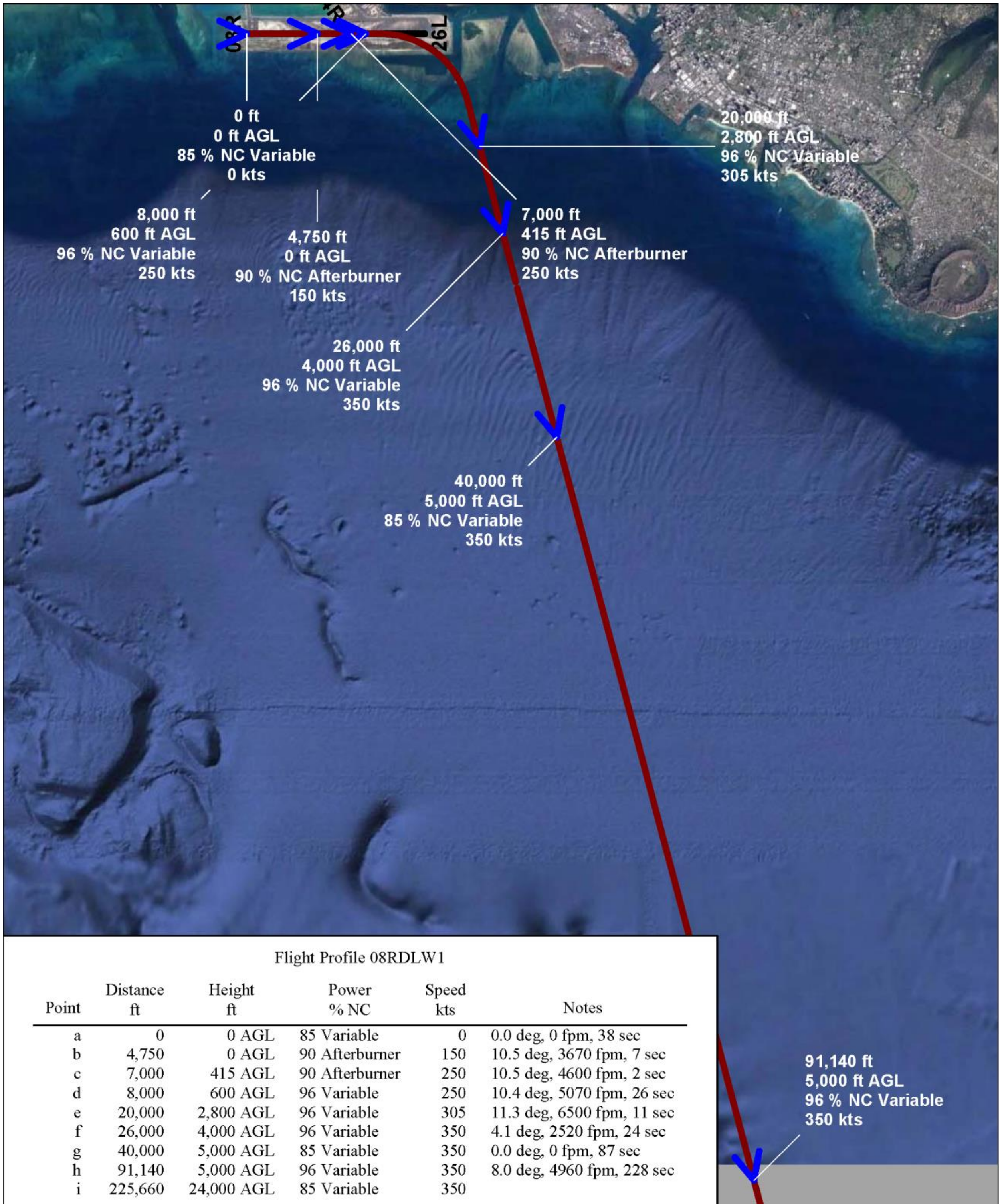
Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	200,000	10,000 AGL	65 Variable	250	-3.2 deg, -1710 fpm, 245 sec
b	76,000	3,000 AGL	80 Variable	350	-1.1 deg, -650 fpm, 46 sec
c	48,850	2,500 AGL	80 Variable	350	-1.9 deg, -1180 fpm, 25 sec
d	33,850	2,000 AGL	80 Variable	350	0.0 deg, 0 fpm, 14 sec
e	26,310	2,000 AGL	65 Variable	300	0.0 deg, 0 fpm, 12 sec
f	20,655	2,000 AGL	65 Variable	250	0.0 deg, 0 fpm, 25 sec
g	11,655	2,000 AGL	80 Approach	180	-16.7 deg, -4960 fpm, 20 sec
h	6,000	300 AGL	80 Approach	160	-2.9 deg, -780 fpm, 11 sec
i	3,000	150 AGL	80 Approach	150	-1.9 deg, -510 fpm, 12 sec
j	0	50 AGL	80 Approach	150	

Flight Profile 08LALW2, ADAIR LOW NOISE - OH ARRIVAL
ADAIR CAT C Low Noise
Flight Track: 8LAP - PITCHOUT

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000

Scale in Feet 1:116,000 (1 inch = 9,650 feet)

N



Flight Profile 08RDLW1

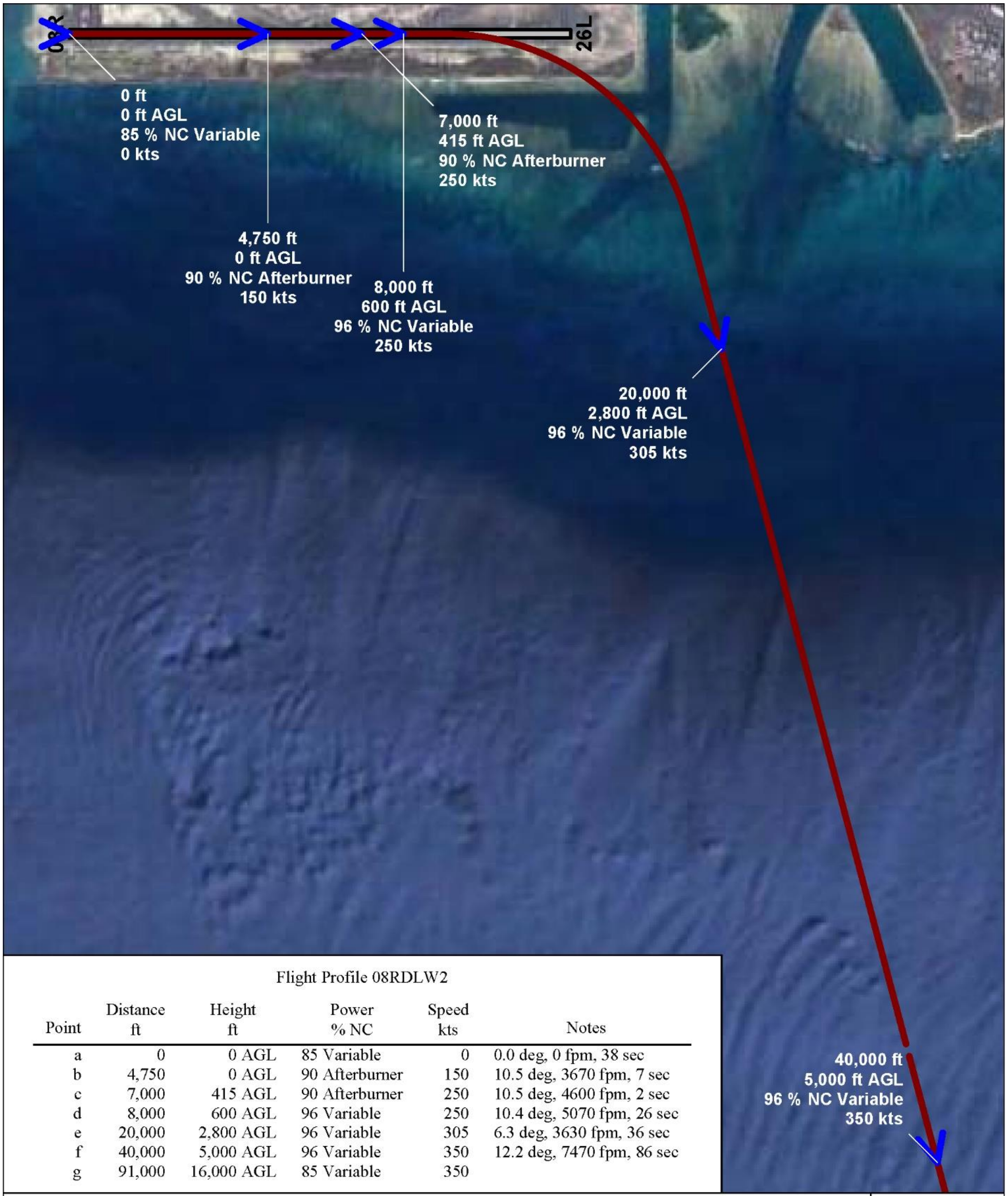
Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	0	0 AGL	85 Variable	0	0.0 deg, 0 fpm, 38 sec
b	4,750	0 AGL	90 Afterburner	150	10.5 deg, 3670 fpm, 7 sec
c	7,000	415 AGL	90 Afterburner	250	10.5 deg, 4600 fpm, 2 sec
d	8,000	600 AGL	96 Variable	250	10.4 deg, 5070 fpm, 26 sec
e	20,000	2,800 AGL	96 Variable	305	11.3 deg, 6500 fpm, 11 sec
f	26,000	4,000 AGL	96 Variable	350	4.1 deg, 2520 fpm, 24 sec
g	40,000	5,000 AGL	85 Variable	350	0.0 deg, 0 fpm, 87 sec
h	91,140	5,000 AGL	96 Variable	350	8.0 deg, 4960 fpm, 228 sec
i	225,660	24,000 AGL	85 Variable	350	

Flight Profile 08RDLW1, ADAIR LOW NOISE - DEPARTURE - (CAPPED)
ADAIR CAT C Low Noise
Flight Track: 8RD5 - SOUTH DEPART TO KUCHI

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000

Scale in Feet 1:123,000 (1 inch = 10,200 feet)

N



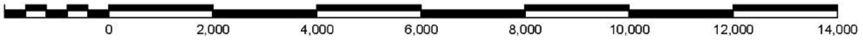
Flight Profile 08RDLW2

Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	0	0 AGL	85 Variable	0	0.0 deg, 0 fpm, 38 sec
b	4,750	0 AGL	90 Afterburner	150	10.5 deg, 3670 fpm, 7 sec
c	7,000	415 AGL	90 Afterburner	250	10.5 deg, 4600 fpm, 2 sec
d	8,000	600 AGL	96 Variable	250	10.4 deg, 5070 fpm, 26 sec
e	20,000	2,800 AGL	96 Variable	305	6.3 deg, 3630 fpm, 36 sec
f	40,000	5,000 AGL	96 Variable	350	12.2 deg, 7470 fpm, 86 sec
g	91,000	16,000 AGL	85 Variable	350	

Flight Profile 08RDLW2, ADAIR LOW NOISE - DEPARTURE - UNRESTRICTED CLIMB

ADAIR CAT C Low Noise

Flight Track: 8RD5 - SOUTH DEPART TO KUCHI



Scale in Feet 1:44,200 (1 inch = 3,690 feet)

B.1.4 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 ADAIR aircraft will be doing maintenance off site, the only ground operations that are expected to increase with the addition of contract ADAIR aircraft are the pre/postflight run-up checks and trim tests. **Figure B-15** shows the location of the hush house towards the south end of the field and the location that trim operations (at tie down) are done as well as the F-22 parking ramp. The arming and dearming of aircraft occurs near the end of runway 08R as shown in the figure. The F-22 aircraft perform no trim operations. Only uninstalled engine operations are performed in the hush house for the F-22 engines. **Figure B-16** shows the location where the larger aircraft park and do maintenance operations. **Figure B-17** shows the proposed parking locations for ADAIR aircraft. **Table B-9** details the number, type, and duration of the on-field maintenance operations. It is estimated that 14 contract ADAIR aircraft would be located at JBPHH as part of the Proposed Action.

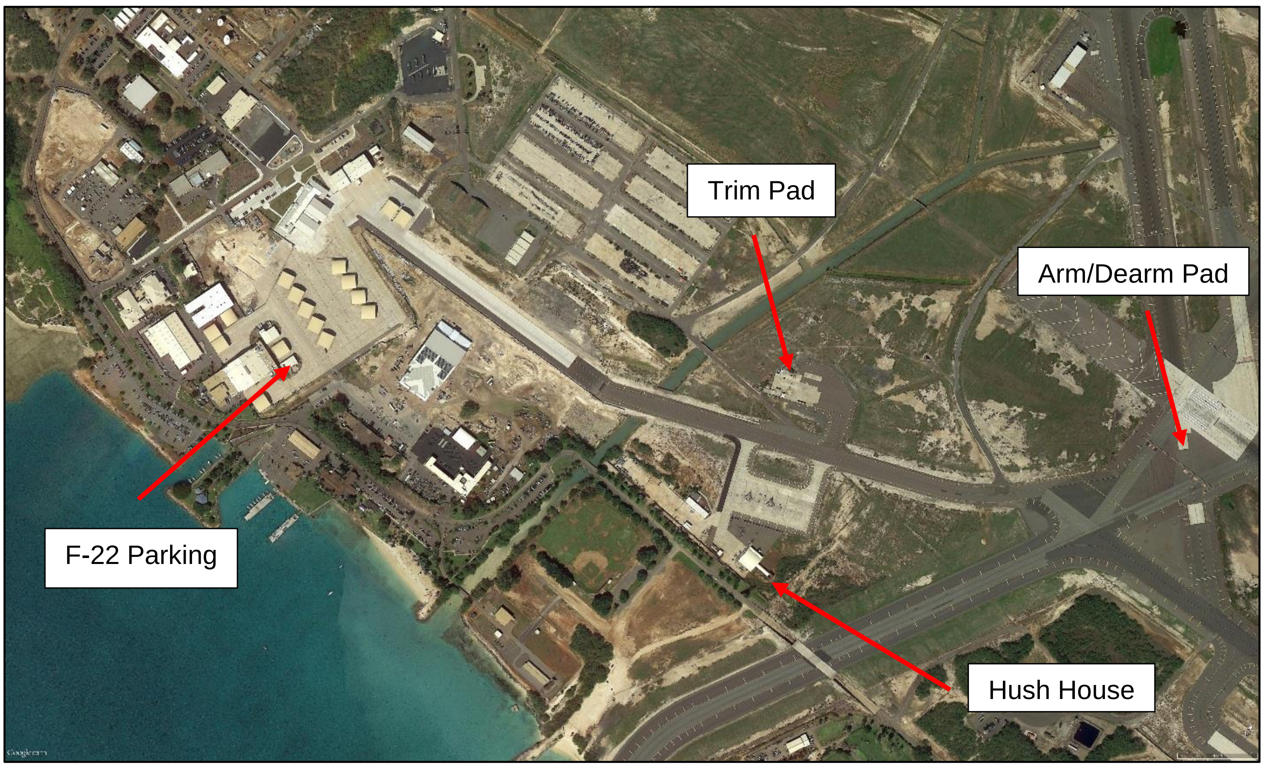


Figure B-15. Maintenance locations at Joint Base Pearl Harbor-Hickam for Trim and Hush House operations, Arm/Dearm Pad, Tie Down, and F-22 parking.

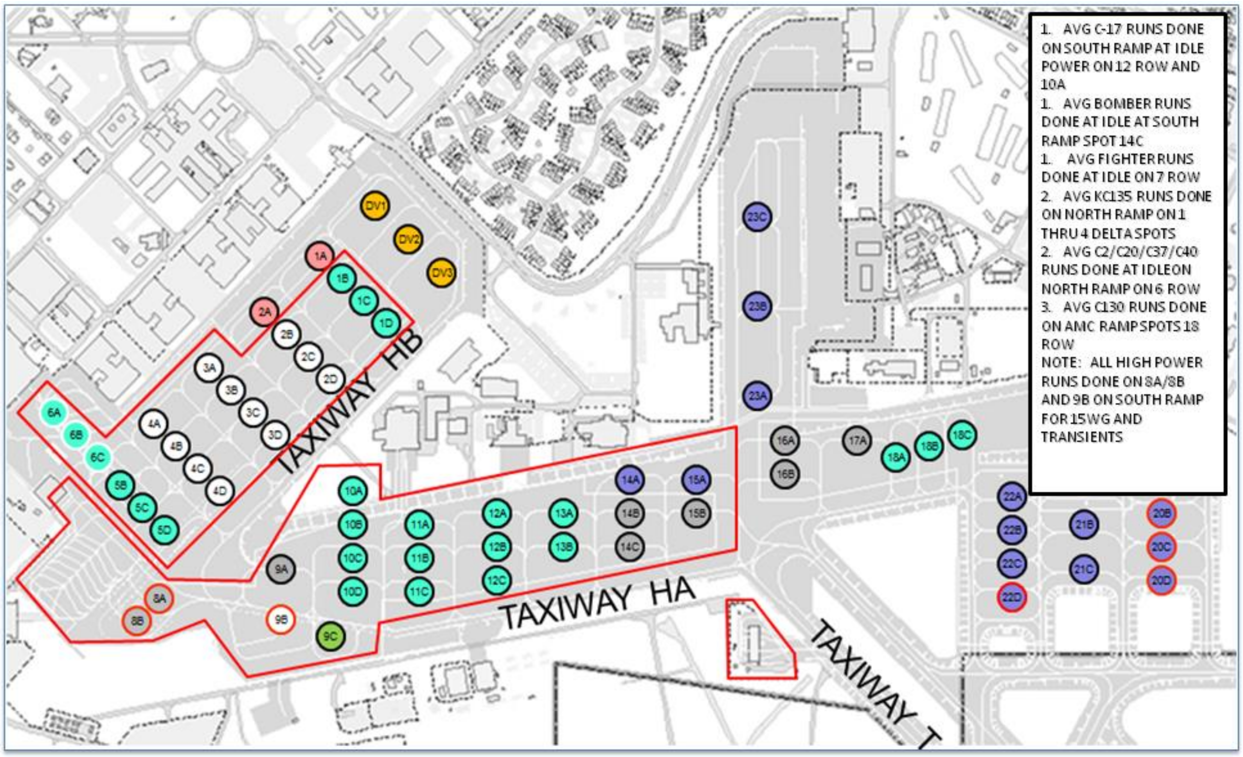


Figure B-16. Parking Locations for Larger Aircraft and High Power Runs.

Figure B-17. Proposed Contract Adversary Air Aircraft Parking Locations.

Table B-9
Location, Type, and Duration of Ground/Maintenance Run-Up Operations at Joint Base Pearl Harbor-Hickam

Aircraft Type	Engine Type	Run-up Type	2017 Annual Events	Percent Day (0700-2200)	Percent Night (2200-0700)	Run-up Pad ID	Percent Pad used	Magnetic Heading (degrees)	Engine Power Setting	Duration (Minutes) Per Event	# of Engines Running Per Event
C-17	F117-PW-100	Pre/Postflight Engine Run	1/sortie	50%	50%	3A	100.00%	30	77% NC	45	2
		1 Engine Run	18	100%	0%	South/North Ramp	50/50%	30/60	77% NC	30	1
		2 Engine Run	17	100%	0%	South/North Ramp	50/50%	30/60	77% NC	30	2
		3 Engine Run	2	100%	0%	South/North Ramp	50/50%	30/60	77% NC	30	3
		4 Engine Run	50	100%	0%	South/North Ramp	50/50%	30/60	77% NC	30	4
		Reverse Power	17	100%	0%	South/North Ramp	50/50%	30/60	77% NC	60	4
		Ops Check	5	1	0%	8A	1	30	77% NC	30	2
									80% NC	15	
KC-135R	F108-CF-100	Pre/Postflight Engine Run	1/sortie	98.5%	1.5%	South/North Ramp	50/50%	30/60	18.9% RPM	30	4/2
		Ops Check	5	1	0%	North Ramp	1	30	70% RPM	5	4
									80% RPM	5	
									18.9% RPM	20	
F-22[1]	F119-PW-100	Pre/Postflight Engine Run	1/sortie	98.5%	1.5%	F-22 Parking	100%	345/165	Idle	10	2
		Arm/Dearm: Idle	1/sortie	100%	0	AD1-Arm/Dearm Pad	100%	0	Idle	3	2
		Hush House: Uninstalled Run	24	1	0	Hush House	1	280	Idle	10	1
									80% ETR	2	
									Mil	1	
									Idle	10	
ADAIR Category C[2]		Pre/Postflight Engine Run	1/sortie	98.5%	1.5%	7 Row	100%	45	Idle	20	All
		Trim	336	100%	0	Trim Pad facing N/S	50/50%	338/158	Idle	12	1 or 2
									Approach	27	
									Intermediate	9	
									Military	9	
									Afterburner	3	

Notes:
(1) No F-22 trim pad testing done with engine installed. Only done in hush house uninstalled.
(2) ACAM defaults assumed for ADAIR aircraft. Expect ADAIR aircraft to be maintained elsewhere except for preflight run-ups and Trim Tests. Based on 24 test/year/aircraft expecting 14 ADAIR aircraft.

This page intentionally left blank

APPENDIX C

AIR QUALITY

This page intentionally left blank

Appendix C-1

Air Conformity Applicability Analysis

This page intentionally left blank

C.1 AIR QUALITY

This appendix presents an overview of the Clean Air Act (CAA) and the relevant state of Hawaii air quality regulations/standards. 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 State of Hawaii, Department of Health (DOH), Clean Air Branch (CAB), oversees the state's air pollution control program under the authority of the federal CAA and amendments, federal regulations, and state laws. Hawaii has adopted the federal NAAQS (HAR Title 11, Chapter 59). These standards are shown in **Table C-1**.

The CAB operates and maintains an ambient air monitoring network that uses the methods and procedures approved by the USEPA. 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 (SIPs) 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) 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 emissions.

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 Joint Base Pearl Harbor Hickam)	100
Ozone (NO_x)	Marginal and moderate nonattainment 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	All nonattainment and maintenance	25

Source: USEPA, 2017

NO_2 = nitrogen dioxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulates equal to or less than 2.5 microns in diameter ; PM_{10} = particulates equal to or less than 10 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound

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). Air quality modeling analysis for a PSD proposed facility is required to demonstrate that its emissions of specific pollutants will not cause or significantly contribute to a violation of any ambient air quality standard.

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	25
SO_2	40
NO_x	40
Ozone (Volatile Organic Compounds)	40
CO	100

Source: Title 40 CFR Part 52 Subpart A, §52.21

CO = carbon monoxide; NO_x = nitrogen oxides; $PM_{2.5}$ = particulates equal to or less than 2.5 microns in diameter ; PM_{10} = particulates equal to or less than 10 microns in diameter; SO_2 = sulfur dioxide

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 Joint Base Pearl Harbor-Hickam (JBPHH) including Papahānaumokuākea Marine National Monument, which is located in Hawaii but well outside the 50-mile radius.

Table C-4
Federal Allowable Pollutant Concentration Increases Under Prevention of Significant Deterioration Regulations

Pollutant	Averaging Time	Maximum Allowable Concentration ($\mu g/m^3$)		
		Class I	Class II	Class III
$PM_{2.5}$	Annual	1	4	8
	24-hour	2	9	18
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

$\mu g/m^3$ = microgram(s) per cubic meter; NO_2 = nitrogen dioxide; $PM_{2.5}$ = particulates equal to or less than 2.5 microns in diameter ; PM_{10} = particulates equal to or less than 10 microns in diameter; SO_2 = sulfur dioxide

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 USEPA has specific requirements for a minimum number of monitoring sites, known as National Air Monitoring Sites. Hawaii has augmented these with additional sites, called Air Surveillance and Analysis, to provide additional air quality data for DOH needs. Locations of these monitoring sites are determined by factors such as emissions sources, population density, permitting needs, modeling results, and site accessibility.

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 activities would be associated with Alternative 1 or 2 at JBPHH. This includes no demolition, earth moving, hauling, or paving. Some minor interior building fabrication possible but affected square footage is too small to result in outdoor air quality impacts.
2. No installation of new boilers or generators.
3. No new storage tanks would be installed - additional Jet A fuel needed by contractor aircraft would be calculated based on engine type, number of sorties, and engine fuel consumption rate.
4. Naval Supply Systems Command personnel at JBPHH would deliver fuel to the contractor at the airfield using tank trucks. Gas and diesel fuel for the Contractor’s Aerospace Ground Equipment (AGE) and flight line special purpose vehicles will be obtained by contract adversary air (ADAIR) personnel from the base/Defense Logistics Agency fuel station through an account established with 154 LRS.
5. Chaff and flares to be used by contractor would 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 booth facilities would be installed, and existing paint booths would not be used for ADAIR contractor aircraft. It is assumed than no corrosion control operations if contract ADAIR aircraft would be conducted at existing JBPHH facilities.
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 will be minimal - (no more than 0.5 gallon/month 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. For the purposes of modeling, ADAIR targeted performance is assumed to start in July 2019 with 10-year contract.
11. Contractor aircraft landing and takeoff (LTO) cycles - use/assume Air Conformity Applicability Model (ACAM) default "times in mode" to be conservative.

12. Assume once an aircraft is out of the LTO cycle the time (5 to 10 minutes) spent traveling to/from the Warning Areas is at an altitude above 3,000 feet (ft).
13. Assume mixing height is 3,000 ft (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 air operations (AOPs) would be strictly due to the addition of the contract ADAIR aircraft and associated ground and maintenance activities.
15. 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 was also assumed.
16. For the High Emission Scenario, the surrogate for the MIG-29 is the F-15 with engine model F100-PW-100.
17. For the Medium Emission Scenario, the surrogate for the Mirage is the F-16 with engine model F110-GE-100. The use of the F-16C with engine model F100-PW-220 is the surrogate for Medium Noise Scenario only.
18. For the Low Emission Scenario represented by the F-5 aircraft there are two potential engine types. We have assumed J85-GE-13 for the engine model.
19. For contactor AGE and Auxiliary Power Units (APUs) - until the contractor is selected, what they would bring/use in terms of AGE and APUs is unknown; thus, ACAM defaults will be used based on the surrogate aircraft and engine type.
20. Assume contractor aircraft would engage in LTO cycles, and touch and go (TGO) or low approach activities only in the vicinity of the airfield.
21. There are no TGOs (Closed Patterns) allowed at Honolulu International Airport; therefore, these are not included in the analyses.
22. It is unknown what contractor requirements would be for trim tests; thus, ACAM defaults will be assumed based on surrogate aircraft and engine type.
23. Assume all new ADAIR contractor personnel (pilots and maintenance staff) would live off-base and commute to the base 5 days per week. Will use ACAM defaults for commute distances.
24. All ADAIR training sorties would utilize chaff and flares. Only RR-188 chaff and M206 flares would be utilized (no other materials will be considered in the analysis).
25. Assume air quality impacts from chaff releases under actual flight conditions would be low and will have negligible impact on the PM_{10} and $PM_{2.5}$ NAAQS (1997 Report: *Environmental Effects of Self-protection Chaff and Flares*); thus, only the use of flares and impulse cartridges (if applicable) used at or below 3,000 ft will be considered in the air quality analysis. Flares used above 3,000 ft will disperse and not affect air quality in the lowest 3,000 ft above sea level (ASL).
26. All ADAIR related training at JBPHH would occur in the Warning Areas (i.e., no Military Operations Areas [MOAs] will be used for ADAIR training).
27. Estimated amount of time each ADAIR contractor aircraft would spend within the Warning Area at or below 3,000 ft ASL is proportioned based on percent time spent between 500 to 4,000 ft. Assuming an average mission time of 45 minutes, the time spent at or below 3,000 ft ASL would be 1.38 minutes (see **Table C-5**).
28. ACAM does not have separate inputs for time spent within a MOA or Warning Area. To represent the time spent at or below 3,000 ft, 1.38 minutes was assigned to climb out/intermediate 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**).
29. Assume the time spent below 3,000 ft would be the same for all sorties.
30. No changes to C-17 Baseline AOPs (sorties) due to the addition of the proposed contract ADAIR.
31. No changes baseline Air Force AOPs (sorties) due to contract ADAIR.
32. No/little changes to transit and civilian AOPs due to contract ADAIR.
33. No changes to the number of KC-135 AOPs as a result of contract ADAIR. Also, Sentry Aloha AOPs are expected to decrease from 1,000 to 600 sorties per year. To be conservative, assume no change to the number of Sentry Aloha F-22 AOPs due to the proposed contract ADAIR.
34. For consideration of potential air quality impacts, it is the volume of air extending up to the mixing height (3,000 ft AGL/ASL) 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 ft AGL is an acceptable default value (40 CFR 93.153[c][2]).

35. **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

Warning Area	Percent of Total Sorties	No. of Sorties in Airspace[1]	Minimum Mission Altitude	Total Mission Time (minutes) ≤3,000 ft AGL	Power Mode[3]
W-188, W-189, and W-190	90	2,765	500 ft ASL	1.38[2]	Intermediate/Climb out
W-192, W-193, and W-194	10	307	500 ft ASL	1.38[2]	Intermediate/Climb out

Notes:
1 Based on 3,100 total sorties in Warning Areas (Source: CAF ADAIR EIS Calculator - NEPA 6)
2 Based on 45 minutes per sortie and proportioned based on percent of time spent between 500 to 4,000 ft
Minutes @ 0 to 4,000 ft = 45 minutes * 5 percent (percent time in altitude range) = 2.25 minutes
Minutes @ 500 to 4,000 ft = 2.25 minutes - (2.25 minutes * 500 ft/3,500 ft) = 1.929 minutes
Minutes @ 500 to 3,000 ft = 1.93 minutes - (1.93 minutes * 1,000 ft/3,500 ft) = 1.38 minutes
3 ACAM does not have separate inputs for time spent within a Warning Area. To represent the time spent within a Warning Area, the expected flight time at or below 3,000 ft (1.38 minutes) was assigned to Intermediate/Climb out 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; ASL = above sea level; CAF = Combat Air Forces; EIS = Environmental Impact Statement; ft = feet; LTO = landing and takeoff; 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)	Takeoff (Military and/or Afterburn	Climb Out	Approach	Taxi/Idle(in)
LTO	3,100	18.5	0.4	0.8	3.5	11.3
TGO[2]	-	-	-	-	-	-

Notes:
1 Given time in mode applicable to all emission scenarios (High, Medium, and Low)
2 No TGOs (Closed Patterns) allowed at Honolulu International Airport; therefore, these are not included in the analyses.

LTO = landing and takeoff; 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 National Environmental Policy Act 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 JBPHH were assessed in **Chapter 4** and compared to regional emissions and the applicable regulatory thresholds. An overview of ACAM inputs and the methodologies used to estimate emissions are summarized in **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

Detailed Air Conformity Applicability Model Sample Reports
(Airfield and Warning Areas W-188, W-189, W190 – High Emission Scenarios)

This page intentionally left blank

1. General Information

- Action Location

Base: HICKAM AFB
State: Hawaii
County(s): Honolulu
Regulatory Area(s): NOT IN A REGULATORY AREA

- Action Title: Joint Base Pearl Harbor-Hickam (JBPHH), Hawaii - Combat Air Forces Adversary Air

- Project Number/s (if applicable): N/A

- Projected Action Start Date: 7 / 2019

- Action Purpose and Need:

Combat Air Forces (CAF) pilots have 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.

Contract ADAIR is proposed 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. The contract ADAIR requirement is roughly 30,000 annual sorties across multiple Air Force installations.

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 154 WG, 15 WG, and other units supported by JBPHH. Dedicated ADAIR will also allow the formal training units (FTUs) to free up resources used to self-generate ADAIR and more effectively use those available flying hours.

- Action Description:

Alternative 1 – Establish contract ADAIR capabilities (an estimated 14 aircraft) providing 3,100 annual training sorties at JBPHH in W-188C, W-189, W-190, W-192, W-193, and W-194, operating out of a consolidated facility in Building 2030. Maintenance would use hangar space and AMU facilities in Building 2030 to perform limited maintenance operations on contract ADAIR aircraft and aircraft parking would be on 7 Row.

Alternative 2 – Establish contract ADAIR capabilities (an estimated 14 aircraft) providing 3,100 annual training sorties at JBPHH in W-188C, W-189, W-190, W-192, W-193, and W-194, operating out of Building 3220. Maintenance would use hangar space and AMU facilities in Building 3220 to perform limited maintenance operations on contract ADAIR aircraft and aircraft parking would be on 7 Row.

Alternative 2 is identical to Alternative 1 in terms of air quality impacts thus ACAM was run for Alternative 1 only.

- Point of Contact

Name:	Radhika Narayanan
Title:	Environmental Scientist
Organization:	Versar
Email:	rnarayanan@versar.com
Phone Number:	301-350-5158

- Activity List:

Activity Type		Activity Title
2.	Aircraft	JBPHH Airfield Operations
3.	Personnel	Workday Commute
4.	Degreaser	Minor Parts Cleaning - ADAIR Contractor Aircraft
5.	Tanks	Jet A Storage
6.	Tanks	Jet A Storage
7.	Tanks	Jet A Storage
8.	Tanks	Jet A Storage

Emission factors and air emission estimating methods come from the United States Air Force's Air Emissions Guide for Air Force Stationary Sources, Air Emissions Guide for Air Force Mobile Sources, and Air Emissions Guide for Air Force Transitory Sources.

2. Aircraft

2.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Honolulu
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: JBPHH Airfield Operations

- Activity Description:
Contract ADAIR sorties and proficiency training in the vicinity of Hickam airfield - High Emission Scenario - F-100-PW-100 Engine (Surrogate for MiG-29). ACAM default times-in-mode is used.

- Activity Start Date
Start Month: 7
Start Year: 2019

- Activity End Date
Indefinite: No
End Month: 6
End Year: 2029

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	136.965336
SO_x	70.069730
NO_x	878.713591
CO	1180.800464
PM 10	113.484480

Pollutant	Total Emissions (TONs)
PM 2.5	103.277352
Pb	0.000000
NH_3	0.000000
CO_2e	173986.0

- Activity Emissions [Flight Operations (includes Trim Test & APU) part]:

Pollutant	Total Emissions (TONs)
VOC	82.073616
SO_x	59.012269
NO_x	720.760649
CO	1084.482875
PM 10	97.201811

Pollutant	Total Emissions (TONs)
PM 2.5	87.481630
Pb	0.000000
NH_3	0.000000
CO_2e	165669.7

- Activity Emissions [Aerospace Ground Equipment (AGE) part]:

Pollutant	Total Emissions (TONs)
VOC	54.891720
SO_x	11.057460
NO_x	157.952942
CO	96.317589
PM 10	16.282669

Pollutant	Total Emissions (TONs)
PM 2.5	15.795722
Pb	0.000000
NH_3	0.000000
CO_2e	8316.3

2.2 Aircraft & Engines

2.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine

Aircraft Designation: F-15A
Engine Model: F100-PW-100
Primary Function: Combat
Number of Engines: 2

- Aircraft & Engine Surrogate

Is Aircraft & Engine a Surrogate? Yes
Original Aircraft Name: MiG-29
Original Engine Name: Klimov RD-33

2.2.2 Aircraft & Engines Emission Factor(s)

- Aircraft & Engine Emissions Factors (lb/1000lb fuel)

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	1127.00	3.79	1.06	4.64	49.58	3.13	2.82	3234
Approach	2765.00	1.06	1.06	12.52	3.99	1.57	1.41	3234
Intermediate	7685.00	0.14	1.06	27.09	0.72	0.72	0.65	3234
Military	10996.00	0.12	1.06	35.01	0.70	1.24	1.12	3234
After Burn	54007.00	0.13	1.06	6.62	9.57	0.87	0.78	3234

2.3 Flight Operations

2.3.1 Flight Operations Assumptions

- Flight Operations

Number of Aircraft: 14
Number of Annual LTOs (Landing and Take-off) cycles for all Aircraft: 3100
Number of Annual TGOs (Touch-and-Go) cycles for all Aircraft: 0
Number of Annual Trim Test(s) per Aircraft: 24

- Default Settings Used: Yes

- 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)

Per the Air Emissions Guide for Air Force Mobile Sources, the defaults values for military aircraft equipped with after burner for takeoff is 50% military power and 50% afterburner.

- Trim Test

Idle (mins):	12 (default)
Approach (mins):	27 (default)
Intermediate (mins):	9 (default)
Military (mins):	9 (default)
AfterBurn (mins):	3 (default)

2.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for LTOs per Year

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)

2.4 Auxiliary Power Unit (APU)

2.4.1 Auxiliary Power Unit (APU) Assumptions

- Default Settings Used: Yes

- Auxiliary Power Unit (APU) (default)

Number of APU per Aircraft	Operation Hours for Each LTO	Exempt Source?	Designation	Manufacturer

2.4.2 Auxiliary Power Unit (APU) Emission Factor(s)

- Auxiliary Power Unit (APU) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e

2.4.3 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

2.5 Aerospace Ground Equipment (AGE)

2.5.1 Aerospace Ground Equipment (AGE) Assumptions

- Default Settings Used: Yes

- AGE Usage
Number of Annual LTO (Landing and Take-off) cycles for AGE: 3100

- 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

2.5.2 Aerospace Ground Equipment (AGE) Emission Factor(s)

- 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-2/TTU-228 - 130hp	7.4	0.195	0.053	3.396	0.794	0.089	0.086	168.8
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

2.5.3 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

3. Personnel

3.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Honolulu
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Workday Commute

- Activity Description:
ADAIR Contractor Personnel Commute from off-base (91 Maintenance Personnel & 18 Pilots).

- Activity Start Date
Start Month: 7
Start Year: 2019

- Activity End Date
Indefinite: No
End Month: 6
End Year: 2029

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	2.637358
SO_x	0.016413
NO_x	2.278339
CO	30.385375
PM 10	0.041181

Pollutant	Total Emissions (TONs)
PM 2.5	0.037162
Pb	0.000000
NH_3	0.156839
CO_2e	2515.8

3.2 Personnel Assumptions

- Number of Personnel
Active Duty Personnel: 0
Civilian Personnel: 0
Support Contractor Personnel: 109
Air National Guard (ANG) Personnel: 0
Reserve Personnel: 0

- Default Settings Used: Yes

- 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)

3.3 Personnel On Road Vehicle Mixture

- 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

3.4 Personnel Emission Factor(s)

- On Road Vehicle Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.309	000.002	000.242	003.639	000.005	000.005		000.024	00342.073
LDGT	000.417	000.003	000.431	005.362	000.007	000.006		000.025	00440.369
HDGV	000.880	000.005	001.102	017.734	000.015	000.013		000.046	00791.990
LDDV	000.083	000.003	000.134	002.685	000.004	000.004		000.008	00335.809
LDDT	000.249	000.004	000.411	004.941	000.007	000.006		000.008	00481.445
HDDV	000.336	000.013	003.964	001.492	000.190	000.175		000.026	01502.295
MC	002.840	000.003	000.678	013.209	000.025	000.023		000.052	00392.137

3.5 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

4. Degreaser

4.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Honolulu
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Minor Parts Cleaning - ADAIR Contractor Aircraft

- Activity Description:
Small Parts Cleaning (assume 0.5 gal solvent /month consumed). Major repairs & maintenance conducted off-site.

- Activity Start Date
Start Month: 7
Start Year: 2019

- Activity End Date
Indefinite: No
End Month: 6
End Year: 2029

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.195390
SO_x	0.000000
NO_x	0.000000
CO	0.000000
PM 10	0.000000

Pollutant	Total Emissions (TONs)
PM 2.5	0.000000
Pb	0.000000
NH_3	0.000000
CO_2e	0.0

4.2 Degreaser Assumptions

- Degreaser
Net solvent usage (total less recycle) (gallons/year): 6

- Default Settings Used: Yes

- Degreaser Consumption
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)

4.3 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

5. Tanks

5.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Honolulu
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Jet A Storage

- Activity Description:
Accounts for additional fuel throughput due to contract ADAIR sorties. Fuel use estimated based on number of sorties and time in mode. Includes fuel used in Warning Areas and in the vicinity of the airfield. Floating roof AST.

- Activity Start Date
Start Month: 7
Start Year: 2019

- Activity End Date
Indefinite: No
End Month: 6
End Year: 2029

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	5.467475
SO_x	0.000000
NO_x	0.000000
CO	0.000000
PM 10	0.000000

Pollutant	Total Emissions (TONs)
PM 2.5	0.000000
Pb	0.000000
NH_3	0.000000
CO_2e	0.0

5.2 Tanks Assumptions

- Chemical
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
Type of Tank: Vertical Tank
Tank Height (ft): 48
Tank Diameter (ft): 93
Annual Net Throughput (gallon/year): 1278750

5.3 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

6. Tanks

6.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Honolulu
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Jet A Storage

- Activity Description:
Accounts for additional fuel throughput due to contract ADAIR sorties. Fuel use estimated based on number of sorties and time in mode. Includes fuel used in Warning Areas and in the vicinity of the airfield. AST.

- Activity Start Date
Start Month: 7
Start Year: 2019

- Activity End Date
Indefinite: No
End Month: 6
End Year: 2029

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	5.467475
SO_x	0.000000
NO_x	0.000000
CO	0.000000
PM 10	0.000000

Pollutant	Total Emissions (TONs)
PM 2.5	0.000000
Pb	0.000000
NH_3	0.000000
CO_2e	0.0

6.2 Tanks Assumptions

- Chemical
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
Type of Tank: Vertical Tank
Tank Height (ft): 48
Tank Diameter (ft): 93
Annual Net Throughput (gallon/year): 1278750

6.3 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

7. Tanks

7.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Honolulu
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Jet A Storage

- Activity Description:
Accounts for additional fuel throughput due to contract ADAIR sorties. Fuel use estimated based on number of sorties and time in mode. Includes fuel used in Warning Areas and in the vicinity of the airfield. AST.

- Activity Start Date
Start Month: 7
Start Year: 2019

- Activity End Date
Indefinite: No
End Month: 6
End Year: 2029

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	2.748923
SO_x	0.000000
NO_x	0.000000
CO	0.000000
PM 10	0.000000

Pollutant	Total Emissions (TONs)
PM 2.5	0.000000
Pb	0.000000
NH_3	0.000000
CO_2e	0.0

7.2 Tanks Assumptions

- Chemical
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
Type of Tank: Vertical Tank
Tank Height (ft): 54
Tank Diameter (ft): 63
Annual Net Throughput (gallon/year): 581250

7.3 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

8. Tanks

8.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Honolulu
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: Jet A Storage

- Activity Description:
Accounts for additional fuel throughput due to contract ADAIR sorties. Fuel use estimated based on number of sorties and time in mode. Includes fuel used in Warning Areas and in the vicinity of the airfield. AST.

- Activity Start Date
Start Month: 7
Start Year: 2019

- Activity End Date
Indefinite: No
End Month: 6
End Year: 2029

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	2.748923
SO_x	0.000000
NO_x	0.000000
CO	0.000000
PM 10	0.000000

Pollutant	Total Emissions (TONs)
PM 2.5	0.000000
Pb	0.000000
NH_3	0.000000
CO_2e	0.0

8.2 Tanks Assumptions

- Chemical
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
Type of Tank: Horizontal Tank
Tank Length (ft): 54
Tank Diameter (ft): 63
Annual Net Throughput (gallon/year): 581250

8.3 Tank Formula(s)

- Vapor Space Volume
$VSV = (PI / 4) * D^2 * L / 2$

VSV: Vapor Space Volume (ft^3)
PI: PI Math Constant
D^2: Tank Diameter (ft)
L: Tank Length (ft)
2: Conversion Factor (Vapor Space Volume is assumed to be one-half of the tank volume)

- Vented Vapor Saturation Factor
$VVSF = 1 / (1 + (0.053 * VP * L / 2))$

VVSF: Vented Vapor Saturation Factor (dimensionless)
0.053: Constant
VP: Vapor Pressure (psia)
L: Tank Length (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 * L)

NT: Number of Turnovers per Year
7.48: Constant
ANT: Annual Net Throughput
PI: PI Math Constant
D^2: Tank Diameter (ft)
L: Tank Length (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

This page intentionally left blank

1. General Information

- Action Location

Base: HICKAM AFB
State: Hawaii
County(s): Honolulu
Regulatory Area(s): NOT IN A REGULATORY AREA

- Action Title: Joint Base Pearl Harbor-Hickam (JBPHH), Hawaii - Combat Air Forces Adversary Air

- Project Number/s (if applicable): N/A

- Projected Action Start Date: 7 / 2019

- Action Purpose and Need:

Combat Air Forces (CAF) pilots have 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.

Contract ADAIR is proposed 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. The contract ADAIR requirement is roughly 30,000 annual sorties across multiple Air Force installations.

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 154 WG, 15 WG, and other units supported by JBPHH. Dedicated ADAIR will also allow the formal triaing units (FTUs) to free up resources used to self-generate ADAIR and more effectively use those available flying hours.

- Action Description:

Alternative 1 – Establish contract ADAIR capabilities (an estimated 14 aircraft) providing 3,100 annual training sorties at JBPHH with 3,072 sorties in airspaces W-188C, W-189, W-190, W-192, W-193, and W-194. Maintenance would use hangar space and AMU facilities in Building 2030 to perform limited maintenance operations on contract ADAIR acircraft and aircraft parking would be on 7 Row.

Alternative 2 – Establish contract ADAIR capabilities (an estimated 14 aircraft) providing 3,100 annual training sorties at JBPHH with 3,072 sorties in airspaces W-188C, W-189, W-190, W-192, W-193, and W-194. Maintenance would use hangar space and AMU facilities in Building 3220 to perform limited maintenance operations on contract ADAIR acircraft and aircraft parking would be on 7 Row.

Alternative 2 is identical to Alternative 1 in terms of air quality impacts thus ACAM was run for Alternative 1 only.

- Point of Contact

Name: Radhika Narayanan
Title: Environmental Scientist
Organization: Versar
Email: rnarayanan@versar.com
Phone Number: 301-350-5158

- Activity List:

Activity Type		Activity Title
2.	Aircraft	JBPHH Airspace Operations

Emission factors and air emission estimating methods come from the United States Air Force's Air Emissions Guide for Air Force Stationary Sources, Air Emissions Guide for Air Force Mobile Sources, and Air Emissions Guide for Air Force Transitory Sources.

2. Aircraft

2.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Honolulu
Regulatory Area(s): NOT IN A REGULATORY AREA

- Activity Title: JBPHH Airspace Operations

- Activity Description:
Contractor ADAIR sorties and proficiency training in the W-188, W-189, W190 - High Emission Scenario - F-100-PW-100 Engine (Surrogate for MiG-29). ACAM default time in mode is used.

- Activity Start Date
Start Month: 7
Start Year: 2019

- Activity End Date
Indefinite: No
End Month: 6
End Year: 2029

- Activity Emissions:

Pollutant	Total Emissions (TONs)
VOC	0.693993
SO_x	5.180512
NO_x	132.396300
CO	3.518839
PM 10	3.518839

Pollutant	Total Emissions (TONs)
PM 2.5	3.166955
Pb	0.000000
NH_3	0.000000
CO_2e	15805.4

- Activity Emissions [Flight Operations (includes Trim Test & APU) part]:

Pollutant	Total Emissions (TONs)
VOC	0.693993
SO_x	5.180512
NO_x	132.396300
CO	3.518839
PM 10	3.518839

Pollutant	Total Emissions (TONs)
PM 2.5	3.166955
Pb	0.000000
NH_3	0.000000
CO_2e	15805.4

2.2 Aircraft & Engines

2.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine
Aircraft Designation: F-15A
Engine Model: F100-PW-100
Primary Function: Combat
Number of Engines: 2

- Aircraft & Engine Surrogate
Is Aircraft & Engine a Surrogate? No
Original Aircraft Name:
Original Engine Name:

2.2.2 Aircraft & Engines Emission Factor(s)

- Aircraft & Engine Emissions Factors (lb/1000lb fuel)

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	1127.00	3.79	1.06	4.64	49.58	3.13	2.82	3234
Approach	2765.00	1.06	1.06	12.52	3.99	1.57	1.41	3234
Intermediate	7685.00	0.14	1.06	27.09	0.72	0.72	0.65	3234
Military	10996.00	0.12	1.06	35.01	0.70	1.24	1.12	3234
After Burn	54007.00	0.13	1.06	6.62	9.57	0.87	0.78	3234

2.3 Flight Operations

2.3.1 Flight Operations Assumptions

- Flight Operations
Number of Aircraft: 14
Number of Annual LTOs (Landing and Take-off) cycles for all Aircraft: 2765
Number of Annual TGOs (Touch-and-Go) cycles for all Aircraft: 0
Number of Annual Trim Test(s) per Aircraft: 0

- Default Settings Used: No

- Flight Operations TIMs (Time In Mode)
Taxi/Idle Out [Idle] (mins): 0
Takeoff [Military and/or After Burn] (mins): 0
Climb Out [Intermediate] (mins): 1.38
Approach [Approach] (mins): 0
Taxi/Idle In [Idle] (mins): 0

Per the Air Emissions Guide for Air Force Mobile Sources, the defaults values for military aircraft equipped with after burner for takeoff is 50% military power and 50% afterburner.

- Trim Test
Idle (mins): 0
Approach (mins): 0
Intermediate (mins): 0
Military (mins): 0
AfterBurn (mins): 0

2.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for LTOs per Year
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)

2.4 Auxiliary Power Unit (APU)

2.4.1 Auxiliary Power Unit (APU) Assumptions

- Default Settings Used: Yes

- Auxiliary Power Unit (APU) (default)

Number of APU per Aircraft	Operation Hours for Each LTO	Exempt Source?	Designation	Manufacturer

2.4.2 Auxiliary Power Unit (APU) Emission Factor(s)

- Auxiliary Power Unit (APU) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e

2.4.3 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

This page intentionally left blank

Appendix C-3

Summary Air Conformity Applicability Model Reports
Record of Air Analysis (ROAA)

This page intentionally left blank

JOINT BASE PEARL HARBOR-HICKAM HIGH EMISSION SCENARIO SUMMARY

1. General Information: The Air Force's Air Conformity Applicability Model (ACAM) was used to perform an analysis to assess the potential air quality impact/s associated with the action in accordance with the Air Force Instruction 32-7040, Air Quality Compliance And Resource Management; the Environmental Impact Analysis Process (EIAP, 32 CFR 989); and the General Conformity Rule (GCR, 40 CFR 93 Subpart B). This report provides a summary of the ACAM analysis.

a. Action Location:
Base: HICKAM AFB
State: Hawaii
County(s): Honolulu
Regulatory Area(s): NOT IN A REGULATORY AREA

b. Action Title: Joint Base Pearl Harbor-Hickam (JBPHH), Hawaii - Combat Air Force Adversary Air

c. Project Number/s (if applicable): N/A

d. Projected Action Start Date: 7 / 2019

e. Action Description:

Alternative 1 – Establish contract ADAIR capabilities (an estimated 14 aircraft) providing 3,100 annual training sorties at JBPHH in W-188C, W-189, W-190, W-192, W-193, and W-194, operating out of a consolidated facility in Building 2030. Maintenance would use hangar space and AMU facilities in Building 2030 to perform limited maintenance operations on contract ADAIR aircraft and aircraft parking would be on 7 Row.

Alternative 2 – Establish contract ADAIR capabilities (an estimated 14 aircraft) providing 3,100 annual training sorties at JBPHH in W-188C, W-189, W-190, W-192, W-193, and W-194, operating out of Building 3220. Maintenance would use hangar space and AMU facilities in Building 3220 to perform limited maintenance operations on contract ADAIR aircraft and aircraft parking would be on 7 Row.

Alternative 2 is identical to Alternative 1 in terms of air quality impacts thus ACAM was run for Alternative 1 only.

f. Point of Contact:
Name: Radhika Narayanan
Title: Environmental Scientist
Organization: Versar
Email: rnarayanan@versar.com
Phone Number: 301-350-5158

2. Air Impact Analysis: Based on the attainment status at the action location, the requirements of the General Conformity Rule are:

_____ applicable
__X__ not applicable

Total combined direct and indirect emissions associated with the action were estimated through ACAM on a calendar-year basis for the "worst-case" and "steady state" (net gain/loss upon action fully implemented) emissions.

"Air Quality Indicators" were used to provide an indication of the significance of potential impacts to air quality. These air quality indicators are EPA General Conformity Rule (GCR) thresholds (de minimis levels) that are applied out of context to their intended use. Therefore, these indicators do not trigger a regulatory requirement; however, they provide a warning that the action is potentially significant. It is important to note that these indicators only provide a clue to the potential impacts to air quality.

Given the GCR de minimis threshold values are the maximum net change an action can acceptably emit in non-attainment and maintenance areas, these threshold values would also conservatively indicate an actions emissions within an attainment would also be acceptable. An air quality indicator value of 100 tons/yr is used based on the GCR de minimis threshold for the least severe non-attainment classification for all criteria pollutants (see 40 CFR 93.153). Therefore, the worst-case year emissions were compared against the GCR Indicator and are summarized below.

Analysis Summary:

2019

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	7.812	100	No
NOx	44.050	100	No
CO	60.559	100	No
SOx	3.504	100	No
PM 10	5.676	100	No
PM 2.5	5.166	100	No
Pb	0.000	25	No
NH3	0.008	100	No
CO2e	8825.1		

2020

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	15.623	100	No
NOx	88.099	100	No
CO	121.119	100	Yes
SOx	7.009	100	No
PM 10	11.353	100	No
PM 2.5	10.331	100	No
Pb	0.000	25	No
NH3	0.016	100	No
CO2e	17650.2		

2021

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	15.623	100	No
NOx	88.099	100	No
CO	121.119	100	Yes
SOx	7.009	100	No
PM 10	11.353	100	No
PM 2.5	10.331	100	No
Pb	0.000	25	No
NH3	0.016	100	No
CO2e	17650.2		

2022

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	15.623	100	No
NOx	88.099	100	No
CO	121.119	100	Yes
SOx	7.009	100	No
PM 10	11.353	100	No
PM 2.5	10.331	100	No
Pb	0.000	25	No
NH3	0.016	100	No
CO2e	17650.2		

2023

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	15.623	100	No
NOx	88.099	100	No
CO	121.119	100	Yes
SOx	7.009	100	No
PM 10	11.353	100	No
PM 2.5	10.331	100	No
Pb	0.000	25	No
NH3	0.016	100	No
CO2e	17650.2		

2024

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	15.623	100	No
NOx	88.099	100	No
CO	121.119	100	Yes
SOx	7.009	100	No
PM 10	11.353	100	No
PM 2.5	10.331	100	No
Pb	0.000	25	No
NH3	0.016	100	No
CO2e	17650.2		

2025

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	15.623	100	No
NOx	88.099	100	No
CO	121.119	100	Yes
SOx	7.009	100	No
PM 10	11.353	100	No
PM 2.5	10.331	100	No
Pb	0.000	25	No
NH3	0.016	100	No
CO2e	17650.2		

2026

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	15.623	100	No
NOx	88.099	100	No
CO	121.119	100	Yes
SOx	7.009	100	No
PM 10	11.353	100	No
PM 2.5	10.331	100	No
Pb	0.000	25	No
NH3	0.016	100	No
CO2e	17650.2		

2027

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	15.623	100	No
NOx	88.099	100	No
CO	121.119	100	Yes
SOx	7.009	100	No
PM 10	11.353	100	No
PM 2.5	10.331	100	No
Pb	0.000	25	No
NH3	0.016	100	No
CO2e	17650.2		

2028

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	15.623	100	No
NOx	88.099	100	No
CO	121.119	100	Yes
SOx	7.009	100	No
PM 10	11.353	100	No
PM 2.5	10.331	100	No
Pb	0.000	25	No
NH3	0.016	100	No
CO2e	17650.2		

2029

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	7.812	100	No
NOx	44.050	100	No
CO	60.559	100	No
SOx	3.504	100	No
PM 10	5.676	100	No
PM 2.5	5.166	100	No
Pb	0.000	25	No
NH3	0.008	100	No
CO2e	8825.1		

2030 - (Steady State)

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.000	100	No
NOx	0.000	100	No
CO	0.000	100	No
SOx	0.000	100	No
PM 10	0.000	100	No
PM 2.5	0.000	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	0.0		

Some estimated emissions associated with this action are above the GCR indicators, indicating a significant impact to air quality; therefore, further air assessment is needed.

Radhika Narayanan, Environmental Scientist — 24 October 2019 (DATE)

JOINT BASE PEARL HARBOR-HICKAM MEDIUM EMISSION SCENARIO SUMMARY

1. General Information: The Air Force's Air Conformity Applicability Model (ACAM) was used to perform an analysis to assess the potential air quality impact/s associated with the action in accordance with the Air Force Instruction 32-7040, Air Quality Compliance And Resource Management; the Environmental Impact Analysis Process (EIAP, 32 CFR 989); and the General Conformity Rule (GCR, 40 CFR 93 Subpart B). This report provides a summary of the ACAM analysis.

a. Action Location:
Base: HICKAM AFB
State: Hawaii
County(s): Honolulu
Regulatory Area(s): NOT IN A REGULATORY AREA

b. Action Title: Joint Base Pearl Harbor-Hickam (JBPHH), Hawaii - Combat Air Force Adversary Air

c. Project Number/s (if applicable): N/A

d. Projected Action Start Date: 7 / 2019

e. Action Description:

Alternative 1 – Establish contract ADAIR capabilities (an estimated 14 aircraft) providing 3,100 annual training sorties at JBPHH in W-188C, W-189, W-190, W-192, W-193, and W-194, operating out of a consolidated facility in Building 2030. Maintenance would use hangar space and AMU facilities in Building 2030 to perform limited maintenance operations on contract ADAIR aircraft and aircraft parking would be on 7 Row.

Alternative 2 – Establish contract ADAIR capabilities (an estimated 14 aircraft) providing 3,100 annual training sorties at JBPHH in W-188C, W-189, W-190, W-192, W-193, and W-194, operating out of Building 3220. Maintenance would use hangar space and AMU facilities in Building 3220 to perform limited maintenance operations on contract ADAIR aircraft and aircraft parking would be on 7 Row.

Alternative 2 is identical to Alternative 1 in terms of air quality impacts thus ACAM was run for Alternative 1 only.

f. Point of Contact:
Name: Radhika Narayanan
Title: Environmental Scientist
Organization: Versar
Email: rnarayanan@versar.com
Phone Number: 301-350-5158

2. Air Impact Analysis: Based on the attainment status at the action location, the requirements of the General Conformity Rule are:

_____ applicable
__X__ not applicable

Total combined direct and indirect emissions associated with the action were estimated through ACAM on a calendar-year basis for the "worst-case" and "steady state" (net gain/loss upon action fully implemented) emissions.

"Air Quality Indicators" were used to provide an indication of the significance of potential impacts to air quality. These air quality indicators are EPA General Conformity Rule (GCR) thresholds (de minimis levels) that are applied out of context to their intended use. Therefore, these indicators do not trigger a regulatory requirement; however, they provide a warning that the action is potentially significant. It is important to note that these indicators only provide a clue to the potential impacts to air quality.

Given the GCR de minimis threshold values are the maximum net change an action can acceptably emit in non-attainment and maintenance areas, these threshold values would also conservatively indicate an actions emissions within an attainment would also be acceptable. An air quality indicator value of 100 tons/yr is used based on the GCR de minimis threshold for the least severe non-attainment classification for all criteria pollutants (see 40 CFR 93.153). Therefore, the worst-case year emissions were compared against the GCR Indicator and are summarized below.

Analysis Summary:

2019

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	4.364	100	No
NOx	24.356	100	No
CO	31.879	100	No
SOx	2.189	100	No
PM 10	3.186	100	No
PM 2.5	2.135	100	No
Pb	0.000	25	No
NH3	0.008	100	No
CO2e	5496.6		

2020

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	8.727	100	No
NOx	48.713	100	No
CO	63.759	100	No
SOx	4.378	100	No
PM 10	6.373	100	No
PM 2.5	4.270	100	No
Pb	0.000	25	No
NH3	0.016	100	No
CO2e	10993.2		

2021

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	8.727	100	No
NOx	48.713	100	No
CO	63.759	100	No
SOx	4.378	100	No
PM 10	6.373	100	No
PM 2.5	4.270	100	No
Pb	0.000	25	No
NH3	0.016	100	No
CO2e	10993.2		

2022

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	8.727	100	No
NOx	48.713	100	No
CO	63.759	100	No
SOx	4.378	100	No
PM 10	6.373	100	No
PM 2.5	4.270	100	No
Pb	0.000	25	No
NH3	0.016	100	No
CO2e	10993.2		

2023

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	8.727	100	No
NOx	48.713	100	No
CO	63.759	100	No
SOx	4.378	100	No
PM 10	6.373	100	No
PM 2.5	4.270	100	No
Pb	0.000	25	No
NH3	0.016	100	No
CO2e	10993.2		

2024

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	8.727	100	No
NOx	48.713	100	No
CO	63.759	100	No
SOx	4.378	100	No
PM 10	6.373	100	No
PM 2.5	4.270	100	No
Pb	0.000	25	No
NH3	0.016	100	No
CO2e	10993.2		

2025

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	8.727	100	No
NOx	48.713	100	No
CO	63.759	100	No
SOx	4.378	100	No
PM 10	6.373	100	No
PM 2.5	4.270	100	No
Pb	0.000	25	No
NH3	0.016	100	No
CO2e	10993.2		

2026

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	8.727	100	No
NOx	48.713	100	No
CO	63.759	100	No
SOx	4.378	100	No
PM 10	6.373	100	No
PM 2.5	4.270	100	No
Pb	0.000	25	No
NH3	0.016	100	No
CO2e	10993.2		

2027

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	8.727	100	No
NOx	48.713	100	No
CO	63.759	100	No
SOx	4.378	100	No
PM 10	6.373	100	No
PM 2.5	4.270	100	No
Pb	0.000	25	No
NH3	0.016	100	No
CO2e	10993.2		

2028

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	8.727	100	No
NOx	48.713	100	No
CO	63.759	100	No
SOx	4.378	100	No
PM 10	6.373	100	No
PM 2.5	4.270	100	No
Pb	0.000	25	No
NH3	0.016	100	No
CO2e	10993.2		

2029

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	4.364	100	No
NOx	24.356	100	No
CO	31.879	100	No
SOx	2.189	100	No
PM 10	3.186	100	No
PM 2.5	2.135	100	No
Pb	0.000	25	No
NH3	0.008	100	No
CO2e	5496.6		

2030 - (Steady State)

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.000	100	No
NOx	0.000	100	No
CO	0.000	100	No
SOx	0.000	100	No
PM 10	0.000	100	No
PM 2.5	0.000	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	0.0		

None of estimated emissions associated with this action are above the GCR indicators, indicating no significant impact to air quality; therefore, no further air assessment is needed.

Radhika

Radhika Narayanan, Environmental Scientist

24 October 2019
DATE

JOINT BASE PEARL HARBOR-HICKAM LOW EMISSION SCENARIO SUMMARY

1. General Information: The Air Force's Air Conformity Applicability Model (ACAM) was used to perform an analysis to assess the potential air quality impact/s associated with the action in accordance with the Air Force Instruction 32-7040, Air Quality Compliance And Resource Management; the Environmental Impact Analysis Process (EIAP, 32 CFR 989); and the General Conformity Rule (GCR, 40 CFR 93 Subpart B). This report provides a summary of the ACAM analysis.

a. Action Location:
Base: HICKAM AFB
State: Hawaii
County(s): Honolulu
Regulatory Area(s): NOT IN A REGULATORY AREA

b. Action Title: Joint Base Pearl Harbor-Hickam (JBPHH), Hawaii - Combat Air Force Adversary Air

c. Project Number/s (if applicable): N/A

d. Projected Action Start Date: 7 / 2019

e. Action Description:

Alternative 1 – Establish contract ADAIR capabilities (an estimated 14 aircraft) providing 3,100 annual training sorties at JBPHH in W-188C, W-189, W-190, W-192, W-193, and W-194, operating out of a consolidated facility in Building 2030. Maintenance would use hangar space and AMU facilities in Building 2030 to perform limited maintenance operations on contract ADAIR aircraft and aircraft parking would be on 7 Row.

Alternative 2 – Establish contract ADAIR capabilities (an estimated 14 aircraft) providing 3,100 annual training sorties at JBPHH in W-188C, W-189, W-190, W-192, W-193, and W-194, operating out of Building 3220. Maintenance would use hangar space and AMU facilities in Building 3220 to perform limited maintenance operations on contract ADAIR aircraft and aircraft parking would be on 7 Row.

Alternative 2 is identical to Alternative 1 in terms of air quality impacts thus ACAM was run for Alternative 1 only.

f. Point of Contact:
Name: Radhika Narayanan
Title: Environmental Scientist
Organization: Versar
Email: rnarayanan@versar.com
Phone Number: 301-350-5158

2. Air Impact Analysis: Based on the attainment status at the action location, the requirements of the General Conformity Rule are:

_____ applicable
__X__ not applicable

Total combined direct and indirect emissions associated with the action were estimated through ACAM on a calendar-year basis for the "worst-case" and "steady state" (net gain/loss upon action fully implemented) emissions.

“Air Quality Indicators” were used to provide an indication of the significance of potential impacts to air quality. These air quality indicators are EPA General Conformity Rule (GCR) thresholds (de minimis levels) that are applied out of context to their intended use. Therefore, these indicators do not trigger a regulatory requirement; however, they provide a warning that the action is potentially significant. It is important to note that these indicators only provide a clue to the potential impacts to air quality.

Given the GCR de minimis threshold values are the maximum net change an action can acceptably emit in non-attainment and maintenance areas, these threshold values would also conservatively indicate an actions emissions within an attainment would also be acceptable. An air quality indicator value of 100 tons/yr is used based on the GCR de minimis threshold for the least severe non-attainment classification for all criteria pollutants (see 40 CFR 93.153). Therefore, the worst-case year emissions were compared against the GCR Indicator and are summarized below.

Analysis Summary:

2019

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	20.780	100	No
NOx	9.708	100	No
CO	107.746	100	Yes
SOx	1.570	100	No
PM 10	0.823	100	No
PM 2.5	0.798	100	No
Pb	0.000	25	No
NH3	0.008	100	No
CO2e	3539.1		

2020

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	41.559	100	No
NOx	19.416	100	No
CO	215.493	100	Yes
SOx	3.140	100	No
PM 10	1.646	100	No
PM 2.5	1.596	100	No
Pb	0.000	25	No
NH3	0.016	100	No
CO2e	7078.2		

2021

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	41.559	100	No
NOx	19.416	100	No
CO	215.493	100	Yes
SOx	3.140	100	No
PM 10	1.646	100	No
PM 2.5	1.596	100	No
Pb	0.000	25	No
NH3	0.016	100	No
CO2e	7078.2		

2022

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	41.559	100	No
NOx	19.416	100	No
CO	215.493	100	Yes
SOx	3.140	100	No
PM 10	1.646	100	No
PM 2.5	1.596	100	No
Pb	0.000	25	No
NH3	0.016	100	No
CO2e	7078.2		

2023

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	41.559	100	No
NOx	19.416	100	No
CO	215.493	100	Yes
SOx	3.140	100	No
PM 10	1.646	100	No
PM 2.5	1.596	100	No
Pb	0.000	25	No
NH3	0.016	100	No
CO2e	7078.2		

2024

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	41.559	100	No
NOx	19.416	100	No
CO	215.493	100	Yes
SOx	3.140	100	No
PM 10	1.646	100	No
PM 2.5	1.596	100	No
Pb	0.000	25	No
NH3	0.016	100	No
CO2e	7078.2		

2025

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	41.559	100	No
NOx	19.416	100	No
CO	215.493	100	Yes
SOx	3.140	100	No
PM 10	1.646	100	No
PM 2.5	1.596	100	No
Pb	0.000	25	No
NH3	0.016	100	No
CO2e	7078.2		

2026

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	41.559	100	No
NOx	19.416	100	No
CO	215.493	100	Yes
SOx	3.140	100	No
PM 10	1.646	100	No
PM 2.5	1.596	100	No
Pb	0.000	25	No
NH3	0.016	100	No
CO2e	7078.2		

2027

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	41.559	100	No
NOx	19.416	100	No
CO	215.493	100	Yes
SOx	3.140	100	No
PM 10	1.646	100	No
PM 2.5	1.596	100	No
Pb	0.000	25	No
NH3	0.016	100	No
CO2e	7078.2		

2028

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	41.559	100	No
NOx	19.416	100	No
CO	215.493	100	Yes
SOx	3.140	100	No
PM 10	1.646	100	No
PM 2.5	1.596	100	No
Pb	0.000	25	No
NH3	0.016	100	No
CO2e	7078.2		

2029

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	20.780	100	No
NOx	9.708	100	No
CO	107.746	100	Yes
SOx	1.570	100	No
PM 10	0.823	100	No
PM 2.5	0.798	100	No
Pb	0.000	25	No
NH3	0.008	100	No
CO2e	3539.1		

2030 - (Steady State)

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.000	100	No
NOx	0.000	100	No
CO	0.000	100	No
SOx	0.000	100	No
PM 10	0.000	100	No
PM 2.5	0.000	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	0.0		

Some estimated emissions associated with this action are above the GCR indicators, indicating a significant impact to air quality; therefore, further air assessment is needed.

Radhika Narayanan, Environmental Scientist

24 October 2019
DATE

W-188C, W-189, & W-190 HIGH EMISSION SCENARIO

1. General Information: The Air Force's Air Conformity Applicability Model (ACAM) was used to perform an analysis to assess the potential air quality impact/s associated with the action in accordance with the Air Force Instruction 32-7040, Air Quality Compliance And Resource Management; the Environmental Impact Analysis Process (EIAP, 32 CFR 989); and the General Conformity Rule (GCR, 40 CFR 93 Subpart B). This report provides a summary of the ACAM analysis.

a. Action Location:
Base: HICKAM AFB
State: Hawaii
County(s): Honolulu
Regulatory Area(s): NOT IN A REGULATORY AREA

b. Action Title: Joint Base Pearl Harbor-Hickam (JBPHH), Hawaii - Combat Air Force Adversary Air

c. Project Number/s (if applicable): N/A

d. Projected Action Start Date: 7 / 2019

e. Action Description:

Alternative 1 – Establish contract ADAIR capabilities (an estimated 14 aircraft) providing 3,100 annual training sorties at JBPHH with 3,072 sorties in airspaces W-188C, W-189, W-190, W-192, W-193, and W-194. Maintenance would use hangar space and AMU facilities in Building 2030 to perform limited maintenance operations on contract ADAIR aircraft and aircraft parking would be on 7 Row.

Alternative 2 – Establish contract ADAIR capabilities (an estimated 14 aircraft) providing 3,100 annual training sorties at JBPHH with 3,072 sorties in airspaces W-188C, W-189, W-190, W-192, W-193, and W-194. Maintenance would use hangar space and AMU facilities in Building 3220 to perform limited maintenance operations on contract ADAIR aircraft and aircraft parking would be on 7 Row.

Alternative 2 is identical to Alternative 1 in terms of air quality impacts thus ACAM was run for Alternative 1 only.

f. Point of Contact:
Name: Radhika Narayanan
Title: Environmental Scientist
Organization: Versar
Email: rnarayanan@versar.com
Phone Number: 301-350-5158

2. Air Impact Analysis: Based on the attainment status at the action location, the requirements of the General Conformity Rule are:

_____ applicable
__X__ not applicable

Total combined direct and indirect emissions associated with the action were estimated through ACAM on a calendar-year basis for the "worst-case" and "steady state" (net gain/loss upon action fully implemented) emissions.

"Air Quality Indicators" were used to provide an indication of the significance of potential impacts to air quality. These air quality indicators are EPA General Conformity Rule (GCR) thresholds (de minimis

levels) that are applied out of context to their intended use. Therefore, these indicators do not trigger a regulatory requirement; however, they provide a warning that the action is potentially significant. It is important to note that these indicators only provide a clue to the potential impacts to air quality.

Given the GCR de minimis threshold values are the maximum net change an action can acceptably emit in non-attainment and maintenance areas, these threshold values would also conservatively indicate an actions emissions within an attainment would also be acceptable. An air quality indicator value of 100 tons/yr is used based on the GCR de minimis threshold for the least severe non-attainment classification for all criteria pollutants (see 40 CFR 93.153). Therefore, the worst-case year emissions were compared against the GCR Indicator and are summarized below.

Analysis Summary:

2019

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.035	100	No
NOx	6.620	100	No
CO	0.176	100	No
SOx	0.259	100	No
PM 10	0.176	100	No
PM 2.5	0.158	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	790.3		

2020

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.069	100	No
NOx	13.240	100	No
CO	0.352	100	No
SOx	0.518	100	No
PM 10	0.352	100	No
PM 2.5	0.317	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	1580.5		

2021

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.069	100	No
NOx	13.240	100	No
CO	0.352	100	No
SOx	0.518	100	No
PM 10	0.352	100	No
PM 2.5	0.317	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	1580.5		

2022

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.069	100	No
NOx	13.240	100	No
CO	0.352	100	No
SOx	0.518	100	No
PM 10	0.352	100	No
PM 2.5	0.317	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	1580.5		

2023

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.069	100	No
NOx	13.240	100	No
CO	0.352	100	No
SOx	0.518	100	No
PM 10	0.352	100	No
PM 2.5	0.317	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	1580.5		

2024

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.069	100	No
NOx	13.240	100	No
CO	0.352	100	No
SOx	0.518	100	No
PM 10	0.352	100	No
PM 2.5	0.317	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	1580.5		

2025

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.069	100	No
NOx	13.240	100	No
CO	0.352	100	No
SOx	0.518	100	No
PM 10	0.352	100	No
PM 2.5	0.317	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	1580.5		

2026

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.069	100	No
NOx	13.240	100	No
CO	0.352	100	No
SOx	0.518	100	No
PM 10	0.352	100	No
PM 2.5	0.317	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	1580.5		

2027

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.069	100	No
NOx	13.240	100	No
CO	0.352	100	No
SOx	0.518	100	No
PM 10	0.352	100	No
PM 2.5	0.317	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	1580.5		

2028

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.069	100	No
NOx	13.240	100	No
CO	0.352	100	No
SOx	0.518	100	No
PM 10	0.352	100	No
PM 2.5	0.317	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	1580.5		

2029

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.035	100	No
NOx	6.620	100	No
CO	0.176	100	No
SOx	0.259	100	No
PM 10	0.176	100	No
PM 2.5	0.158	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	790.3		

2030 - (Steady State)

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.000	100	No
NOx	0.000	100	No
CO	0.000	100	No
SOx	0.000	100	No
PM 10	0.000	100	No
PM 2.5	0.000	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	0.0		

None of estimated emissions associated with this action are above the GCR indicators, indicating no significant impact to air quality; therefore, no further air assessment is needed.

Radhika

Radhika Narayanan, Environmental Scientist — 24 October 2019 (DATE)

W-188C, W-189, & W-190 MEDIUM EMISSION SCENARIO

1. General Information: The Air Force's Air Conformity Applicability Model (ACAM) was used to perform an analysis to assess the potential air quality impact/s associated with the action in accordance with the Air Force Instruction 32-7040, Air Quality Compliance And Resource Management; the Environmental Impact Analysis Process (EIAP, 32 CFR 989); and the General Conformity Rule (GCR, 40 CFR 93 Subpart B). This report provides a summary of the ACAM analysis.

a. Action Location:
Base: HICKAM AFB
State: Hawaii
County(s): Honolulu
Regulatory Area(s): NOT IN A REGULATORY AREA

b. Action Title: Joint Base Pearl Harbor-Hickam (JBPHH), Hawaii - Combat Air Force Adversary Air

c. Project Number/s (if applicable): N/A

d. Projected Action Start Date: 7 / 2019

e. Action Description:

Alternative 1 – Establish contract ADAIR capabilities (an estimated 14 aircraft) providing 3,100 annual training sorties at JBPHH with 3,072 sorties in airspaces W-188C, W-189, W-190, W-192, W-193, and W-194. Maintenance would use hangar space and AMU facilities in Building 2030 to perform limited maintenance operations on contract ADAIR aircraft and aircraft parking would be on 7 Row.

Alternative 2 – Establish contract ADAIR capabilities (an estimated 14 aircraft) providing 3,100 annual training sorties at JBPHH with 3,072 sorties in airspaces W-188C, W-189, W-190, W-192, W-193, and W-194. Maintenance would use hangar space and AMU facilities in Building 3220 to perform limited maintenance operations on contract ADAIR aircraft and aircraft parking would be on 7 Row.

Alternative 2 is identical to Alternative 1 in terms of air quality impacts thus ACAM was run for Alternative 1 only.

f. Point of Contact:
Name: Radhika Narayanan
Title: Environmental Scientist
Organization: Versar
Email: rnarayanan@versar.com
Phone Number: 301-350-5158

2. Air Impact Analysis: Based on the attainment status at the action location, the requirements of the General Conformity Rule are:

_____ applicable
__X__ not applicable

Total combined direct and indirect emissions associated with the action were estimated through ACAM on a calendar-year basis for the "worst-case" and "steady state" (net gain/loss upon action fully implemented) emissions.

"Air Quality Indicators" were used to provide an indication of the significance of potential impacts to air quality. These air quality indicators are EPA General Conformity Rule (GCR) thresholds (de minimis

levels) that are applied out of context to their intended use. Therefore, these indicators do not trigger a regulatory requirement; however, they provide a warning that the action is potentially significant. It is important to note that these indicators only provide a clue to the potential impacts to air quality.

Given the GCR de minimis threshold values are the maximum net change an action can acceptably emit in non-attainment and maintenance areas, these threshold values would also conservatively indicate an actions emissions within an attainment would also be acceptable. An air quality indicator value of 100 tons/yr is used based on the GCR de minimis threshold for the least severe non-attainment classification for all criteria pollutants (see 40 CFR 93.153). Therefore, the worst-case year emissions were compared against the GCR Indicator and are summarized below.

Analysis Summary:

2019

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.346	100	No
NOx	2.813	100	No
CO	3.003	100	No
SOx	0.323	100	No
PM 10	0.157	100	No
PM 2.5	0.073	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	1006.6		

2020

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.692	100	No
NOx	5.626	100	No
CO	6.006	100	No
SOx	0.647	100	No
PM 10	0.315	100	No
PM 2.5	0.147	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	2013.1		

2021

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.692	100	No
NOx	5.626	100	No
CO	6.006	100	No
SOx	0.647	100	No
PM 10	0.315	100	No
PM 2.5	0.147	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	2013.1		

2022

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.692	100	No
NOx	5.626	100	No
CO	6.006	100	No
SOx	0.647	100	No
PM 10	0.315	100	No
PM 2.5	0.147	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	2013.1		

2023

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.692	100	No
NOx	5.626	100	No
CO	6.006	100	No
SOx	0.647	100	No
PM 10	0.315	100	No
PM 2.5	0.147	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	2013.1		

2024

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.692	100	No
NOx	5.626	100	No
CO	6.006	100	No
SOx	0.647	100	No
PM 10	0.315	100	No
PM 2.5	0.147	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	2013.1		

2025

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.692	100	No
NOx	5.626	100	No
CO	6.006	100	No
SOx	0.647	100	No
PM 10	0.315	100	No
PM 2.5	0.147	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	2013.1		

2026

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.692	100	No
NOx	5.626	100	No
CO	6.006	100	No
SOx	0.647	100	No
PM 10	0.315	100	No
PM 2.5	0.147	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	2013.1		

2027

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.692	100	No
NOx	5.626	100	No
CO	6.006	100	No
SOx	0.647	100	No
PM 10	0.315	100	No
PM 2.5	0.147	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	2013.1		

2028

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.692	100	No
NOx	5.626	100	No
CO	6.006	100	No
SOx	0.647	100	No
PM 10	0.315	100	No
PM 2.5	0.147	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	2013.1		

2029

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.346	100	No
NOx	2.813	100	No
CO	3.003	100	No
SOx	0.323	100	No
PM 10	0.157	100	No
PM 2.5	0.073	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	1006.6		

2030 - (Steady State)

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.000	100	No
NOx	0.000	100	No
CO	0.000	100	No
SOx	0.000	100	No
PM 10	0.000	100	No
PM 2.5	0.000	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	0.0		

None of estimated emissions associated with this action are above the GCR indicators, indicating no significant impact to air quality; therefore, no further air assessment is needed.

Radhika

____ 24 October 2019

Radhika Narayanan, Environmental Scientist DATE

W-188C, W-189, & W-190 LOW EMISSION SCENARIO

1. General Information: The Air Force's Air Conformity Applicability Model (ACAM) was used to perform an analysis to assess the potential air quality impact/s associated with the action in accordance with the Air Force Instruction 32-7040, Air Quality Compliance And Resource Management; the Environmental Impact Analysis Process (EIAP, 32 CFR 989); and the General Conformity Rule (GCR, 40 CFR 93 Subpart B). This report provides a summary of the ACAM analysis.

a. Action Location:
Base: HICKAM AFB
State: Hawaii
County(s): Honolulu
Regulatory Area(s): NOT IN A REGULATORY AREA

b. Action Title: Joint Base Pearl Harbor-Hickam (JBPHH), Hawaii - Combat Air Force Adversary Air

c. Project Number/s (if applicable): N/A

d. Projected Action Start Date: 7 / 2019

e. Action Description:

Alternative 1 – Establish contract ADAIR capabilities (an estimated 14 aircraft) providing 3,100 annual training sorties at JBPHH with 3,072 sorties in airspaces W-188C, W-189, W-190, W-192, W-193, and W-194. Maintenance would use hangar space and AMU facilities in Building 2030 to perform limited maintenance operations on contract ADAIR aircraft and aircraft parking would be on 7 Row.

Alternative 2 – Establish contract ADAIR capabilities (an estimated 14 aircraft) providing 3,100 annual training sorties at JBPHH with 3,072 sorties in airspaces W-188C, W-189, W-190, W-192, W-193, and W-194. Maintenance would use hangar space and AMU facilities in Building 3220 to perform limited maintenance operations on contract ADAIR aircraft and aircraft parking would be on 7 Row.

Alternative 2 is identical to Alternative 1 in terms of air quality impacts thus ACAM was run for Alternative 1 only.

f. Point of Contact:
Name: Radhika Narayanan
Title: Environmental Scientist
Organization: Versar
Email: rnarayanan@versar.com
Phone Number: 301-350-5158

2. Air Impact Analysis: Based on the attainment status at the action location, the requirements of the General Conformity Rule are:

_____ applicable
__X__ not applicable

Total combined direct and indirect emissions associated with the action were estimated through ACAM on a calendar-year basis for the "worst-case" and "steady state" (net gain/loss upon action fully implemented) emissions.

"Air Quality Indicators" were used to provide an indication of the significance of potential impacts to air quality. These air quality indicators are EPA General Conformity Rule (GCR) thresholds (de minimis

levels) that are applied out of context to their intended use. Therefore, these indicators do not trigger a regulatory requirement; however, they provide a warning that the action is potentially significant. It is important to note that these indicators only provide a clue to the potential impacts to air quality.

Given the GCR de minimis threshold values are the maximum net change an action can acceptably emit in non-attainment and maintenance areas, these threshold values would also conservatively indicate an actions emissions within an attainment would also be acceptable. An air quality indicator value of 100 tons/yr is used based on the GCR de minimis threshold for the least severe non-attainment classification for all criteria pollutants (see 40 CFR 93.153). Therefore, the worst-case year emissions were compared against the GCR Indicator and are summarized below.

Analysis Summary:

2019

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.284	100	No
NOx	0.163	100	No
CO	3.038	100	No
SOx	0.075	100	No
PM 10	0.001	100	No
PM 2.5	0.001	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	228.5		

2020

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.569	100	No
NOx	0.325	100	No
CO	6.076	100	No
SOx	0.150	100	No
PM 10	0.002	100	No
PM 2.5	0.001	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	457.0		

2021

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.569	100	No
NOx	0.325	100	No
CO	6.076	100	No
SOx	0.150	100	No
PM 10	0.002	100	No
PM 2.5	0.001	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	457.0		

2022

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.569	100	No
NOx	0.325	100	No
CO	6.076	100	No
SOx	0.150	100	No
PM 10	0.002	100	No
PM 2.5	0.001	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	457.0		

2023

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.569	100	No
NOx	0.325	100	No
CO	6.076	100	No
SOx	0.150	100	No
PM 10	0.002	100	No
PM 2.5	0.001	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	457.0		

2024

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.569	100	No
NOx	0.325	100	No
CO	6.076	100	No
SOx	0.150	100	No
PM 10	0.002	100	No
PM 2.5	0.001	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	457.0		

2025

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.569	100	No
NOx	0.325	100	No
CO	6.076	100	No
SOx	0.150	100	No
PM 10	0.002	100	No
PM 2.5	0.001	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	457.0		

2026

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.569	100	No
NOx	0.325	100	No
CO	6.076	100	No
SOx	0.150	100	No
PM 10	0.002	100	No
PM 2.5	0.001	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	457.0		

2027

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.569	100	No
NOx	0.325	100	No
CO	6.076	100	No
SOx	0.150	100	No
PM 10	0.002	100	No
PM 2.5	0.001	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	457.0		

2028

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.569	100	No
NOx	0.325	100	No
CO	6.076	100	No
SOx	0.150	100	No
PM 10	0.002	100	No
PM 2.5	0.001	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	457.0		

2029

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.284	100	No
NOx	0.163	100	No
CO	3.038	100	No
SOx	0.075	100	No
PM 10	0.001	100	No
PM 2.5	0.001	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	228.5		

2030 - (Steady State)

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.000	100	No
NOx	0.000	100	No
CO	0.000	100	No
SOx	0.000	100	No
PM 10	0.000	100	No
PM 2.5	0.000	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	0.0		

None of estimated emissions associated with this action are above the GCR indicators, indicating no significant impact to air quality; therefore, no further air assessment is needed.

Radhika Narayanan, Environmental Scientist

24 October 2019
DATE

W-192, W-193, & W-194 HIGH EMISSION SCENARIO

1. General Information: The Air Force's Air Conformity Applicability Model (ACAM) was used to perform an analysis to assess the potential air quality impact/s associated with the action in accordance with the Air Force Instruction 32-7040, Air Quality Compliance And Resource Management; the Environmental Impact Analysis Process (EIAP, 32 CFR 989); and the General Conformity Rule (GCR, 40 CFR 93 Subpart B). This report provides a summary of the ACAM analysis.

a. Action Location:
Base: HICKAM AFB
State: Hawaii
County(s): Honolulu
Regulatory Area(s): NOT IN A REGULATORY AREA

b. Action Title: Joint Base Pearl Harbor-Hickam (JBPHH), Hawaii - Combat Air Force Adversary Air

c. Project Number/s (if applicable): N/A

d. Projected Action Start Date: 7 / 2019

e. Action Description:

Alternative 1 – Establish contract ADAIR capabilities (an estimated 14 aircraft) providing 3,100 annual training sorties at JBPHH with 3,072 sorties in airspaces W-188C, W-189, W-190, W-192, W-193, and W-194. Maintenance would use hangar space and AMU facilities in Building 2030 to perform limited maintenance operations on contract ADAIR aircraft and aircraft parking would be on 7 Row.

Alternative 2 – Establish contract ADAIR capabilities (an estimated 14 aircraft) providing 3,100 annual training sorties at JBPHH with 3,072 sorties in airspaces W-188C, W-189, W-190, W-192, W-193, and W-194. Maintenance would use hangar space and AMU facilities in Building 3220 to perform limited maintenance operations on contract ADAIR aircraft and aircraft parking would be on 7 Row.

Alternative 2 is identical to Alternative 1 in terms of air quality impacts thus ACAM was run for Alternative 1 only.

f. Point of Contact:
Name: Radhika Narayanan
Title: Environmental Scientist
Organization: Versar
Email: rnarayanan@versar.com
Phone Number: 301-350-5158

2. Air Impact Analysis: Based on the attainment status at the action location, the requirements of the General Conformity Rule are:

_____ applicable
__X__ not applicable

Total combined direct and indirect emissions associated with the action were estimated through ACAM on a calendar-year basis for the "worst-case" and "steady state" (net gain/loss upon action fully implemented) emissions.

"Air Quality Indicators" were used to provide an indication of the significance of potential impacts to air quality. These air quality indicators are EPA General Conformity Rule (GCR) thresholds (de minimis

levels) that are applied out of context to their intended use. Therefore, these indicators do not trigger a regulatory requirement; however, they provide a warning that the action is potentially significant. It is important to note that these indicators only provide a clue to the potential impacts to air quality.

Given the GCR de minimis threshold values are the maximum net change an action can acceptably emit in non-attainment and maintenance areas, these threshold values would also conservatively indicate an actions emissions within an attainment would also be acceptable. An air quality indicator value of 100 tons/yr is used based on the GCR de minimis threshold for the least severe non-attainment classification for all criteria pollutants (see 40 CFR 93.153). Therefore, the worst-case year emissions were compared against the GCR Indicator and are summarized below.

Analysis Summary:

2019

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.004	100	No
NOx	0.735	100	No
CO	0.020	100	No
SOx	0.029	100	No
PM 10	0.020	100	No
PM 2.5	0.018	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	87.7		

2020

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.008	100	No
NOx	1.470	100	No
CO	0.039	100	No
SOx	0.058	100	No
PM 10	0.039	100	No
PM 2.5	0.035	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	175.5		

2021

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.008	100	No
NOx	1.470	100	No
CO	0.039	100	No
SOx	0.058	100	No
PM 10	0.039	100	No
PM 2.5	0.035	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	175.5		

2022

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.008	100	No
NOx	1.470	100	No
CO	0.039	100	No
SOx	0.058	100	No
PM 10	0.039	100	No
PM 2.5	0.035	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	175.5		

2023

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.008	100	No
NOx	1.470	100	No
CO	0.039	100	No
SOx	0.058	100	No
PM 10	0.039	100	No
PM 2.5	0.035	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	175.5		

2024

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.008	100	No
NOx	1.470	100	No
CO	0.039	100	No
SOx	0.058	100	No
PM 10	0.039	100	No
PM 2.5	0.035	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	175.5		

2025

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.008	100	No
NOx	1.470	100	No
CO	0.039	100	No
SOx	0.058	100	No
PM 10	0.039	100	No
PM 2.5	0.035	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	175.5		

2026

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.008	100	No
NOx	1.470	100	No
CO	0.039	100	No
SOx	0.058	100	No
PM 10	0.039	100	No
PM 2.5	0.035	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	175.5		

2027

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.008	100	No
NOx	1.470	100	No
CO	0.039	100	No
SOx	0.058	100	No
PM 10	0.039	100	No
PM 2.5	0.035	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	175.5		

2028

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.008	100	No
NOx	1.470	100	No
CO	0.039	100	No
SOx	0.058	100	No
PM 10	0.039	100	No
PM 2.5	0.035	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	175.5		

2029

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.004	100	No
NOx	0.735	100	No
CO	0.020	100	No
SOx	0.029	100	No
PM 10	0.020	100	No
PM 2.5	0.018	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	87.7		

2030 - (Steady State)

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.000	100	No
NOx	0.000	100	No
CO	0.000	100	No
SOx	0.000	100	No
PM 10	0.000	100	No
PM 2.5	0.000	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	0.0		

None of estimated emissions associated with this action are above the GCR indicators, indicating no significant impact to air quality; therefore, no further air assessment is needed.

Radhika

Radhika Narayanan, Environmental Scientist — 24 October 2019 (DATE)

W-192, W-193, & W-194 MEDIUM EMISSION SCENARIO

1. General Information: The Air Force's Air Conformity Applicability Model (ACAM) was used to perform an analysis to assess the potential air quality impact/s associated with the action in accordance with the Air Force Instruction 32-7040, Air Quality Compliance And Resource Management; the Environmental Impact Analysis Process (EIAP, 32 CFR 989); and the General Conformity Rule (GCR, 40 CFR 93 Subpart B). This report provides a summary of the ACAM analysis.

a. Action Location:
Base: HICKAM AFB
State: Hawaii
County(s): Honolulu
Regulatory Area(s): NOT IN A REGULATORY AREA

b. Action Title: Joint Base Pearl Harbor-Hickam (JBPHH), Hawaii - Combat Air Force Adversary Air

c. Project Number/s (if applicable): N/A

d. Projected Action Start Date: 7 / 2019

e. Action Description:

Alternative 1 – Establish contract ADAIR capabilities (an estimated 14 aircraft) providing 3,100 annual training sorties at JBPHH with 3,072 sorties in airspaces W-188C, W-189, W-190, W-192, W-193, and W-194. Maintenance would use hangar space and AMU facilities in Building 2030 to perform limited maintenance operations on contract ADAIR aircraft and aircraft parking would be on 7 Row.

Alternative 2 – Establish contract ADAIR capabilities (an estimated 14 aircraft) providing 3,100 annual training sorties at JBPHH with 3,072 sorties in airspaces W-188C, W-189, W-190, W-192, W-193, and W-194. Maintenance would use hangar space and AMU facilities in Building 3220 to perform limited maintenance operations on contract ADAIR aircraft and aircraft parking would be on 7 Row.

Alternative 2 is identical to Alternative 1 in terms of air quality impacts thus ACAM was run for Alternative 1 only.

f. Point of Contact:
Name: Radhika Narayanan
Title: Environmental Scientist
Organization: Versar
Email: rnarayanan@versar.com
Phone Number: 301-350-5158

2. Air Impact Analysis: Based on the attainment status at the action location, the requirements of the General Conformity Rule are:

_____ applicable
__X__ not applicable

Total combined direct and indirect emissions associated with the action were estimated through ACAM on a calendar-year basis for the "worst-case" and "steady state" (net gain/loss upon action fully implemented) emissions.

"Air Quality Indicators" were used to provide an indication of the significance of potential impacts to air quality. These air quality indicators are EPA General Conformity Rule (GCR) thresholds (de minimis

levels) that are applied out of context to their intended use. Therefore, these indicators do not trigger a regulatory requirement; however, they provide a warning that the action is potentially significant. It is important to note that these indicators only provide a clue to the potential impacts to air quality.

Given the GCR de minimis threshold values are the maximum net change an action can acceptably emit in non-attainment and maintenance areas, these threshold values would also conservatively indicate an actions emissions within an attainment would also be acceptable. An air quality indicator value of 100 tons/yr is used based on the GCR de minimis threshold for the least severe non-attainment classification for all criteria pollutants (see 40 CFR 93.153). Therefore, the worst-case year emissions were compared against the GCR Indicator and are summarized below.

Analysis Summary:

2019

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.038	100	No
NOx	0.312	100	No
CO	0.333	100	No
SOx	0.036	100	No
PM 10	0.017	100	No
PM 2.5	0.008	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	111.8		

2020

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.077	100	No
NOx	0.625	100	No
CO	0.667	100	No
SOx	0.072	100	No
PM 10	0.035	100	No
PM 2.5	0.016	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	223.5		

2021

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.077	100	No
NOx	0.625	100	No
CO	0.667	100	No
SOx	0.072	100	No
PM 10	0.035	100	No
PM 2.5	0.016	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	223.5		

2022

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.077	100	No
NOx	0.625	100	No
CO	0.667	100	No
SOx	0.072	100	No
PM 10	0.035	100	No
PM 2.5	0.016	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	223.5		

2023

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.077	100	No
NOx	0.625	100	No
CO	0.667	100	No
SOx	0.072	100	No
PM 10	0.035	100	No
PM 2.5	0.016	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	223.5		

2024

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.077	100	No
NOx	0.625	100	No
CO	0.667	100	No
SOx	0.072	100	No
PM 10	0.035	100	No
PM 2.5	0.016	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	223.5		

2025

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.077	100	No
NOx	0.625	100	No
CO	0.667	100	No
SOx	0.072	100	No
PM 10	0.035	100	No
PM 2.5	0.016	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	223.5		

2026

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.077	100	No
NOx	0.625	100	No
CO	0.667	100	No
SOx	0.072	100	No
PM 10	0.035	100	No
PM 2.5	0.016	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	223.5		

2027

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.077	100	No
NOx	0.625	100	No
CO	0.667	100	No
SOx	0.072	100	No
PM 10	0.035	100	No
PM 2.5	0.016	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	223.5		

2028

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.077	100	No
NOx	0.625	100	No
CO	0.667	100	No
SOx	0.072	100	No
PM 10	0.035	100	No
PM 2.5	0.016	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	223.5		

2029

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.038	100	No
NOx	0.312	100	No
CO	0.333	100	No
SOx	0.036	100	No
PM 10	0.017	100	No
PM 2.5	0.008	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	111.8		

2030 - (Steady State)

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.000	100	No
NOx	0.000	100	No
CO	0.000	100	No
SOx	0.000	100	No
PM 10	0.000	100	No
PM 2.5	0.000	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	0.0		

None of estimated emissions associated with this action are above the GCR indicators, indicating no significant impact to air quality; therefore, no further air assessment is needed.

Radhika

Radhika Narayanan, Environmental Scientist

24 October 2019
DATE

W-192, W-193, & W-194 LOW EMISSION SCENARIO

1. General Information: The Air Force's Air Conformity Applicability Model (ACAM) was used to perform an analysis to assess the potential air quality impact/s associated with the action in accordance with the Air Force Instruction 32-7040, Air Quality Compliance And Resource Management; the Environmental Impact Analysis Process (EIAP, 32 CFR 989); and the General Conformity Rule (GCR, 40 CFR 93 Subpart B). This report provides a summary of the ACAM analysis.

a. Action Location:
Base: HICKAM AFB
State: Hawaii
County(s): Honolulu
Regulatory Area(s): NOT IN A REGULATORY AREA

b. Action Title: Joint Base Pearl Harbor-Hickam (JBPHH), Hawaii - Combat Air Force Adversary Air

c. Project Number/s (if applicable): N/A

d. Projected Action Start Date: 7 / 2019

e. Action Description:

Alternative 1 – Establish contract ADAIR capabilities (an estimated 14 aircraft) providing 3,100 annual training sorties at JBPHH with 3,072 sorties in airspaces W-188C, W-189, W-190, W-192, W-193, and W-194. Maintenance would use hangar space and AMU facilities in Building 2030 to perform limited maintenance operations on contract ADAIR aircraft and aircraft parking would be on 7 Row.

Alternative 2 – Establish contract ADAIR capabilities (an estimated 14 aircraft) providing 3,100 annual training sorties at JBPHH with 3,072 sorties in airspaces W-188C, W-189, W-190, W-192, W-193, and W-194. Maintenance would use hangar space and AMU facilities in Building 3220 to perform limited maintenance operations on contract ADAIR aircraft and aircraft parking would be on 7 Row.

Alternative 2 is identical to Alternative 1 in terms of air quality impacts thus ACAM was run for Alternative 1 only.

f. Point of Contact:
Name: Radhika Narayanan
Title: Environmental Scientist
Organization: Versar
Email: rnarayanan@versar.com
Phone Number: 301-350-5158

2. Air Impact Analysis: Based on the attainment status at the action location, the requirements of the General Conformity Rule are:

_____ applicable
__X__ not applicable

Total combined direct and indirect emissions associated with the action were estimated through ACAM on a calendar-year basis for the "worst-case" and "steady state" (net gain/loss upon action fully implemented) emissions.

"Air Quality Indicators" were used to provide an indication of the significance of potential impacts to air quality. These air quality indicators are EPA General Conformity Rule (GCR) thresholds (de minimis

levels) that are applied out of context to their intended use. Therefore, these indicators do not trigger a regulatory requirement; however, they provide a warning that the action is potentially significant. It is important to note that these indicators only provide a clue to the potential impacts to air quality.

Given the GCR de minimis threshold values are the maximum net change an action can acceptably emit in non-attainment and maintenance areas, these threshold values would also conservatively indicate an actions emissions within an attainment would also be acceptable. An air quality indicator value of 100 tons/yr is used based on the GCR de minimis threshold for the least severe non-attainment classification for all criteria pollutants (see 40 CFR 93.153). Therefore, the worst-case year emissions were compared against the GCR Indicator and are summarized below.

Analysis Summary:

2019

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.032	100	No
NOx	0.018	100	No
CO	0.337	100	No
SOx	0.008	100	No
PM 10	0.000	100	No
PM 2.5	0.000	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	25.4		

2020

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.063	100	No
NOx	0.036	100	No
CO	0.675	100	No
SOx	0.017	100	No
PM 10	0.000	100	No
PM 2.5	0.000	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	50.7		

2021

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.063	100	No
NOx	0.036	100	No
CO	0.675	100	No
SOx	0.017	100	No
PM 10	0.000	100	No
PM 2.5	0.000	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	50.7		

2022

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.063	100	No
NOx	0.036	100	No
CO	0.675	100	No
SOx	0.017	100	No
PM 10	0.000	100	No
PM 2.5	0.000	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	50.7		

2023

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.063	100	No
NOx	0.036	100	No
CO	0.675	100	No
SOx	0.017	100	No
PM 10	0.000	100	No
PM 2.5	0.000	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	50.7		

2024

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.063	100	No
NOx	0.036	100	No
CO	0.675	100	No
SOx	0.017	100	No
PM 10	0.000	100	No
PM 2.5	0.000	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	50.7		

2025

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.063	100	No
NOx	0.036	100	No
CO	0.675	100	No
SOx	0.017	100	No
PM 10	0.000	100	No
PM 2.5	0.000	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	50.7		

2026

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.063	100	No
NOx	0.036	100	No
CO	0.675	100	No
SOx	0.017	100	No
PM 10	0.000	100	No
PM 2.5	0.000	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	50.7		

2027

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.063	100	No
NOx	0.036	100	No
CO	0.675	100	No
SOx	0.017	100	No
PM 10	0.000	100	No
PM 2.5	0.000	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	50.7		

2028

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.063	100	No
NOx	0.036	100	No
CO	0.675	100	No
SOx	0.017	100	No
PM 10	0.000	100	No
PM 2.5	0.000	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	50.7		

2029

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.032	100	No
NOx	0.018	100	No
CO	0.337	100	No
SOx	0.008	100	No
PM 10	0.000	100	No
PM 2.5	0.000	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	25.4		

2030 - (Steady State)

Pollutant	Action Emissions (ton/yr)	AIR QUALITY INDICATOR	
		Threshold (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.000	100	No
NOx	0.000	100	No
CO	0.000	100	No
SOx	0.000	100	No
PM 10	0.000	100	No
PM 2.5	0.000	100	No
Pb	0.000	25	No
NH3	0.000	100	No
CO2e	0.0		

None of estimated emissions associated with this action are above the GCR indicators, indicating no significant impact to air quality; therefore, no further air assessment is needed.

Radhika Narayanan, Environmental Scientist

24 October 2019
DATE

APPENDIX D

LISTED SPECIES POTENTIALLY OCCURRING IN THE ACTION AREA

This page intentionally left blank

THREATENED AND ENDANGERED SPECIES/CRITICAL HABITAT

Table D-1 provides a complete list of federally and state listed threatened and endangered species that could occur at Joint Base Pearl Harbor-Hickam (JBPHH) and in the Warning Areas. This species list is derived from the JBPHH Integrated Natural Resources Management Plan, United States Fish and Wildlife Service (USFWS) Environmental Conservation Online System, National Marine Fisheries Service (NMFS) Listed Species Lists, and the State of Hawaii, Division of Forestry and Wildlife Species of Greatest Conservation Need list. The USFWS's Information and Planning for Consultation website is not available for locations in Hawaii.

There is no suitable terrestrial habitat at JBPHH for any federally or state listed species. The entire base is developed and is located in urban Honolulu; however, federally and state listed species that occur in, estuarine and coastal habitats near JBPHH could potentially be affected. One federally listed endangered waterbird, the Hawaiian black-necked stilt (*Himantopus mexicanus knudseni*), is common in coastal wetland areas at JBPHH. Hawaiian duck (*Anas wyvilliana*) X mallard (*Anas platyrhynchos*) hybrids, and potentially Hawaiian ducks, are also frequently observed in ponding areas around base. The Hawaiian common moorhen (*Gallinula chloropus sandviciensis*) and Hawaiian coot (*Fulica alai*) have been observed on base. Hawaiian monk seals (*Monachus schauinslandi*) are occasionally observed at JBPHH beaches, and injured green turtles (*Chelonia mydas*) occasionally wash up on shore.

Because there would be no construction or ground-disturbing activities and all potential impacts to listed species would be from aircraft noise and movement, there would be no impacts on terrestrial reptiles, amphibians, freshwater fish, mollusks, crustaceans, insects, corals, and plants, including any of these species that are federally listed and with potential occurrences elsewhere on Oahu or in the surrounding coastal waters. Potential impacts would be limited to birds, mammals, and marine reptiles and marine fish. The description of those species potentially impacted by the Proposed Action are provided below.

There is no designated critical habitat on or immediately adjacent to JBPHH.

Table D-1
Federal and State Listed Species with the Potential to Occur in or near Joint Base Pearl Harbor-Hickam and the Warning Areas

Species	Federal Status[1]	Hawaii State Status[2]	JBPHH	Warning Areas
Birds				
Hawaiian common moorhen (*Gallinula chloropus sandviciensis*)	E	E	X	
Hawaiian coot (*Fulica alai*)	E	E	X	
Hawaiian duck (*Anas wyvilliana*)	E	E	X	
Hawaiian short-eared owl (*Asio flammeus sandwichensis*)	-	E	X	
Hawaiian black-necked stilt (*Himantopus mexicanus knudseni*)	E	E	X	
Newell's Townsend's shearwater (*Puffinus auricularis newelli*)	T	T		X
Short-tailed albatross (*Phoebastria* [=*Diomedea*] *albatrus*)	E	E		X
White tern (*Gygis alba*)	-	T	X	

Table D-1
Federal and State Listed Species with the Potential to Occur in or near Joint Base Pearl Harbor-Hickam and the Warning Areas

Species	Federal Status[1]	Hawaii State Status[2]	JBPHH	Warning Areas
Mammals				
Blue whale (*Balaenoptera musculus*)	E	-		X
Bryde's whale – Gulf of Mexico DPS (*Balaenoptera edeni*)	E	-		
False killer whale – Main Hawaiian Islands Insular DPS (*Pseudorca crassidens*)	E	E		X
Fin whale (*Balaenoptera physalus*)	E	E		X
Hawaiian monk seal (*Monachus schauinslandi*)	E	E	X	X
Humpback whale – Western North Pacific DPS (*Megaptera novaeangliae*)	E	-	X	X
Humpback whale – Mexico DPS (*Megaptera novaeangliae*)	T	E	X	X
Killer whale – Southern Resident DPS (*Orcinus orca*)	E	-		
Sei whale (*Balaenoptera borealis*)	E	-		X
Sperm whale (*Physeter macrocephalus*)	E	E		X
Reptiles				
Green turtle – Central South Pacific and Central West Pacific DPSs (*Chelonia mydas*)	E	T	X	X
Hawksbill turtle (*Eretmochelys imbricata*)	E	E	X	X
Leatherback turtle (*Dermochelys coriacea*)	E	E		X
Loggerhead turtle - (North Pacific Ocean DPS (*Caretta caretta*)	E	T	X	X
Olive ridley turtle (*Lepidochelys olivacea)*	T	T		X
Fish				
Giant manta ray (*Manta birostris*)	T	-		X
Oceanic whitetip shark (*Carcharhinus longimanus*)	T	-		X
Scalloped hammerhead shark – East Pacific DPS (*Sphyrna lewini*)	E	-		X

Source:
[1] USFWS, 2019a
[2] JBPHH, 2011; Hawaii Division of Forestry and Wildlife, 2019

DPS = Distinct Population Segment; E = Endangered; JBPHH = Joint Base Pearl Harbor Hickam; T = Threatened

Hawaiian Duck: The Hawaiian duck is a federally listed endangered, endemic waterbird that historically was found along the shoreline, estuarine, and freshwater habitats of Pearl Harbor. They were generally observed in the Honouliuli and Waiawa Units of the Pearl Harbor National Wildlife Refuge (PHNWR) and at the mouth of streams that flow into the harbor. They primarily feed on freshwater vegetation, insects, and mollusks. Biologists believe that the Hawaiian duck has largely been replaced with a hybrid between the Hawaiian duck and mallard. State waterbird biannual survey efforts indicate that the hybridized duck numbers do dominate the Island of Oahu; however, as recently as 2005, a Hawaiian duck was documented on Oahu, through genetic testing, as result of an airstrike incident with a commercial airliner at Daniel K. Inouye International airport (JBPHH, 2011).

Hawaiian Common Moorhen. Hawaiian common moorhens are federally listed endangered, endemic, small, black waterbirds that can be found along the shoreline, estuarine, and freshwater habitats of Pearl Harbor including JBPHH. They are opportunistic feeders and their diet varies with habitat but may include algae, grass seeds, plant material, insects, and snails. Hawaiian common moorhens are very secretive and, thus, are hard to monitor. Population estimates indicate there are up to 300 common moorhens in existence (JBPHH, 2011).

Hawaiian Coot. Hawaiian coots are federally listed endangered, endemic, plump, chicken-like birds that can be found along the shoreline, estuarine, and freshwater habitats of Pearl Harbor including JBPHH. The species is somewhat gregarious and uses freshwater and brackish wetlands, including agricultural (e.g., taro fields) wetlands and aquaculture ponds. They have a broad diet that includes snails, crustaceans, insects, small fish, tadpoles, leaves, and seeds. Nesting habitats includes freshwater and brackish ponds, irrigation ditches, and taro fields. Floating nests are constructed of aquatic vegetation and found in open water or anchored to emergent vegetation (JBPHH, 2011).

Hawaiian Black-Necked Stilt. Hawaiian black-necked stilts (also known as Hawaiian stilts) are federally listed endangered, endemic, slim, wading birds that can be found along the shoreline, estuarine, and freshwater habitats of Pearl Harbor including JBPHH. They primarily feed on insects and crustaceans. In Pearl Harbor, the primary stilt habitat includes the Honouliuli and Waiawa Units of the PHNWR, as well as other shallow mudflats along the intertidal areas of Pearl City Peninsula and Naval Magazine Pearl Harbor West Loch Branch (JBPHH, 2011).

White (Fairy) Tern. White (fairy) tern (*Gygis alba*) is a state listed threatened bird species that was recorded at PHNWR. It is a small, entirely white tern that primarily feeds on small fish, squid, and crustaceans. Individuals have dark eyes and a thick, sharply pointed black bill with an electric blue bae. They do not construct nests but instead lay a single egg in a suitable depression including tree branches, building, rock ledges, or on the ground. On Oahu, the number of pairs has increased from one to greater than 250 between 1961 and 2005 (JBPHH, 2011).

Hawaiian Short-Eared Owl. The Hawaiian short-eared owl (*Asio flammeus sandwichensis*) is state listed as an endangered species on Oahu and was recorded at Waipiʻo Peninsula and PHNWR. It is an endemic subspecies of one of the world’s most widely distributed medium-sized owls. They primarily consume small mammals. Females build nests on the ground constructed of simple scraps in the ground lined with grasses and feather down. Population is unknown as few of the owls were detected during previous forest bird surveys (JBPHH, 2011).

Newell’s Townsend’s Shearwater. The Newell’s Townsend’s shearwater (*Puffinus newelli*) is a medium-sized shearwater with a glossy black top, a white bottom, and a black bill that is sharply hooked. They live in open tropical seas and offshore waters near breeding grounds where they plunge-dive for prey such as squid and fish. During the breeding season, they nest in burrows under ferns on forested mountain slopes. They forage over the open ocean. The primarily occur in the southern portion of the Hawaiian Islands but could be present in all of the Warning Areas (US Navy, 2018).

Short-Tailed Albatross. The short-tailed albatross (*Phoebastria* [=*Diomedea*] *albatrus*) is a large, white seabird with a 7-foot wingspan, black and white wings, and a large, pink bill. It forages across the entire North Pacific, but its nesting habitat is isolated to islands in Japan. Its diet consists of squid, fish, and shrimp.

Currently, the short-tailed albatross population is estimated at approximately 1,200 individuals. Of these, the total number of breeding age birds is thought to be approximately 600 individuals. At-sea sightings since the 1940s indicate that the short-tailed albatross, while very few in number today, is distributed widely throughout its historical foraging range of the temperate and subarctic North Pacific Ocean and is often found close to the United States coast (USFWS, 2019b). The short-tailed albatross could travel and forage in the Warning Areas.

Blue Whale. The blue whale (*Balaenoptera musculus*) is a baleen whale primarily feeding on krill that occurs globally and the largest animal to have ever lived on Earth. Females are slightly larger than males. Blue whales are listed as a federally endangered species. Blue whales inhabit all oceans and typically occur near the coast over the continental shelf; they have also been recorded in oceanic waters (US Navy, 2018). The blue whale could occur in the Warning Areas with peak abundance in the winter.

Bryde's Whale. The Bryde's whale (*Balaenoptera edeni*) is a baleen whale feeding primarily on crustaceans, cephalopods, and small fish and also a member of the rorquals, a group that also includes blue whales and humpback whales. Bryde's whales occur in warm, temperate oceans including the Atlantic, Indian, and Pacific. Some populations of Bryde's whales migrate with the seasons, while others do not migrate, making them unique among other migrating baleen whales. Bryde's whales are threatened by vessel strikes, ocean noise, and whaling outside the United States while the Gulf of Mexico subspecies, which does not migrate, is also threatened by oil and gas activities, and oil spills and cleanup. It is estimated that there are fewer than 100 Gulf of Mexico Bryde's whales (NOAA Fisheries, 2019a). Although the Bryde's whale is occasionally spotted in Hawaiian waters, the Gulf of Mexico Bryde's whale is listed as Endangered and would not occur in the Warning Areas.

False Killer Whale. The Main Hawaiian Islands Insular Stock Distinct Population Segment (DPS) of the false killer whale (*Pseudorca crassidens*) is listed as federally endangered. False killer whales feed primarily on deep sea cephalopods and fish and have been known to attack other cetaceans, including dolphins and large whales. This species is found regularly within Hawaiian waters and has been reported in groups of up to 100 and would occur in the Warning Areas (US Navy, 2018).

Fin Whale. The federally endangered fin whale (*Balaenoptera physalus*) has a v-shaped head and a tall, hooked dorsal fin that rises at a shallow angle from its back. It is the second largest whale species. The fin whale feeds by gulping a wide variety of organisms including small schooling fish, squid, and crustaceans (including krill). Fin whales are found in all of the world's oceans and could occur rarely in deep offshore waters in the Warning Areas (US Navy, 2018).

Hawaiian Monk Seal. The federally listed, endangered Hawaiian monk seal is a pinniped, of the family Phocidae. Adult monk seals measure about 7 to 8 feet in length and weigh about 400 to 600 pounds with females often being larger than males. Mature Hawaiian monk seals are a silver or slate gray on their dorsal side and have a cream coloring on their stomach, chest, and throat. They feed on fish, cephalopods, and crustaceans. Current population estimates of Hawaiian monk seals indicate approximately 1,200 seals remaining. Haul-out areas for pupping, nursing, and resting are primarily sandy beaches, but virtually all substrates, including emergent reef and shipwrecks, are used at various islands. Hawaiian monk seals frequently haul out primarily on a sandy beach at Iroquois Point-Puʻuloa Beach (versus emergent reef across the Pearl Harbor Entrance Chanel from JBPHH); however, one seal has been observed hauled out in the vicinity of Marine Railway No. 2 at the Shipyard (JBPHH, 2011) and could occur in the Warning Areas.

Humpback Whale. Three DPSs of the humpback whale (*Megaptera novaeangliae*) are present within the Warning Areas; the Mexico DPS and Western North Pacific DPS are federally listed, and the Hawaii DPS is not listed. The humpback whale primarily feeds on krill and fish. During the winter breeding season from December through April, the humpback whale is present in coastal waters, primarily within water depths of 985 feet (300 meters). Whale sightings in the vicinity of Pearl Harbor are extremely rare. A humpback whale was sighted within Pearl Harbor on 9 August 2005, and an adult humpback whale and calf were reported in East Loch on 21 March 1998 (JBPHH, 2011).

Killer Whale. The killer whale (*Orcinus orca*) has a distinctive black and white color pattern with black dorsal and white ventral portions and a white patch above and behind the eye. They are globally distributed and likely the most widely distributed mammal species. They have a diverse diet and primarily feed on fish, although some individual populations prey on marine mammals such as dolphins and seals. Five killer whale stocks are recognized within the Pacific US Exclusive Economic Zone, with only the Hawaiian stock occurring in Hawaii; the Hawaiian stock is not federally listed and no listed killer whale DPSs would occur in the Warning Areas (US Navy, 2018).

Sei Whale. The sei whale (*Balaenoptera boreali*) is mostly dark-gray in color with a lighter belly, often with mottling on the back. The major prey species for the sei whale are copepods and krill. Sei whales occur in very low population numbers. They typically occur in deep, oceanic waters of the cool temperate zone and prefer regions of steep bathymetric relief, such as the continental shelf break, canyons, or basins between banks and ledges. They occur in the warmer waters of the Warning Areas in the winter and have only been detected in the Hawaiian Islands on a few occasions (US Navy, 2018).

Sperm Whale. The sperm whale (*Physeter microcephalus*) is the largest of the toothed whales and is distinguished by an extremely large head and a single blowhole located on the left side of its head (asymmetrical) near the tip. The sperm whale is mostly dark-gray with some sperm whales having white patches on the belly. The sperm whale preys on large mesopelagic squids and other cephalopods, demersal fish, and benthic invertebrates. Sperm whales are globally distributed and occur in deep offshore waters. Sperm whales are listed as federally endangered. They occur in offshore waters of Hawaii during most of the year but do migrate to equatorial waters in the winter (US Navy, 2018).

Green Turtle. The Central North Pacific and East Pacific Ocean DPS green turtle (*Chelonia mydas*) occur in the Warning Areas. The green turtle has a smooth black, gray-green, brown, and yellow top shell and a yellowish-white bottom shell. Its diet consists mostly of seagrasses and algae. The green turtle was listed under the federal Endangered Species Act in July 1978. Similar to the loggerhead turtle, the green turtle is globally distributed, is the most common sea turtle in the waters of the main Hawaiian Islands and occurs in waters near JBPHH including the Pearl Harbor Entrance Channel and in the Warning Areas year round (US Navy, 2018; NMFS, 2018).

Hawksbill Turtle. The hawksbill turtle (*Eretmochelys imbricata*) is a small- to medium-sized sea turtle, has the longest measured dive times of any sea turtle, and is omnivorous during its later juvenile stage, feeding on encrusting organisms such as sponges, tunicates, bryozoans, algae, mollusks, and a variety of other items such as crustaceans and jellyfish; however, older juveniles and adults are more specialized, feeding primarily on sponges, which comprise as much as 95 percent of their diet in some locations. Hawksbill sea turtles are migratory and hatchlings may prefer the open ocean with juveniles returning to coastal habitats and nearshore foraging grounds (US Navy, 2018). The hawksbill turtle would occur in the Warning Areas.

Leatherback Turtle. The leatherback turtle (*Dermochelys coriacea*) is the largest and deepest-diving sea turtle. Leatherback turtles feed throughout the epipelagic and into the mesopelagic zones of the water column on gelatinous zooplankton such as cnidarians (jellyfish and siphonophores) and tunicates (salps and pyrosomas). Leatherback turtles nest along the Pacific coast of the Americas and along the along the Indo-Pacific coastlines. Leatherback turtles could occur throughout the Warning Areas as they migrate across the Pacific past Hawaii. They are sighted in offshore waters typically beyond the 3,800-foot depth contour and especially off the southeastern end of the Hawaiian Islands (US Navy, 2018). Leatherback turtles could occur in the Warning Areas.

Loggerhead Turtle. Loggerhead turtles (*Caretta caretta*) are the most abundant species of sea turtle found in US coastal waters. Loggerhead turtles have a top shell that is slightly heart-shaped and reddish-brown with a pale, yellowish bottom shell. Their diet primarily consists of whelks and conch. Loggerhead turtles are circumglobal, occurring throughout the temperate and tropical regions of the Atlantic, Pacific, and Indian Oceans. Pelagic juveniles and feeding adults can occur in the Warning Areas as they use the entire North Pacific during development and as they make transoceanic crossing to and from nesting grounds in Japan (US Navy, 2018; NMFS, 2018).

Olive Ridley Turtle. The olive ridley turtle (*Lepidochelys olivacea*) has a heart-shaped, grayish-green top shell and has a broad diet consisting of shrimp, fish, lobster, crabs, tunicates, mollusks, and algae. They are globally distributed. The olive ridley turtle was listed as threatened under the ESA in July 1978. This species is globally distributed and requires international protection. Cooperation between countries, as well as individual country initiative has led to various international treaties and agreements as well as federal laws for olive ridley sea turtle conservation (NOAA Fisheries, 2019d). The olive ridley turtle is known to occur in waters in the Warning Areas and has been documented to nest on the Hawaiian Islands three times (US Navy, 2018).

Giant Manta Ray. The giant manta ray (*Manta birostris*), the largest ray in the world, is listed as Threatened. It is a filter feeder and eats large quantities of zooplankton. Giant manta rays are migratory with small, highly fragmented populations that are sparsely distributed across the world. The main threat to the giant manta ray is commercial fishing, with the species both targeted and caught as bycatch in a number of global fisheries throughout its range (NOAA Fisheries, 2019b). The giant manta ray is found throughout the waters off of the Hawaiian Islands and large aggregations are known to occur along the Kona coast off the Big Island (US Navy, 2018). The giant manta ray does occur in the Warning Areas.

Oceanic Whitetip Shark. The oceanic whitetip shark (*Carcharhinus longimanus*) is listed as Threatened, found in tropical and subtropical oceans throughout the world, and long-lived and late maturing. They feed on a wide variety of bony fishes including mackerel and tuna as well as sea birds, sea turtles, stingrays, and squid. Their fins are highly valued in the international trade for shark products. This along with being caught as bycatch in commercial fisheries are the likely causes of their population declines (NOAA Fisheries, 2019c). The oceanic whitetip shark could be present in the Warning Areas.

Scalloped Hammerhead Shark. The Eastern Pacific DPS of the scalloped hammerhead shark (*Sphyrna lewini*) is federally listed as endangered. It occurs in coastal and semioceanic temperate and tropical waters from the surface to approximately 900 feet in depth. Scalloped hammerhead sharks feed primarily at night on a wide variety of fishes and invertebrates. They occur in the waters off the Hawaiian Islands and would occur in the Warning Areas (US Navy, 2018).

References

Hawaii Division of Forestry and Wildlife. 2019. *State Wildlife Action Plan Fact Sheets*. <http://dlnr.hawaii.gov/wildlife/hswap/fact-sheets/>. Accessed May 2019.

JBPHH. 2011. *Joint Base Pearl Harbor Hickam Integrated Natural Resources Management Plan*. September.

NMFS. 2018. *Find a Species*. <https://www.fisheries.noaa.gov/find-species>. Accessed May 2018.

NOAA Fisheries. 2019a. *Species Directory: Bryde's Whale*. <https://www.fisheries.noaa.gov/species/brydes-whale>. Accessed April 2019.

NOAA Fisheries. 2019b. *Species Directory: Giant Manta Ray*. <https://www.fisheries.noaa.gov/species/giant-manta-ray>. Accessed April 2019.

NOAA Fisheries. 2019c. *Species Directory: Oceanic Whitetip Shark*. <https://www.fisheries.noaa.gov/species/oceanic-whitetip-shark>. Accessed April 2019.

NOAA Fisheries. 2019d. *Species Directory: Olive Ridley Turtle*. <https://www.fisheries.noaa.gov/species/olive-ridley-turtle>. Accessed April 2019.

US Navy. 2018. *Hawaii-Southern California Training and Testing Final Environmental Impact Statement/ Overseas Environmental Impact Statement*. October.

USFWS. 2019a. *Environmental Conservation Online System*. <https://ecos.fws.gov/ecp/>. Accessed May 2019.

USFWS. 2019b. *Species Profile for Short-Tailed Albatross (Phoebastria (=diomedea) albatrus)*. <https://ecos.fws.gov/ecp0/profile/speciesProfile?spcode=B00Y>. Accessed February 2019.

This page intentionally left blank