Draft
Environmental Assessment
Addition of F-35 Joint Strike Fighters, Addition of F-22A Raptors and Contract Adversary Air
Nellis Air Force Base, Nevada

May 2021

United States Air Force
57th Wing
65th Aggressor Squadron
422nd Test and Evaluation Squadron
Nellis Air Force Base, Nevada

United Kingdom
Royal Air Force
No. 17 Test and Evaluation Squadron

PRIVACY ADVISORY

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

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

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 Personal home addresses and phone numbers will not be published in the EA.

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COVER SHEET
Draft Environmental Assessment for Addition of F-35 Joint Strike Fighters, Addition of F-22A Raptors and Contract Adversary Air

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

b. *Cooperating Agency: None*

c. *Proposals and Actions:*

The Air Force is proposing to add 17 F-35 Joint Strike Fighter aircraft at Nellis Air Force Base (AFB) to support the 65th Aggressor Squadron (AGRS), 422nd Test and Evaluation Squadron (TES), and No. 17 TES; add three F-22A Raptor aircraft to the 422nd TES; and operate contractor-owned contractor-operated Adversary Air (COCO ADAIR) from Nellis AFB, Nevada. Together, the components of this action would add 751 personnel at Nellis AFB (479 personnel for the addition of the 17 F-35 Joint Strike Fighter aircraft, 32 personnel for the addition of the three F-22A Raptor aircraft, and 240 personnel for COCO ADAIR). Facility demolition, renovation, construction, and addition would be necessary to support the new aircraft.

d. *For Additional Information:* Mr. Tod Oppenborn, 99 CES/CENPP, 6020 Beale Avenue, Building 812, Nellis AFB, Nevada. Phone: 702-652-9366 or by email at tod.oppenborn@us.af.mil.

e. *Designation: Draft EA*

f. *Abstract*:

This environmental assessment (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) s§ 1500-1508, and 32 CFR § 989, *Environmental Impact Analysis Process*. Potentially affected environmental resources were identified in coordination with local, state, and federal agencies. Specific environmental resources with the potential for environmental consequences include airspace management and use; noise; safety; air quality; biological resources; water resources; soils; land use; socioeconomics; environmental justice and protection of children; cultural resources; hazardous materials and waste, contaminated sites, and toxic substances; and infrastructure, transportation, and utilities.

The overall purpose of the Proposed Action is to improve test, training, and tactics development capabilities at Nellis AFB to keep pace with Air Force mission requirements, evolving technology, and enemy capabilities. This purpose would be achieved through implementation of several supporting actions. These supporting actions include the addition of F-35 Joint Strike Fighter aircraft, the addition of F-22A Raptor aircraft, and operation of COCO ADAIR.

The analysis of the affected environmental and environmental consequences of implementing the Proposed Action and Alternatives concluded that by implementing standing environmental protection measures and Best Management Practices, there would be no significant adverse impacts from the proposed and alternative actions at Nellis AFB or in the special use airspace on the following resources: airspace management and use; noise; safety; air quality; biological resources; water resources; soils; land use; socioeconomics; environmental justice and protection of children; cultural resources; hazardous materials and wastes, contaminated sites, and toxic substances; and infrastructure, transportation, and utilities. Nellis AFB is an active installation with aircraft operations, demolition and new construction actions currently underway as well as future development currently in the planning phase; however, impacts associated with construction, demolition, and renovation would be minor; therefore, significant cumulative impacts are not anticipated from activities associated with the Proposed Action when considered with past, present, or reasonably foreseeable future actions.

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DRAFT FINDING OF NO SIGNIFICANT IMPACT (FONSI)

ADDITION OF F-35 JOINT STRIKE FIGHTERS, ADDITION OF F-22A RAPTORS AND CONTRACT ADVERSARY AIR

Pursuant to provisions of the National Environmental Policy Act (NEPA), 42 United States Code (U.S.C.) § 4321 to 4370h; Council on Environmental Quality (CEQ) Regulations, 40 *Code of Federal Regulations* (CFR) §§ 1500–1508; and 32 CFR § 989, *Environmental Impact Analysis Process,* the United States (US) Air Force (Air Force) prepared the attached Draft Environmental Assessment (EA) to address the potential environmental consequences associated addition of F-35 Joint Strike Fighter aircraft, the addition of F-22A Raptor aircraft, and operation of contractor-owed contractor-operated Adversary Air (COCO ADAIR) at Nellis Air Force Base (AFB) in Nevada. This EA has been prepared in accordance with the NEPA (42 USC §§ 4321–4347), the CEQ Regulations (40 CFR §§ 1500–1508), and 32 CFR § 989 et seq., *Environmental Impact Analysis Process*.

Purpose and Need

The overall purpose of the Proposed Action is to improve test, training and tactics development capabilities at Nellis AFB to keep pace with Air Force mission requirements, evolving technology and enemy capabilities. This purpose would be achieved through implementation of several supporting actions. These supporting actions include the addition of F-35 Joint Strike Fighter aircraft, the addition of F-22A Raptor aircraft, and operation of COCO ADAIR.

Addition of F-35 Joint Strike Fighter Aircraft

The U.S. Air Force, in conjunction with the United Kingdom Royal Air Force, proposes to move 17 F-35 Joint Strike Fighter aircraft to Nellis AFB as part of a larger initiative to improve test and training for 5th Generation fighter aircraft. The purpose of adding 17 F-35s to Nellis AFB is twofold: 1) establish a realistic 5th Generation adversary threat to support Tactics, Techniques and Procedures (TTP) for Air Force fighter aircraft, the Air Force Weapons School Weapons Instructor Courses (WIC), tests and exercises; and 2) integrate F-35 flight operations for military operational testing and evaluation.

Addition of F-22A Raptor Aircraft

The purpose of this action is to reassign three F-22A Raptor aircraft from the 95th Fighter Squadron (FS) at Tyndall AFB, Florida, into the 422nd Test and Evaluation Squadron (TES) at Nellis AFB.

Contract Adversary Air

ADAIR services provide tactical fighter jet aircraft flight operations flown by COCO aircraft supporting advanced testing, training, and tactics development. ADAIR is training that simulates real-world threat scenarios. The purpose of this action is to provide a 5-year Indefinite Quantity Indefinite Delivery (IDIQ) type contract that would provide the 57th Operations Group (OG) Nellis AFB with ADAIR services. Up to thirty aircraft would be added to Nellis AFB.

The 57th OG is currently experiencing an aggressor training deficit of 5,600 flight hours annually. At this time, the military cannot provide enough suitable aircraft for the mission. Contract surrogate aircraft are needed to emulate potential adversaries.

The overall need for the Proposed Action is to increase operational readiness rates, improve WIC and operational test and evaluation, provide realistic adversary training for current and future threats, and to develop 5th Generation close air support tactics, techniques and procedures.

Description of Proposed Action and Alternatives

The Air Force is proposing to add 17 F-35 Joint Strike Fighter aircraft at Nellis AFB to support the 65th Aggressor Squadron (AGRS), 422nd TES, and No. 17 TES; add three F-22A Raptor aircraft into the 422nd TES; and operate COCO ADAIR from Nellis AFB. Together, the components of this action would add 751 personnel at Nellis AFB (479 personnel for the addition of the 17 F-35s, 32 personnel for the addition of three F-22A Raptor aircraft, and 240 personnel for COCO ADAIR). Facility demolition, renovation, construction, or addition would be necessary to support the new aircraft.

Addition of F-35 Joint Strike Fighter Aircraft

The Proposed Action would increase the approved baseline of 36 F-35 aircraft based at Nellis AFB by 17 to a total of 53 F-35s. The 17 aircraft will be transferred or reassigned from the following:

- Nine F-35 aircraft would be transferred from the 33rd Fighter Wing (FW), 58th FS, Eglin AFB to the 57th Wing, 65th AGRS, Nellis AFB.
- Two F-35 aircraft would be reassigned from the 53rd Wing, 31st TES, Edwards AFB to the 57th Wing, 65th AGRS, Nellis AFB.
- Six total F-35A/B aircraft would be added to Nellis AFB to perform operational test and evaluation of the F-35A/B weapons system.
    - Either three or six additional F-35 aircraft would be assigned to the 422nd TES to perform operational test and evaluation of the F-35 weapons system.
    - Either zero or three F-35B aircraft would move to Nellis AFB if the Royal Air Force No. 17 TES were to be relocated from Edwards AFB to perform operational test and evaluation of the F-35B weapons system.

The 65th AGRS would require operations and maintenance (O&M) and/or military construction (MILCON) facility projects on Nellis AFB to successfully beddown additional F-35s. Facilities proposed for demolition, renovation, and construction would comply with all applicable Federal, State, and local regulations to include the most current Installation Facilities Standards (IFS). The No. 17 TES would require a temporary facility (trailer) to be sited on Nellis AFB.

Addition of F-22A Raptor Aircraft

Three 95th FS F-22A Raptor aircraft initially would be on loan to the 422nd TES in accordance with the aircraft loan process as outlined in Air Force Instruction (AFI) 16-402, *Aerospace Vehicle Programming, Assignment, Distribution, Accounting, and Termination*. These loans would be a “possession only” change until permanent assignment changes would be made. The 422nd TES at Nellis AFB would add three 95th FS F-22A Primary Aerospace Vehicles Authorized (PAA) into their current PAA of 12 F-22As, resulting in a total of 15 F-22A PAAs.

Contract Adversary Air

The Proposed Action would provide dedicated COCO ADAIR sorties for Combat Air Forces (CAF) training at Nellis AFB, to address shortfalls in 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 Nellis COCO ADAIR program utilizes contract air service for Red Air training.

Alternative A

Nellis Alternative A would add 17 F-35 Joint Strike Fighter aircraft to support the 422nd TES, No. 17 TES, and the 65th AGRS; add three F-22A Raptor aircraft into the 422nd TES; and operate COCO ADAIR. Facility renovation and addition, as well as an increase in personnel, would be necessary to support the new aircraft. Renovations and/or additions to Buildings 1770A, 278, 423, 451, 878, 10301, and siting of a temporary facility would be needed under this alternative. In addition, this alternative includes renovation and addition to Buildings 283, 257, and 262.

Alternative B

Nellis Alternative B would add 17 F-35 Joint Strike Fighter aircraft to support the 422nd TES, No. 17 TES and the 65th AGRS; add three F-22A Raptor aircraft into the 422nd TES; and operate COCO ADAIR. Facility demolition, renovation, construction, addition, as well as an increase in personnel, would be necessary to support the new aircraft. Like Alternative A, this alternative would include the renovations and/or additions to Buildings 1770A, 278, 423, 451, 878, and 10301, and siting of a temporary facility. This alternative includes construction of a new 65 AGRS hangar (six bays for 17 PAA F-35) and Aircraft Maintenance Unit (AMU) facilities, and associated demolition of Building 250. The current occupants of Building 250 (Eagle AMU personnel) would be moved to three existing buildings – Hangar 245, Building 246 and Building 248. Interior renovations would occur at the three buildings because they are not currently configured for administrative functions, and a 4,000 square foot addition would be made to Build 246. No renovation or additions to Buildings 283, 257, and 262 would occur under this alternative.

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. As the nine F-35s at Eglin are replaced by newer aircraft, those aircraft would either be retired or another use would have to be found for them that does not include the capability to use the internal cannon. No F-35 aircraft would be reassigned from Edwards AFB, and no new F-35s would be assigned to Nellis AFB. The No. 17 TES would not relocate to Nellis AFB and would remain at Edwards AFB. This would result in additional facility costs for the United Kingdom. Without 5th Generation Aggressors, the Air Force would not have the ability to train and develop tactics against adversary 5th Generation aircraft.

The 422nd TES would not receive the additional three PAA F-22A. Those three aircraft would be distributed to one or more operational squadrons, which would not improve Air Force capability to train weapons instructor pilots or test capability. As a result, one or more operational squadrons would have more than 24 PAA, making force management more difficult as deployable force modules are normally based on a 24 PAA squadron size.

Under the No Action Alternative, COCO ADAIR would not operate at Nellis AFB. The 57th OG would continue to experience an aggressor training deficit of 5,600 flight hours annually.

Summary of Findings

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

Under Alternative A and B, the annual number of sorties would increase by 20 percent for aircraft based at Nellis AFB and would not impact the operational capacity or necessitate changes to the locations or dimensions of the airspace at the Nevada Test and Training Range (NTTR) and R-2508 airspace. Potential impacts to the airspace around the airfield for Alternatives A and B would be negligible. Likewise, the Military Operating Areas (MOAs) proposed for use have the capacity and the dimensions necessary to support additional sorties; therefore, negligible impacts to airspace are anticipated for Alternatives A and B.

Proposed operations would increase noise impacts; however, that increase would result in negligible to minor impacts for all alternatives. The primary changes in noise contour features between the Alternative A and B, and the existing conditions are the slight elongation of the day-night sound level (DNL) contours along the flight paths with a heading to/from the northwest. North of the airfield, the elongated 65 dBA DNL contour associated with Alternative A and B does not impact residential areas. West of the airfield, the 65 dBA DNL contour is elongated slightly over a small residential area west of the airfield and represents a 1 dB or less increase in DNL over existing conditions. Under Alternatives A and B, noise levels at the representative points of interest (POIs) identified would remain the same. Modeled POIs include noise-sensitive locations, such as hospitals, residences, schools, and places of worship, located in the vicinity of Nellis AFB. At the representative noise-sensitive locations modeled, the DNL would not change. All POIs examined would experience negligible changes to DNL.

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 to ground safety are expected to occur. No significant impacts are expected to flight safety under the implementation of contractor flight safety rules and bird/wildlife-aircraft strike hazard (BASH) procedures.

Increased air emissions resulting from the Proposed Action are not considered significant under Alternatives A and B. Implementation of the Proposed Action would not interfere with the region's ability to maintain compliance with National Ambient Air Quality Standards for attainment area pollutants and would not interfere with the ability to achieve compliance for pollutants that contribute to ozone nonattainment. None of the criteria pollutants emission rates exceeded the 100 tons per year *de minimis* threshold; therefore, no impacts to air quality are expected from operations at Nellis AFB or the associated airspace.

Noise impacts from increased operations would have a negligible, short-term and long-term effect on wildlife. Airfield management and risk reduction implementation measures associated with the BASH program would continue to reduce BASH resulting in a minor impact to birds and other wildlife. Federally listed species are present at Nellis AFB; however, no impacts are anticipated to any listed species. Sonic booms from supersonic flights are expected during training activities; however, potential impacts wildlife and cultural resources in the airspace associated with sonic booms are expected to be negligible. Likewise, use of flares would have no impact on wildlife or cultural resources. The Air Force has found that there would be no impact to wildlife or habitats and has made a *no effect* determination for federally listed species and critical habitat.

Impacts to water resources could occur from the deposition and transport of flares released during training operations; however, flares are currently used for training at Nellis AFB with no apparent impacts to water resources. Additionally, emergency fuel dumps are rare, but if needed, federal law requires a release at an altitude of at least 10,000 feet above ground level to allow for fuel evaporation before reaching the ground or surface water. As such, no impacts to water resources from flares or emergency fuel dumps are expected.

There are no impacts resulting from construction activities to soils. The potential for impacts to soils is possible with the release of flares from training operations. Proposed flare use would be localized and dispersed over time; therefore, no direct impacts are anticipated, and any adverse indirect effects would be negligible for both alternatives.

No changes to the existing land use at Nellis AFB are expected from demolition/renovation/construction activities. The 751 additional military, contract, and civilian personnel would represent a small increase in the total persons permanently assigned to and working at Nellis AFB, where currently over 40,000 military and civilian personnel are employed. Adequate housing and educational resources are available in the ROI to accommodate the small increase in personnel; therefore, no adverse impacts on employment, housing, or educational resources would occur.

Construction/renovation activities would not result in direct or indirect impacts to cultural resources on Nellis AFB because none of the buildings proposed for construction/renovation activities have been determined eligible for the National Register of Historic Places (NRHP) by Nellis AFB. Negligible to minor noise increases are expected in the airspace from an increase in flight activities; however, impacts would be transient in nature and brief in duration and are not expected to negatively affect cultural resources under the airspace. No known traditional cultural resources or sacred sites are present.

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

Hazardous wastes generated as a result of Alternative A and B would be stored and disposed in accordance with the Nellis AFB *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 construction/demolition/renovations of proposed facilities with implementation of requirements described in the Nellis AFB *Asbestos Management Plan* and *Lead-Based Paint Management Plan*. Lighting fixtures containing polychlorinated biphenyls would be disposed in accordance with federal, state, and local laws, which would result in a long-term, minor, beneficial impact. There is a low potential for radon to pose a health hazard at Nellis AFB. As such no impacts from radon is anticipated. There is no environmental contamination known to occur within the project area. The groundwater plumes associated with Sites ST-28 and ST-44 would not be disturbed by surface-level construction efforts since the plumes are more than 40 feet below ground level. While no impact is expected, an Environmental Restoration Program (ERP) waiver would be required if proposed construction would occur above ERP groundwater plumes.

Under Alternative A and B, 751 new personnel would be added to the Nellis AFB workforce, a 2-percent increase over the current number of military and civilian personnel who live and work on Base. As such, there would be no appreciable change in demand for utilities (i.e., electricity, sewer, natural gas). New facility construction would likely employ new energy-efficient hot water boilers and cooling systems to reduce the impact on the existing electrical infrastructure. Any effect on the availability of groundwater and drinking water at Nellis AFB or in the surrounding areas from increased usage associated with a 2-percent increase in military and civilian personnel would be minimal, would be well below the Base's allotment, and would not require Nellis AFB to seek additional water rights.

The addition of 751 personnel would increase traffic on Base and increase congestion at the various gates/access points at Nellis AFB. Nearby Las Vegas and Nellis Boulevards, Craig Road, and I-15 would be able to accommodate the anticipated increase in off-Base traffic resulting from the increase in personnel.

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 Nellis AFB or the NTTR or R-2508 airspace.

Mitigation

The EA analysis concluded that Alternative A and B 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 § 989, *Environmental Impact Analysis Process,* and which is hereby incorporated by reference, I have determined that the proposed activities to provide the addition of F-35 Joint Strike Fighter aircraft, the addition of F-22A Raptor aircraft, and operation of COCO ADAIR 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.

TODD R. DYER Colonel, USAF Commander	DATE

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ENVIRONMENTAL ASSESSMENT (EA)

FOR THE

ADDITION OF F-35 JOINT STRIKE FIGHTERS, ADDITION OF F-22A RAPTORS AND

CONTRACT ADVERSARY AIR

PREPARED FOR:

Department of the Air Force

May 2021

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LIST OF ACRONYMS AND ABBREVIATIONS

°F	degree Fahrenheit
ACAM	Air Conformity Applicability Model
ACC	Air Combat Command
ACM	asbestos-containing material
ACP	access control point
ADF	Automatic Direction Finder
AFB	Air Force Base
AFH	Air Force Handbook
AFMAN	Air Force Manual
AGE	aerospace ground equipment
AGL	above ground level
AGRS	Aggressor Squadron
AICUZ	Air Installation Compatibility Use Zone
Air Force	United States Air Force
ALIS	Autonomic Logistics Information System
AMU	Aircraft Maintenance Unit
APE	Area of Potential Effect
API	American Petroleum Institute
APZ	accident potential zone
AQCR	air quality control region
AST	aboveground storage tank
ATCAA	Air Traffic Control-Assigned Airspace
ATW	Adversary Tactics Wing
BASH	bird/wildlife-aircraft strike hazard
BEA	Bureau of Economic Analysis
BGEPA	Bald and Golden Eagle Protection Act of 1940
BLS	Bureau of Labor Statistics
BMP	best management practice
BOS	Base operating support
BP	before present
CAA	Clean Air Act
CAD	cartridge activated devices
CAF	Combat Air Forces
CAS	Coral Academy of Science
CCPC	Clark County Planning Commission
CCRFCD	Clark County Regional Flood Control District
CCWRD	Clark County Water Reclamation District
CDDAR	crash damaged or disabled aircraft recovery
CDNL	C-weighted day-night average sound level
CDWR	California Department of Water Resources
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CIG	Close Air Support Integration Group
CO	carbon monoxide
CO_2e	carbon dioxide equivalent
COCO ADAIR	contractor-owned contractor-operated Adversary Air
COMACC	Commander of Air Combat Command
CPSC	Consumer Product Safety Commission
CSEL	C-weighted sound exposure level
CWA	Clean Water Act
CY	calendar year
DETR	Department of Employment, Training & Rehabilitation

DME	Distance Measuring Equipment
DMO	Distributed Mission Operations
DNL, L_{dn}	day-night sound level
DoD	United States Department of Defense
EA	Environmental Assessment
EFH	essential fish habitat
EIAP	Environmental Impact Analysis Process
EIS	Environmental Impact Statement
EO	Executive Order
ERP	Environmental Restoration Program
ESA	Endangered Species Act
EW	electronic warfare
FAA	Federal Aviation Administration
FONSI	Finding of No Significant Impact
FS	Fighter Squadron
ft	feet
ft^2	square foot (feet)
FW	Fighter Wing
FY	fiscal year
GAO	Government Accountability Office
GHG	greenhouse gas
GOV	government-owned vehicle
GWP	global warming potential
HAP	hazardous air pollutant
HAZMAT	hazardous material
ICRMP	Integrated Cultural Resources Management Plan
IDIQ	indefinite quantity indefinite delivery
IFR	instrument flight rules
IFS	installation facilities standard
JP-8	jet fuel
LBP	lead-based paint
L_{dnmr}	onset-rate adjusted monthly day-night average sound level
L_{eq}	equivalent sound level
L_{max}	maximum sound level
LO	low observable
LOLA	live ordnance loading area
LRS	Logistics Readiness Squadron
LUPZ	Land Use Planning Zone
LVIS	Large Vehicle Inspection Station
MBTA	Migratory Bird Treaty Act of 1918
MILCON	military construction
mm	millimeter
MOA	Military Operating Area
mph	mile per hour
MSL	mean sea level
MTR	military training route
Mx	Maintenance
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NLVWD	North Las Vegas Water District
nm	nautical mile(s)
NMFS	National Marine Fisheries Service
NO_2	nitrogen dioxide
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places

NTTR	Nevada Test and Training Range
O_3	ozone
O&M	operations and maintenance
OG	Operations Group
OSHA	Occupational Safety and Health Administration
PAA	primary aerospace vehicles authorized
PAD	propellant activated device
Pb	lead
PCBs	polychlorinated biphenyls
pCi/L	picocuries per liter
PD	Policy Directive
PM_x	particulate matter with particulates less than or equal to *x* microns
POI	point of interest
POL	petroleum, oil, lubricant
POV	privately owned vehicle
ppm	parts per million
PSD	Prevention of Significant Deterioration
psf	pounds per square foot
PTE	potential to emit
Q-D	Quantity-Distance
RCRA	Resource Conservation and Recovery Act
ROI	Region of Influence
SARA	Superfund Amendments and Reauthorization Act
SEL	sound exposure level
SHPO	State Historic Preservation Officer
SIP	state implementation plan
SNWA	Southern Nevada Water Authority
SO_2	sulfur dioxide
SUA	special use airspace
SWPPP	Stormwater Pollution Prevention Plan
TASS	Tactical C-2 Air Support Squadron
TES	Test and Evaluation Squadron
tpy	tons per year
TSCA	Toxic Substances Control Act
TTP	tactics, techniques and procedures
UK	United Kingdom
USC	United States Code
US	United States
USACE	United States Army Corps of Engineers
USCB	United States Census Bureau
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UST	underground storage tank
VOC	volatile organic compound
WIC	weapons instructor course
μg/m3	microgram per cubic meter

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CHAPTER 1 PURPOSE AND NEED FOR ACTION

The United States Air Force (Air Force), Air Combat Command (ACC), prepared this Environmental Assessment (EA) in accordance with the requirements of the National Environmental Policy Act (NEPA) (42 United States Code [USC] §§ 4321–4317), implemented through the Council on Environmental Quality (CEQ) regulations of 1978 (40 Code of Federal Regulations [CFR] §§ 1500–1508), and codified at 32 CFR § 989, et seq., *Environmental Impact Analysis Process* (EIAP). Other pertinent environmental statutes, regulations, and compliance requirements were also considered during the preparation of the EA, and these authorities will be addressed in various sections throughout this EA when relevant to particular environmental resources and conditions.

1.1 INTRODUCTION

The Air Force is tasked with the defense of the United States (US) and fulfillment of the directives of the President and the Secretary of Defense. The Air Force's mission is to fly, fight, and win. 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.

In support of Combat Air Force (CAF) fighter pilots, the Air Force proposes the following at Nellis Air Force Base (AFB), Nevada:

- Add 17 F-35 Joint Strike Fighter aircraft to support the 65th Aggressor Squadron (AGRS), the No. 17 Test and Evaluation Squadron (TES), and the 422nd TES.
- Add three F-22A Raptor aircraft into the 422nd TES.
- Operate contractor-owned contractor-operated Adversary Air (COCO ADAIR).

1.1.1 Location

Nellis AFB, located in Clark County in the southeast corner of the state of Nevada, lies 5 miles northeast of the city of Las Vegas and adjacent to the city of North Las Vegas (**Figure 1-1**). Nellis AFB is the center for ACC training and testing activities at the Nevada Test and Training Range (NTTR), with the Base providing logistical and organizational support for NTTR, aircraft training, and personnel. The unincorporated town of Sunrise Manor and undeveloped portions of Clark County surround the majority of the Base, although open space dominates to the northeast. Covering 14,161 acres, the Base contains three major functional areas. Area I, the Main Base, is located east of U.S. Highway 93 and includes the airfield and most Base functions. Northeast of the Main Base lies Area II, the Munitions Storage Area/Weapons Storage Area. Area III, situated northwest of the Main Base, includes a number of facilities such as a hospital, storage, and housing.

The areas north and east of Nellis AFB consist primarily of open range and mountains, with urban uses along Highway 93. Directly southwest of the Base, commercial and residential land uses mixed with some industrial activities, dominate the area. The NTTR occupies 2.9 million acres of land, 5,000 square miles of airspace, which is restricted from civilian air traffic over-flight, and another 7,000 square miles of Military Operating Area (MOA), which is shared with civilian aircraft (**Figure 1-2**).

> A SPECIAL USE AIRSPACE (SUA) CONSISTS OF DEFINED DIMENSIONS OF AIRSPACE WHEREIN ACTIVITIES MUST BE CONFINED BECAUSE OF THEIR NATURE, OR WHEREIN LIMITATIONS ARE IMPOSED UPON NON-PARTICIPATING AIRCRAFT OPERATIONS, OR BOTH
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> A MOA IS A TYPE OF SUA OUTSIDE OF CLASS A AIRSPACE TO SEPARATE OR SEGREGATE CERTAIN NONHAZARDOUS MILITARY ACTIVITIES FROM INSTRUMENT FLIGHT RULES (IFR) TRAFFIC. ACTIVITIES IN MOAS INCLUDE, BUT ARE NOT LIMITED TO, AIR COMBAT MANEUVERS, AIR INTERCEPTS, AND LOW-ALTITUDE-TACTICS. THE DEFINED VERTICAL AND LATERAL LIMITS VARY FOR EACH MOA.
>
> CLASS A AIRSPACE IS CONTROLLED AIRSPACE OF DEFINED DIMENSIONS WITHIN WHICH AIR TRAFFIC CONTROL SERVICE IS PROVIDED AND ALL OPERATIONS MUST OCCUR UNDER IFR. CLASS A AIRSPACE IS GENERALLY FROM 18,000 FEET (FT) MEAN SEA LEVEL (MSL) UP TO AND INCLUDING 60,000 FT MSL AND INCLUDES AIRSPACE OVERLYING WATERS WITHIN 12 NAUTICAL MILES OF THE COAST OF THE 48 CONTIGUOUS US AND ALASKA.

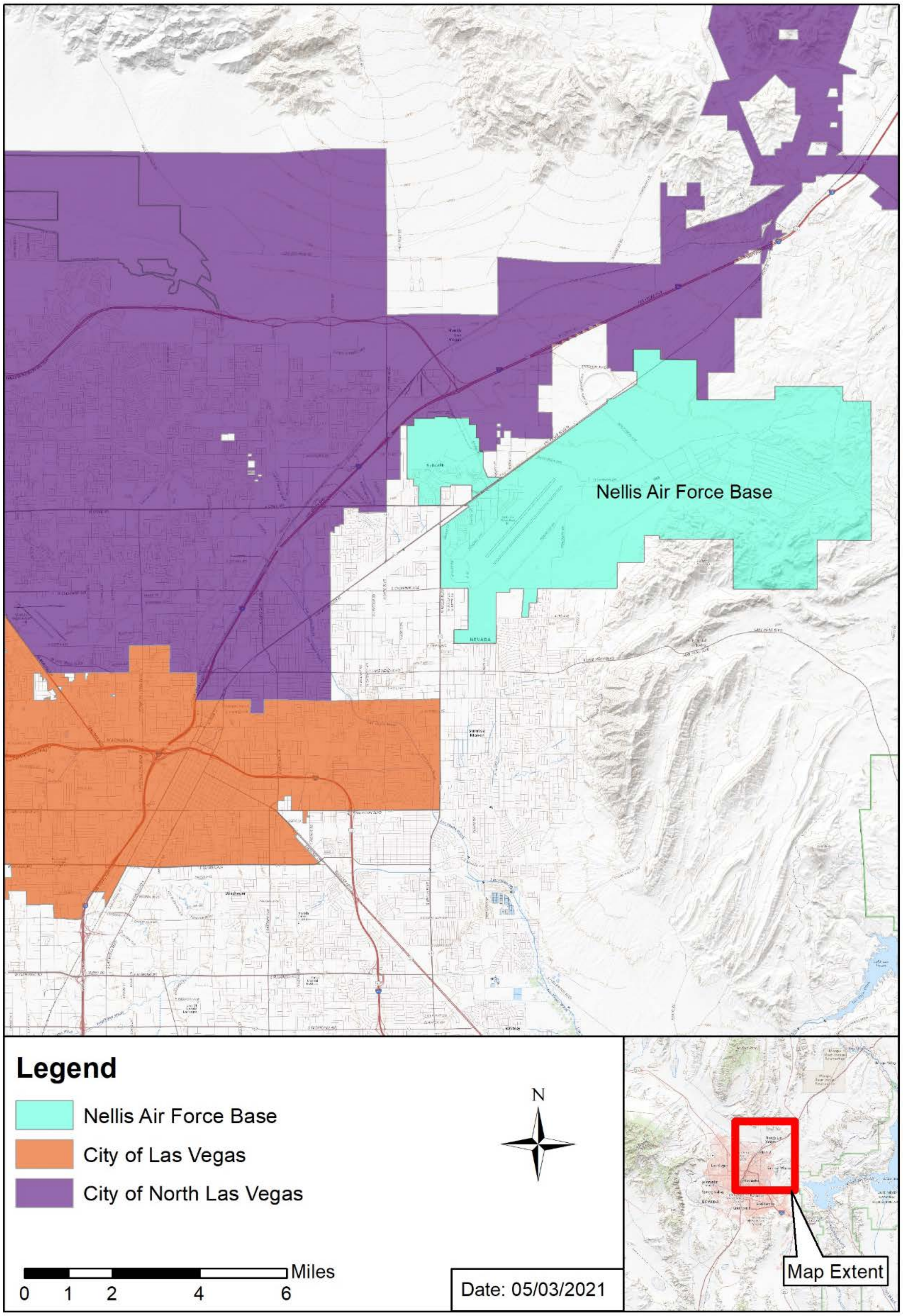

Figure 1-1. Location of Nellis Air Force Base (Regional View)

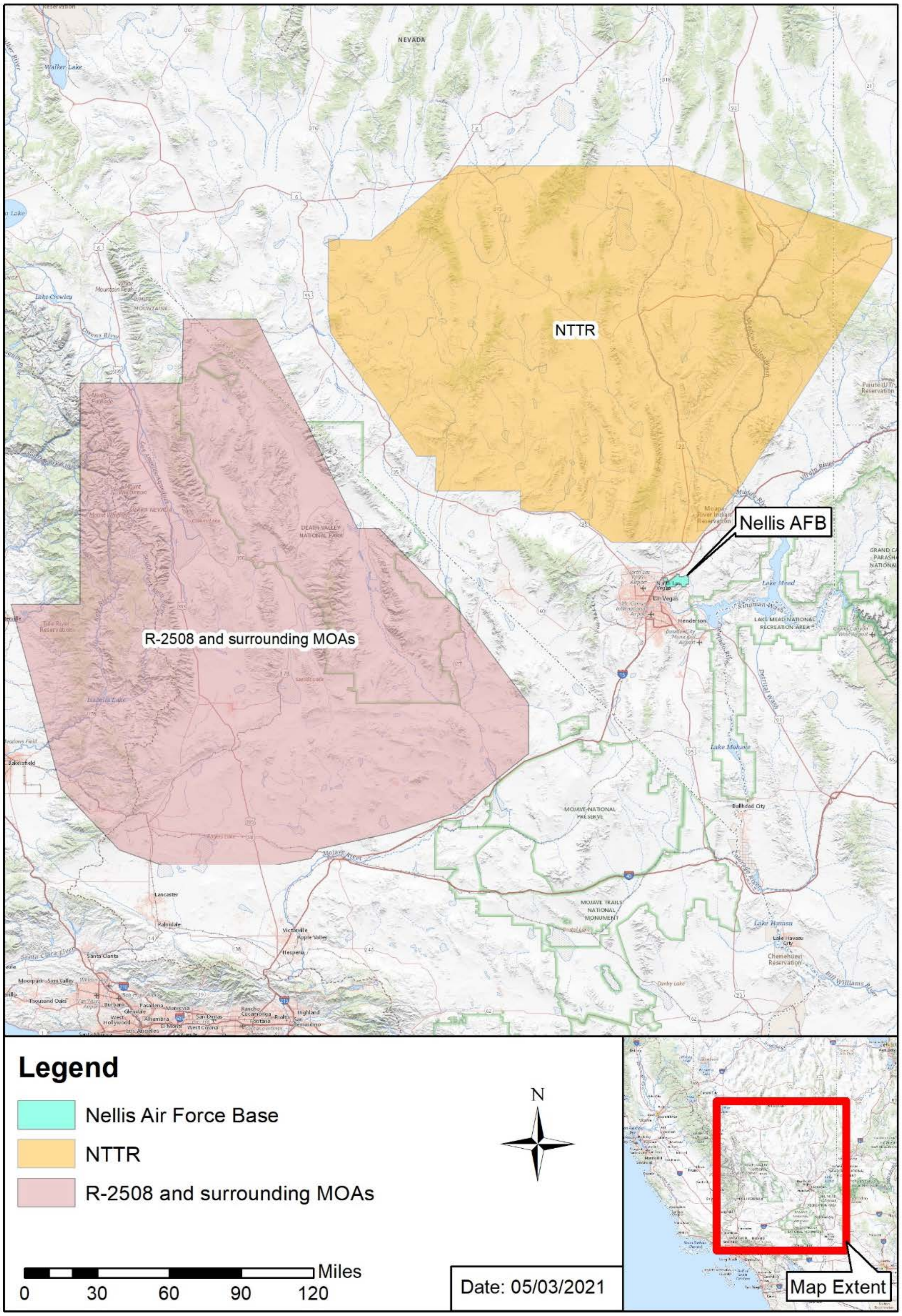

Figure 1-2. Special Use Airspace used by Nellis Air Force Base

Nellis AFB also uses the R-2508 Complex for flight activities. The R-2508 Complex is discussed further below.

The 12,000-square-nautical mile (nm) range at NTTR provides a realistic arena for operational testing and training aircrews and ground forces to improve combat readiness. The range within NTTR was originally established by Executive Order (EO) as the Las Vegas Bombing and Gunnery Range in 1940. By 1999, Public Law 106-65 (Military Lands Withdrawal Act of 1999), extended the land withdrawal until 2021 and superseded any former land withdrawals. The National Defense Authorization Act of 2021 included status-quo extensions for the next 25 years (until 2046) for the NTTR withdrawal.

> ATCAA IS ASSIGNED TO AIR TRAFFIC CONTROL TO SEGREGATE AIR TRAFFIC BETWEEN SPECIFIED ACTIVITIES BEING CONDUCTED WITHIN THE ASSIGNED AIRSPACE AND OTHER IFR TRAFFIC. THIS AIRSPACE IS NOT DEPICTED ON ANY CHART BUT IS OFTEN AN EXTENSION OF A MOA TO HIGHER ALTITUDES AND USUALLY REFERRED TO BY THE SAME NAME. THIS AIRSPACE REMAINS UNDER CONTROL OF THE FEDERAL AVIATION ADMINISTRATION (FAA) WHEN NOT IN USE TO SUPPORT GENERAL AVIATION ACTIVITIES. ALTHOUGH ATCAAS ARE TYPICALLY ASSOCIATED WITH SUA, THEY ARE NOT A TYPE OF SUA.

The R-2508 Complex, operated by Edwards AFB, California, is located over large portions of Inyo, Kern, San Bernardino, and Tulare counties in east-central California. It also includes a portion of Fresno and Los Angeles counties in California and extends into Nevada's Esmeralda County. Major communities beneath the R-2508 Complex include Lone Pine (population approximately 1,810), Tehachapi (5,800), Ridgecrest (27,700), Rosamond (7,430), Mojave (3,760), California City (5,960), Boron (2,100), North Edwards (1,259), Lake Isabella (3,323), and Kernville (1,656). The R-2508 Complex is composed of restricted airspace, MOAs, the Black Mountain Supersonic Corridor, and Air Traffic Control Assigned Airspaces (ATCAAs).

1.2 PURPOSE OF THE ACTION

The overall purpose of the Proposed Action is to improve test, training, and tactics development capabilities at Nellis AFB to keep pace with Air Force mission requirements, evolving technology, and enemy capabilities. This purpose would be achieved through implementation of several supporting actions. These supporting actions include the addition of F-35 Joint Strike Fighter aircraft, the addition of F-22A Raptor aircraft, and operation of COCO ADAIR.

1.2.1 Addition of F-35 Joint Strike Fighter Aircraft

The US Air Force and United Kingdom (UK) Royal Air Force are proposing to move 17 F-35 Joint Strike Fighter aircraft to Nellis AFB as part of a larger initiative to improve test and training for 5th Generation fighter aircraft. The purpose of adding 17 F-35s to Nellis AFB is twofold: 1) establish a realistic 5th Generation adversary threat to support Tactics, Techniques and Procedures (TTP) for Air Force fighter aircraft, the Air Force Weapons School Weapons Instructor Courses (WIC), tests and exercises; and 2) integrate F-35 flight operations for military operational testing and evaluation. Though there is no universal definition of 5th Generation aircraft, they typically have the characteristics of all-aspect stealth, low probability of intercept radar, high-performance airframes, advanced avionics features, and highly integrated computer systems capable of networking with other elements within the battlespace for situational awareness.

> FIFTH (5TH) GENERATION AIRCRAFT ARE THE NEWEST WEAPONS SYSTEMS SUCH AS THE F-22 AND F-35 FIGHTERS THAT CONTAIN NEW AND ENHANCED LEVELS OF STEALTH PROFILES, SPEED, MANEUVERABILITY, AND ADVANCED AVIONICS AND ATTACK CAPABILITIES.

The first purpose would be achieved by transferring nine F-35 aircraft from Eglin AFB, Florida, and two F--35 aircraft from Edwards AFB, California, to the 65th AGRS at Nellis AFB. The mission of the 65th AGRS is to prepare the CAF, joint, and allied aircrews with realistic threat replication, training, academics, and feedback with the understanding that several potential adversaries are fielding 5th Generation fighters.

The second purpose would be achieved by assigning and relocating a total of six F-35s to Nellis AFB. The six F-35 aircraft would either be six USAF F-35As or a mix of three F-35As and three UK Royal Air Force F-35Bs. Either three or six new F-35 aircraft would move from the F-35 production facility to Nellis AFB to join the 422nd TES. The 422nd TES performs operational testing of all fighter aircraft and munitions entering and in operational use by ACC. The 422nd TES is a geographically separated unit of the 53rd Test and Evaluation Group stationed at Eglin AFB, Florida. After a new fighter weapons system completes developmental testing, the mission of the 422nd TES is to thoroughly vet the new equipment in a combat representative environment. Either zero or three UK Royal Air Force F-35Bs would move from Edwards AFB to Nellis AFB as part of the relocation of the No. 17 TES. The No. 17 TES is the F-35B Operational Evaluation Unit for the UK Royal Air Force and performs nearly identical test operations as the 422nd TES.

1.2.2 Addition of F-22A Raptor Aircraft

The purpose of this action is to reassign three F-22A Raptor aircraft from the 95th Fighter Squadron (FS) at Tyndall AFB, Florida, to the 422nd TES at Nellis AFB.

1.2.3 Contract Adversary Air

ADAIR services provide tactical fighter jet aircraft flight operations flown by COCO aircraft supporting advanced testing, training, and tactics development. ADAIR is training that simulates real-world threat scenarios. The purpose of this action is to provide a 5-year Indefinite Quantity Indefinite Delivery (IDIQ) type contract that will provide the 57th Operations Group (OG) Nellis AFB with ADAIR services. Up to 30 aircraft would be added to Nellis AFB.

1.3 NEED FOR THE ACTION

1.3.1 Addition of F-35 Joint Strike Fighter Aircraft

The mission of the 65th AGRS is to prepare the CAF, joint, and allied aircrews with realistic threat replication, training, academics, and feedback with the understanding that several potential adversaries are fielding 5th Generation fighters. The need for the Proposed Action is to increase operational readiness rates; improve WIC and operational test and evaluation; provide realistic adversary training for current and future threats; and to develop 5th Generation close air support tactics, techniques, and procedures. The Commander of Air Combat Command (COMACC) identified a requirement to provide realistic 5th Generation adversary training for current and future threats and directed the movement of nine F-35s from Eglin AFB, Florida, to establish this capability at Nellis AFB. Today’s aggressor force consists of legacy fighter aircraft and does not have the capability to replicate adversary 5th Generation fighter capability.

As part of the 57th OG, the F-35s would be used by pilots to train at the tactical level and to develop enhanced 5th Generation TTPs and Low Observable (LO) practices in a realistic environment to meet emerging peer adversary capabilities. In addition to replicating a realistic 5th Generation threat, these F-35s would support the 422nd TES, the Air Force WIC, the 561st Joint Tactics Squadron, and local exercises/training events.

The 422nd TES would conduct operational test of the F-35 weapons system in a combat representative environment. This would include evaluating F-35 capabilities against a variety of target sets and against representative threats. The 422nd TES would also develop and evaluate new tactics for employment by the F-35.

The No. 17 TES would also conduct operational test of the F-35B weapons system, in a fashion very similar to the 422nd TES, to provide enhanced combat capability for the UK Royal Air Force.

1.3.2 Addition of F-22A Raptor Aircraft

On October 10, 2018, Hurricane Michael tore through the gulf coast, causing catastrophic damage to the region and damaging 95 percent of the buildings at Tyndall AFB, Florida. The Base’s hangars and flight operations buildings suffered extensive damage from the storm.

Before the storm, Tyndall AFB was home to the 325th Fighter Wing (FW), composed of two F-22A squadrons. One squadron, the 95th FS, was operational and the other, the 43rd FS, was a training squadron. Neither squadron will be able to operate from Tyndall AFB for the foreseeable future due to the amount of damage done by Hurricane Michael. The F-22 Formal Training Unit (FTU) is currently operating at Eglin AFB, Florida, on a temporary basis. The EIAP for permanent basing for the F-22 FTU is ongoing.

Rather than relocating the 95th FS, the Air Force decided to distribute the aircraft assigned to the 95th FS to other F-22A operational squadrons. The Air Force expects this distribution to increase the F-22A's readiness rate and address key recommendations from a recent Government Accountability Office (GAO) report that identified small unit size as one of the challenges with F-22A readiness. GAO-18-190, *F-22 Organization and Utilization Changes Could Improve Aircraft Availability and Pilot Training*, recommended:

> "The Secretary of the Air Force should conduct a comprehensive assessment of the F-22 organizational structure that identifies and assesses alternative approaches to organizing F-22 squadrons. The assessment could at a minimum assess the following two alternatives: consolidating the fleet into larger squadrons and/or wings to improve aircraft availability and revising the design of the deployable units in squadrons to better support current deployment practices and future operational concepts."

PRIMARY AEROSPACE VEHICLES AUTHORIZED ARE AIRCRAFT AUTHORIZED TO A UNIT FOR PERFORMANCE OF ITS OPERATIONAL MISSION. THE PRIMARY AUTHORIZATION FORMS THE BASIS FOR THE ALLOCATION OF OPERATING RESOURCES TO INCLUDE MANPOWER, SUPPORT EQUIPMENT, AND FLYING-HOUR FUNDS.

The Air Force concurred with this recommendation and as a result will be using the F-22As assigned to the 95th FS to increase the primary aircraft assigned to the remaining operational squadrons to 24 Primary Aerospace Vehicles Authorized (PAA) each. This would leave three PAA aircraft from the 95th FS, which would be used to improve operational test and evaluation and WIC training, and are included as part of this Proposed Action.

1.3.3 Contract Adversary Air

Air Force 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 Chief of Staff of the Air Force'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. Current Air Force ADAIR capacity provides 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 of 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. The Air Force created dedicated ADAIR units, or Aggressor Squadrons, to provide required training while lessening the impact to operations squadrons.

The 57th OG is currently experiencing an aggressor training deficit of 5,600 flight hours annually. At this time, the military cannot provide enough suitable aircraft for the mission. Contract surrogate aircraft are needed to emulate potential adversaries.

1.4 Scope of the Environmental Analysis

This EA analyzes the potential environmental consequences associated with the Proposed Action and Alternatives. This EA has been prepared in accordance with the NEPA (42 USC §§ 4321–4347), the CEQ Regulations (40 CFR §§ 1500–1508), and 32 CFR § 989, et seq., *Environmental Impact Analysis Process*. NEPA is the basic national requirement for identifying environmental consequences of federal decisions. NEPA ensures that environmental information, including the anticipated environmental consequences of a proposed action, is available to the public, federal and state agencies, and the decision-maker before decisions are made and before actions are taken.

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

- Chapter 1, Purpose and Need for Action, includes an introduction, location, purpose and need statements, scope of environmental analysis, decision to be made, interagency and intergovernmental coordination and consultations, applicable laws and environmental regulations, and a description of public and agency review of the EA.
- Chapter 2, Description of the Proposed Action and Alternatives, includes a description of the Proposed Action, alternative selection standards, screening of alternatives, alternatives eliminated from further consideration, a description of the selected alternatives, summary of potential environmental consequences, and mitigation and environmental commitments.
- Chapter 3, Affected Environment, includes a description of the natural and man-made environments within and surrounding Nellis AFB and the airspace that may be affected by the Proposed Action and Alternatives.
- Chapter 4, Environmental Consequences, includes definitions and discussions of direct and indirect impacts and environmental commitments.
- Chapter 5, Cumulative Effects, considers the potential cumulative impacts on the environment that may result from the incremental impact of the Proposed Action when added to other past, present, and reasonably foreseeable future actions.
- Chapter 6, List of Preparers, provides a list of the preparers of this EA.
- Chapter 7, References, contains references for studies, data, and other resources used in the preparation of the EA.
- Appendices, as required, provide relevant correspondence, studies, modeling results, and public review information.

NEPA, which is implemented through the CEQ regulations, requires federal agencies to consider alternatives to the Proposed Action and to analyze potential impacts of alternative actions. Potential impacts of the Proposed Action and its Alternatives described in this document will be assessed in accordance with the Air Force EIAP (32 CFR § 989), which requires that impacts to resources be analyzed in terms of their context, duration, and intensity. To help the public and decision-makers understand the implications of impacts, they will be described in the short and long term, cumulatively, and within context. Environmental resources and the Region of Influence (ROI) analyzed in the EA are summarized in **Table 1-1**. The expected geographic scope of any potential consequences is identified as the ROI.

Nellis AFB 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**, Water Resources; Land Use; Socioeconomics; Hazardous Materials and Wastes, Toxic Substances, and Contaminated Sites; and Infrastructure, Transportation, and Utilities are not described in the airspace ROI for baseline in **Chapter 3** or considered for detailed analysis in **Chapter 4**. All construction activities would occur at Nellis AFB, so no impacts to these resources would occur under the airspace. Groundwater was eliminated from detailed analysis for Nellis AFB and the airspace ROIs because the Proposed Action does not have the potential to cause impacts to this resource. Visual Resources were eliminated from detailed analysis for Nellis AFB and the airspace ROIs because facility demolition, renovation, construction, and addition would occur entirely within the installation and consistent with existing visual landscapes. Additional aircraft operations would be similar to those currently conducted so there would be no change in Visual Resources associated with aircraft operations.

**Table 1-1.
Environmental Resources Analyzed in the Environmental Assessment**

Resource	Region of Influence: Nellis AFB and Environs	Region of Influence: NTTR, R-2508, and Environs
Airspace Management and Use	✓	✓
Noise	✓	✓
Safety	✓	✓
Air Quality	✓	✓
Biological Resources	✓	✓
Water Resources	✓	
Soils	✓	✓
Land Use	✓	
Socioeconomics	✓	
Visual Resources		
Environmental Justice and Protection of Children	✓	✓
Cultural Resources	✓	✓
Hazardous Materials and Wastes, Toxic Substances, and Contaminated Sites	✓	
Infrastructure, Transportation, and Utilities	✓	

Notes: AFB = Air Force Base; NTTR = Nevada Test and Training Range

1.5 DECISION TO BE MADE

This EA analyzes the potential environmental consequences associated with the Proposed Action and Alternatives. Facility demolition, renovation, construction, minor building additions as well as an increase in personnel, are also included in the Proposed Action.

Based on the analysis in this EA, the Air Force will make one of three decisions regarding the Proposed Action: 1) choose the Proposed Action and sign a Finding of No Significant Impact (FONSI), allowing implementation of the preferred 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 proposed and alternative actions. Scoping is an early and open process for developing the breadth of issues to be addressed in an EA and for identifying significant concerns related to an action. Per the requirements of the Intergovernmental Cooperation Act of 1968 (42 USC § 4231[a]) and EO 12372, *Intergovernmental Review of Federal Programs*, federal, state, and local agencies with jurisdiction that could potentially be affected by the proposed and alternative actions were notified during the development of this EA. Interagency and Intergovernmental Coordination for Environmental Planning letters and responses are included in **Appendix A**.

1.6.2 Agency Consultations

Implementation of the Proposed Action involves coordination with several organizations and agencies. Compliance with Section 7 of the Endangered Species Act of 1973 (ESA) (16 USC § 1531 et seq.) and implementing regulations (50 CFR § 402), requires communication with the US Fish and Wildlife Service (USFWS) and/or National Oceanic and Atmospheric Administration (NOAA) 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 is made of any potential adverse effects on the species. Should no species protected by the ESA be affected by the proposed or alternative actions, no additional consultation is required. Letters were sent to the appropriate USFWS office (NMFS is not applicable) as well as relevant state agencies informing them of the proposal and requesting data regarding applicable protected species.

Coordination with the appropriate state government agencies and planning districts is ongoing through publication of the Draft EA for review and comment. Compliance with Section 106 of the National Historic Preservation Act (54 USC § 300101) (NHPA) and implementing regulations (36 CFR § 800) will be accomplished through the State Historic Preservation Officers (SHPOs). The Nevada Department of Environmental Protection and Clark County Department of Environment and Sustainability would be included for air and water quality, and the Nevada Department of Wildlife would be included in this coordination on habitat and species of concern.

All agency correspondence is included in **Appendix A** of the EA.

1.6.3 Government to Government Consultation

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

1.7 Applicable Laws and Environmental Regulations

Implementation of the Proposed Action would involve coordination with several organizations and agencies. Adherence to the requirements of specific laws, regulations, best management practices, and necessary permits is described in detail in each resource section in **Chapter 3**.

1.7.1 National Environmental Policy Act

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

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

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

1.7.2 The Environmental Impact Analysis Process

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

1.8 PUBLIC AND AGENCY REVIEW OF ENVIRONMENTAL ASSESSMENT

A Notice of Availability (NOA) of the Draft EA and FONSI was published in Las Vegas Review Journal and Desert Lightning News newspapers announcing the availability of the EA for review on 25-26 June 2021. The NOA invited the public to review and comment on the Draft EA. The public and agency review period ended on 26 July 2021. The public and agency comments are provided in **Appendix A**.

CHAPTER 2 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 PROPOSED ACTION

The Air Force is proposing to add 17 F-35 Joint Strike Fighter aircraft at Nellis AFB to support the 65th AGRS, 422nd TES, and No. 17 TES; add three F-22A Raptor aircraft into the 422nd TES; and operate COCO ADAIR from Nellis AFB. Together, the components of this action would add 751 personnel at Nellis AFB (479 personnel for the addition of the 17 F-35s, 32 personnel for the addition of three F-22A Raptor aircraft, and 240 personnel for COCO ADAIR). Facility demolition, renovation, construction, and addition would be necessary to support the new aircraft.

2.1.1 Addition of F-35 Joint Strike Fighter Aircraft

The Proposed Action would increase the approved baseline of 36 F-35s at Nellis AFB by 17 to a total of 53 F-35s. The 17 aircraft will be transferred or reassigned from the following:

- Nine F-35 aircraft would be transferred from the 33rd FW, 58th FS, Eglin AFB to the 57th Wing, 65th AGRS, Nellis AFB.
- Two F-35 aircraft would be reassigned from the 53rd Wing, 31st TES, Edwards AFB to the 57th Wing, 65th AGRS, Nellis AFB.
- Six total F-35A/B aircraft would be added to Nellis AFB to perform operational test and evaluation of the F-35A/B weapons system.
    - Either three or six additional F-35A aircraft would be assigned to the 422nd TES to perform operational test and evaluation of the F-35A weapons system.
    - Either zero or three F-35B aircraft would move to Nellis AFB if the Royal Air Force No. 17 TES relocates from Edwards AFB to perform operational test and evaluation of the F-35B weapons system.

There would be no reduction of F-35s at Eglin AFB; as each F-35 is reassigned from Eglin AFB to Nellis AFB, it would be replaced at Eglin AFB by a new F-35 aircraft direct from the plant or by an aircraft transfer from another F-35 location. No change in mission is planned for Eglin AFB as part of this action.

The 33rd FW was selected as the source of the nine F-35 aircraft due to structural issues that preclude those nine aircraft from firing the internal 25-millimeter (mm) cannon. The bulkhead structures of these aircraft are not structurally capable of withstanding the vibration of firing the internal cannon. Since the structural modifications to fire the internal 25mm cannon are cost prohibitive to modify, those aircraft are better utilized for the Aggressor mission, which does not require the internal 25mm cannon to fire.

Two F-35 aircraft would be reassigned from the 53rd Wing, 31st TES, Edwards AFB to the 57th Wing, 65th AGRS, Nellis AFB. As Initial Operational Test and Evaluation is completed at Edwards AFB, six F-35 aircraft supporting that effort at Edwards will all move to Nellis AFB. Four of those aircraft would be reassigned to the 422nd TES at Nellis AFB (previously evaluated in a separate NEPA action and included in the 36 F-35 baseline number), and the other two would be reassigned to the 65th AGRS as described above.

Either three or six additional F-35 aircraft from the F-35 production facility would be assigned to the 422nd TES to perform operational test and evaluation of the F-35 weapons system in a combat representative environment. The 422nd TES is an existing unit already tasked to perform this mission and has 12 assigned F-35s prior to this action being implemented. The 422nd TES would have a total of either 15 or 18 F-35 aircraft assigned after this action is complete. The No. 17 TES would relocate with zero or three F-35B aircraft from Edwards AFB to perform operational test and evaluation of the F-35B weapons system in a combat representative environment.

Proposed aircraft moves are captured in **Tables 2-1** through **2-3**. The COMACC has directed that this action not impact F-35 Full Operational Capability, which is planned for February 2022. Therefore, the nine aircraft that would be transferred from Eglin to the 65th AGRS are not planned to move until fiscal year (FY)22. Reassignment of the two F-35s from Edwards are planned to occur in FY21.

Table 2-1.
F-35 Planned Moves for 65th Aggressor Squadron

Unit	Location	FY21 Qtr 3	FY21 Qtr 4	FY22 Qtr 1	FY22 Qtr 2	FY22 Qtr 3	FY22 Qtr 4	FY23 Qtr 1	FY23 Qtr 2	FY23 Qtr 3	FY23 Qtr 4
65th AGRS	Nellis AFB	0	2	2	2	2	2	2	4	10	11
31st TES	Edwards AFB	6	4	4	4	4	4	4	4	4	4
58th FS	Eglin AFB	25[a]	25	25	25	25	25	25	25	25	25

Notes:
Numbers indicate total F-35s in each squadron.
a. The total F-35s assigned to the 58th FS will not change; as they transfer aircraft to the 65th AGRS, the 58th FS will be backfilled with other F-35s.
AFB = Air Force Base; AGRS = Aggressor Squadron; FS = Fighter Squadron; TES = Test and Evaluation Squadron; Qtr = quarter

Table 2-2.
F-35 Planned Moves for 422nd Test and Evaluation Squadron

Unit	Location	FY21 Qtr 2	FY21 Qtr 3	FY21 Qtr 4	FY22 Qtr 1	FY22 Qtr 2	FY22 Qtr 3	FY22 Qtr 4
422nd TES	Nellis AFB	12	12	15	15	15	15	15
OR								
422nd TES	Nellis AFB	12	12	15	15	15	15	18

Notes:
Numbers indicate total F-35s in each squadron. The six F-35s are assigned from the F-35 production facility.
AFB = Air Force Base; TES = Test and Evaluation Squadron; Qtr = quarter

Table 2-3.
F-35B Planned Moves for No. 17 Test and Evaluation Squadron

Unit	Location	FY20 Qtr 4	FY21 Qtr 1	FY21 Qtr 2	FY21 Qtr 3	FY21 Qtr 4	FY22 Qtr 1	FY22 Qtr 2	FY22 Qtr 3	FY22 Qtr 4
No. 17 TES	Nellis AFB	0	0	0	0	0	3	3	3	3
OR										
No. 17 TES	Nellis AFB	0	0	0	0	0	0	0	0	0

Notes:
Numbers indicate total F-35Bs. The three F-35s are currently based at Edwards AFB.
AFB = Air Force Base; TES = Test and Evaluation Squadron; Qtr = quarter

2.1.2 Addition of F-22A Raptor Aircraft

Three 95th FS F-22A Raptor aircraft initially would be on loan to the 422nd TES in accordance with the aircraft loan process as outlined in Air Force Instruction (AFI) 16-402, *Aerospace Vehicle Programming, Assignment, Distribution, Accounting, and Termination*. These loans would be a “possession only” change until permanent assignment changes would be made. The 422nd TES at Nellis AFB would consolidate three 95th FS F-22A PAA into their current PAA of 12 F-22As, resulting in a total of 15 F-22A PAAs.

2.1.3 Contract Adversary Air

The Proposed Action would provide dedicated COCO ADAIR sorties for CAF training at Nellis AFB to address shortfalls in 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 Nellis COCO ADAIR program utilizes contract air service for Red Air training.

COCO ADAIR would have multiple aircraft available with acceptable capabilities to support training requirements. These aircraft would include:

1) The Douglas A4 Skyhawk
2) The Aero Vodochody L-159 Alca
3) The Dassault F1 Mirage
4) The Atlas Cheetah

2.1.4 Facilities

2.1.4.1 Addition of F-35 Joint Strike Fighter Aircraft

The 65th AGRS would require operations and maintenance (O&M) and/or military construction (MILCON) facility projects on Nellis AFB to successfully bed down additional F-35s. **Figure 2-1** shows the facilities proposed for demolition, renovation, and construction under the Proposed Action. Facilities proposed for demolition, renovation, and construction shall comply with all applicable federal, state, and local regulations to include the most current Nellis and Creech AFB Installation Facilities Standards (IFSs).

Building 1770A is currently occupied by the 57th OG, the 57th Adversary Tactics Wing (ATW), and the COCO ADAIR. Expansion of Building 1770A would be necessary to support the 65th AGRS, which would require a 4,000-square-foot (ft^2) addition over previously disturbed land on the northwest side of the building, extending towards the parking lot. Renovations would also be necessary and would consist of modernization efforts, making the existing vault certified for F-35 flying operations. This includes power and air conditioning adjustments necessary to support Autonomic Logistics Information Systems (ALIS) installation. The parking lot for Building 1770A would be increased by approximately 30,000 ft^2.

Current occupants of Building 1770A would be moved as follows:

- COCO ADAIR staff would move into a new Building 1770B addition that is part of another Proposed Action analyzed in a separate EA.
- 57th ATW would move to Building 451, which would require a renovation and addition. The proposed addition to Building 451 would be from 3,000 to 4,000 ft^2. The parking lot at Building 451 would be increased by 20,000 ft^2.
- The 57th OG would move into the Close Air Support Integration Group (CIG)/Tactical C-2 Air Support Squadron (TASS) trailers near Building 1770A.

The following renovations and expansions are included as part of the Proposed Action (**Figure 2-1**):

- Building 423 would have an annex of 4,000 ft^2 to provide space for the 59 TES.
- Building 278 would be repaired and expanded with a 4,000 ft^2 addition to provide space for a Nondestructive Investigation Lab.
- Building 878 would be repaired, altered, and expanded with a 4,000 ft^2 addition to support the 422 TES.
- Building 10301 would have interior renovations only.

The A-10 mission currently occupying facility space in Building 262 would be relocated to an area adjacent to the Live Ordnance Loading Area (LOLA) on the east side of the runway. As part of the Proposed Action, a clamshell type hangar would be erected on a new concrete pad.

Approximately 20 to 50 construction personnel would be on site during the construction period, particularly during the peak construction action when concrete is being delivered. These crews include truck drivers, equipment operators, escort personnel, craftsmen, and supervisor personnel.

There would be two facility options for additional F-35 maintenance hangar facilities: either an O&M renovation of hangar 262 (Option 1), or MILCON construction of a new hangar (Option 2). Both facility options would meet the needs of the 65th AGRS, 422nd TES, and No. 17 TES missions. Each alternative is presented below. The screening process for site-specific Nellis alternatives is further discussed in **Section 2.5**.

The No. 17 TES with three F-35Bs would be bedded down through the use of existing and temporary facilities (Figure 2-2). The maintenance functions would share Building 262 with A-10 maintenance from November 2021 until the start of the Building 262 F-35 Aggressor renovation. At that point, the No. 17 TES maintenance would move to Building 245 and share the space with the Flanker AMU. The aircraft can use existing sunshades but would need lightning protection added.

The operations functions for the No. 17 TES would be

- A deployable facility provided by the UK, to be sited west of Building 878 on existing pavement,
- Portions of Red Flag Building 220, or
- Portions of the F-35 LOLA facility being used by the A-10 AMU (Building 2107).

The second phase would utilize a 4,200 square foot trailer to be sited west of Building 878 on existing pavement.

Facilities for the No. 17 TES are not evaluated in Chapter 4 because activities for the No. 17 TES use existing buildings without the need for renovation and/or the use of temporary facilities on existing pavement. Nellis AFB has determined that categorical exclusions under NEPA are applicable to these elements of the Proposed Action.

Option 1
Option 1 assumes there would be no MILCON funding and the increase of additional maintenance hangar facilities would be accomplished using only O&M facility projects. **Figure 2-1** shows the facilities proposed for renovation. Facilities modification actions associated with Option 1 are described below.

Building 262 would be renovated and expanded with a 4,000 ft^2 addition. Maintenance for the 65th AGRS would occupy this facility. Building 257 would be expanded with a 4,000 ft^2 addition. Maintenance for the F-35 operational test aircraft would occupy this facility.

In addition, aircraft sunshades would be installed over existing pavement. Building 283 also would require interior repairs.

Option 2
Under this option, O&M and MILCON facility projects on Nellis AFB would be accomplished to successfully increase available maintenance hangar facilities.

Option 2 would include demolition of Building 250, which is now the Eagle Aircraft Maintenance Unit (AMU) and includes the Weapons School on the western side of the building. Construction of a new 6-bay hangar/AMU for the 65 AGRS F-35s would occur in that location. The total area impacted by demolition for Building 250 would be about 164,000 ft^2 including utility lines, impervious areas, walls, and utility holes. All demolition material would be removed and disposed of according to federal, state, local, and installation regulations. The size of the 6-bay hangar would be approximately 103,000 ft^2, not including exterior paved areas. The existing parking on the other side of Tyndall Avenue from Building 250 would be expanded by 106 spots, increasing the paved area by approximately 50,000 ft^2.

Eagle AMU personnel would be moved to three existing buildings – Hangar 245, Building 246, and Building 248. Renovations would occur at the three buildings, adding interior walls to Buildings 246 and 248 because they are not currently configured for administrative functions. The proposed addition to Building 246 would be 4,000 ft^2 in size.

Figure 2-1 shows the facilities proposed for demolition, renovation, and construction under this option. **Appendix B** provides detailed figures for each facility.

No new building is planned at this time for the Weapons School, which would be moved to temporary trailers. Preliminary siting for these trailers is adjacent to Building 100. New construction for the Weapons School is not part of this action.

2.1.4.2 Addition of F-22A Raptor Aircraft

Facilities at Nellis AFB are sufficient to accept three additional F-22A Raptor aircraft. No MILCON or sustainment, restoration, and modernization projects would be required.

2.1.4.3 Contract Adversary Air

COCO ADAIR would utilize the existing Buildings 194 and 199 for hangar maintenance, as was done for the COCO ADAIR proof-of-concept. Under the Proposed Action, the pilots would operate out of a portion of Building 1770B, occupying the new addition to that facility when completed. Contract aircraft would not have permanently assigned parking on the ramp due to the fluid and flexible nature of operations at Nellis AFB. Sufficient aircraft parking is available, but the contract aircraft would be required to move around the ramp as needed.

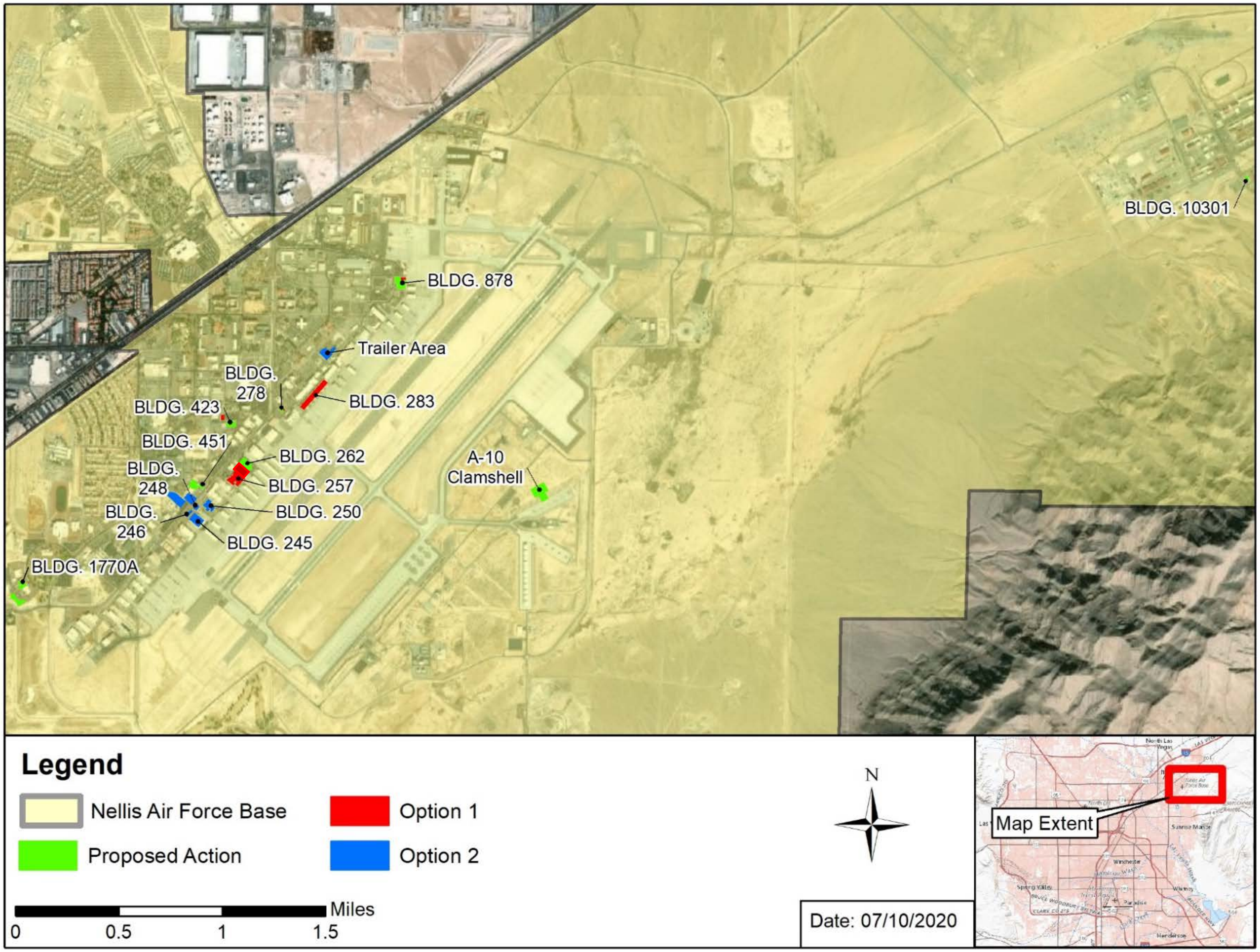

Figure 2-1. Location of Facilities Proposed for Demolition/Renovation/Construction at Nellis Air Force Base under Options 1 and 2

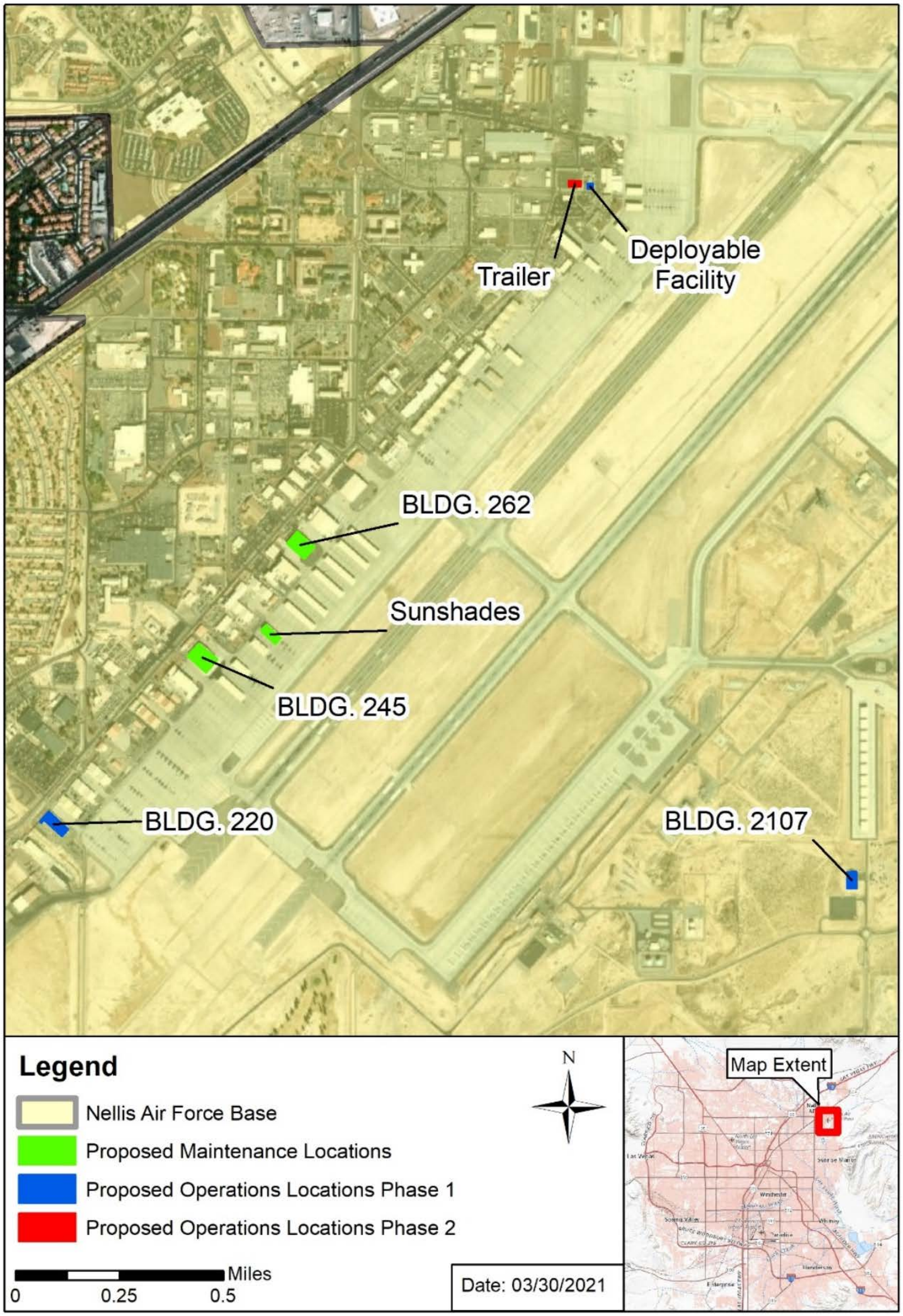

Figure 2-2. Location of Facilities Proposed for Use by No. 17 TES at Nellis Air Force Base

2.1.5 Personnel

Under the Proposed Action, 751 new personnel would be added to the Nellis AFB workforce, a 2-percent increase over the current number of military and civilian personnel who live and work on Base. Further description of the new personnel is provided below.

2.1.5.1 Addition of F-35 Joint Strike Fighter Aircraft

Additional military and contractor personnel would be required at Nellis AFB to support the Proposed Action associated with F-35 aircraft. The total increase is approximately 297 military, 143 civilians, and 39 contractor personnel and is depicted in **Table 2-4**. If the No. 17 TES relocates to Nellis AFB with its F-35Bs, they would bring 83 total personnel. That would result in reducing the additive F-35As from six to three, with a decrease in additive personnel roughly equivalent to the increase for F-35B.

Table 2-4.
Additive Nellis Air Force Base Personnel

Unit/Function	Officer	Enlisted	Civilian	Contractor	Total
65th AGRS	15	8	5		28
Operational Test Mgt/Ops (422 & 59th TES)	28	20	101		149
AGRS Maintenance (Flanker AMU, MUNS, MXG)	2	160	2	2	166
OT Maintenance (Bolt AMU, MUNS, MXG)	1	63	2		66
Lightning AMU			2		2
COR			2		2
BOS			29		29
Backshops				29	29
ALIS				8	8
Total	**46**	**251**	**143**	**39**	**479**

Notes:
AFB = Air Force Base; AGRS = Aggressor Squadron; AMU = aircraft maintenance unit; ALIS = Autonomic Logistics Information System; BOS= Base Operation Support; MXG = Maintenance Group; OT = Operational Test

2.1.5.2 Addition of F-22A Raptor Aircraft

As shown in **Table 2-5**, the Proposed Action would add two officers and 30 enlisted personnel for a total of 32 additional personnel authorizations at Nellis AFB associated with F-22A Raptor aircraft.

Table 2-5.
Additive Nellis Air Force Base Personnel

Unit/Function	Officer	Enlisted	Total
422nd TES	2	30	32

Notes:
TES = Test and Evaluation Squadron

2.1.5.3 Contract Adversary Air

Contract adversary air would add approximately 240 contract personnel, consisting of pilots, operations staff, and maintenance staff.

2.1.6 Sorties

2.1.6.1 Addition of F-35 Joint Strike Fighter Aircraft

The 17 F-35 aircraft would be additive at Nellis AFB with additional programmed flying hours and additional sorties. **Table 2-6** depicts the changes to sorties flown at each location affected by the F-35 component of the Proposed Action. A sortie is defined as a single military aircraft flight from initial takeoff through final landing. If the No. 17 TES relocates to Nellis AFB with three F-35B aircraft, the squadron would fly the same number of sorties as three of the F-35A aircraft that would have been added to the 422 TES.

Table 2-6.
Planned F-35 Annual Sortie Changes

Location	Unit	Δ Day Sorties	Δ Total Sorties	Δ Low Level Sorties	Δ Supersonic Sorties
Nellis AFB	65 AGRS	+1,202	+1,514	+110	+983
Nellis AFB	422 TES	+434	+462	+69	+346

Notes:
Night sorties are defined as sorties operating from 2200 to 0700 the next day. For night sorties, the 422 TES would operate at approximately 10% of overall departures and approximately 10% arrivals of overall arrivals. The 65 AGRS would operate at approximately 4% departures and approximately 10% of overall arrivals for night sorties.
AFB = Air Force Base; AGRS = Aggressor Squadron; TES = Test and Evaluation Squadron; Δ = change

2.1.6.2 Addition of F-22A Raptor Aircraft

The three F-22A Raptor aircraft would be additive at Nellis AFB but would support the existing flying program with no planned increases in sorties, airspace use, or airfield operations.

2.1.6.3 Contract Adversary Air

Up to 30 contract adversary air aircraft would be based on Nellis AFB. Existing taxiways, runways, and terminal airspace are fully compatible with aircraft requirements. The Nellis COCO ADAIR program would fly no more than 5,600 hours per year or 3,500 sorties (**Table 2-7**). Operations would be during the day except to support the night “go” for two Red Flags per year. All aircraft under the Proposed Action would follow the published departure and arrival procedures to and from Nellis AFB.

Table 2-7.
Planned ADAIR II Annual Sortie Changes

Location	Unit	Δ Day Sorties	Δ Total Sorties	Δ Low Level Sorties	Δ Supersonic Sorties
Nellis AFB	ADAIR II	+2,975	+3,500	+525	+100

Note
Δ = change

For night sorties, COCO ADAIR operates at approximately 4-percent departures and approximately 10 percent of overall arrivals.

2.1.7 Airspace Use

Nellis AFB, along with the NTTR and R-2508 airspace, represents the Air Force’s premier location to conduct complex, multi-aircraft CAS combat training exercises in support of ground maneuver units. Nellis AFB airfield airspace environment comprises part of the Class B airspace that the FAA designates around the nation’s busiest airports. Designed for air traffic operating under instrument flight rules, Class B airspace for Nellis AFB extends around Nellis AFB and Las Vegas’ McCarran International Airport. Class B airspace requires that all aircraft operating within the area be in contact with the controlling air traffic control facility. No changes to operational patterns, altitudes, or routes would be required to accommodate the additional F-35, F-22A, or COCO ADAIR aircraft.

The primary training airspace that would be used by the additional F-35, F-22A, or COCO ADAIR aircraft would be the NTTR and R-2508 (**Figure 2-3** and **2-4**). The NTTR includes 5,000 square miles of airspace, which is restricted from civilian air traffic over-flight, and another 7,000 square miles of MOAs, which are shared with civilian aircraft. The primary training areas include Desert and Reveille North/South MOA, overlying ATCAA, low-altitude tactical navigation areas, the XRay MOA, and restricted areas 4806E, 4806W, 4807A, 4807B, R-4808N, R-4808S, and 4809. NTTR's restricted areas comprise SUA within which the FAA has determined that potentially hazardous activities occur, including air-to-ground ordnance delivery. Regulations prohibit nonparticipating military and civil/commercial aircraft from flying within this airspace without authorization. Training activities within NTTR predominantly would involve subsonic flight but supersonic flight is authorized in all NTTR airspace units, although at differing altitudes.

R-2508 MOA and ATCAA areas consist of four major work areas: Isabella, Owens, Saline, and Panamint. Additional minor MOA areas consist of Porterville, Bakersfield, Deep Springs, Barstow, Buckhorn, Bishop, Shoshone, Silver North, and Silver South airspace. The restricted airspace inside R-2508 consist of R-2505, R-2506, R-2524, R-2515, and R-2502. These restricted airspaces overlie military lands and are adjacent to the MOA airspace. The restricted areas are composed of SUA within which the FAA has determined that potentially hazardous activities occur, including air-to-ground ordnance delivery. Regulations prohibit nonparticipating military and civil/commercial aircraft from flying within the restricted portions of the airspace without authorization. Training activities within R-2508 predominantly involve subsonic flight but supersonic flight is authorized in the High-Altitude and Black Mountain supersonic corridors when properly scheduled, as well as inside the internal restricted areas after receiving specific approval from the appropriate scheduling agency.

Table 2-8 provides a breakdown of current and projected training activities for the AGRS, TES, and COCO ADAIR at NTTR and R-2508 for both low and high altitude. The total increase in sorties associated with the Proposed Action would be 5,476 flown in the NTTR and R-2508 annually. If the No. 17 TES relocates with three F-35B aircraft to Nellis AFB, the 422 TES additional F-35A aircraft would be reduced by three. The three F-35Bs would fly the same number of sorties and airspace operations as the three F-35As.

Table 2-8.
Current and Projected Training Activities for AGRS, TES, and COCO ADAIR

Airspace	Current Altitude	Baseline Training Sorties	Projected Additional Training Sorties	Projected Total Sorties
NTTR	Low altitude	64th AGRS: 400	65th AGRS: 110	1,209
		422nd TES: 143	422nd TES: 56	
		COCO ADAIR: 0	COCO ADAIR: 500	
NTTR	High altitude	64th AGRS: 1,925	65th AGRS: 1,264	7,141
		422nd TES: 813	422nd TES: 314	
		COCO ADAIR: 0	COCO ADAIR: 2,825	
R-2508 Complex	Low altitude	64th AGRS: 66	65th AGRS: 30	171
		422nd TES: 36	422nd TES: 14	
		COCO ADAIR: 0	COCO ADAIR: 25	
R-2508 Complex	High altitude	64th AGRS: 109	65th AGRS: 110	650
		422nd TES: 203	422nd TES: 78	
		COCO ADAIR: 0	COCO ADAIR: 150	
Total Proposed Airspace Sorties		**3,695**	**5,476**	9,171

Notes:
64th AGRS sorties represent those sorties currently flown by F-16 Aggressor aircraft. 65th AGRS additional sorties represent the sorties that would be flown by F-35 aircraft.
AGRS = Aggressor Squadron; COCO ADAIR = contractor-owned contractor-operated Adversary Air; NTTR = Nevada Test and Training Range; TES = Test and Evaluation Squadron

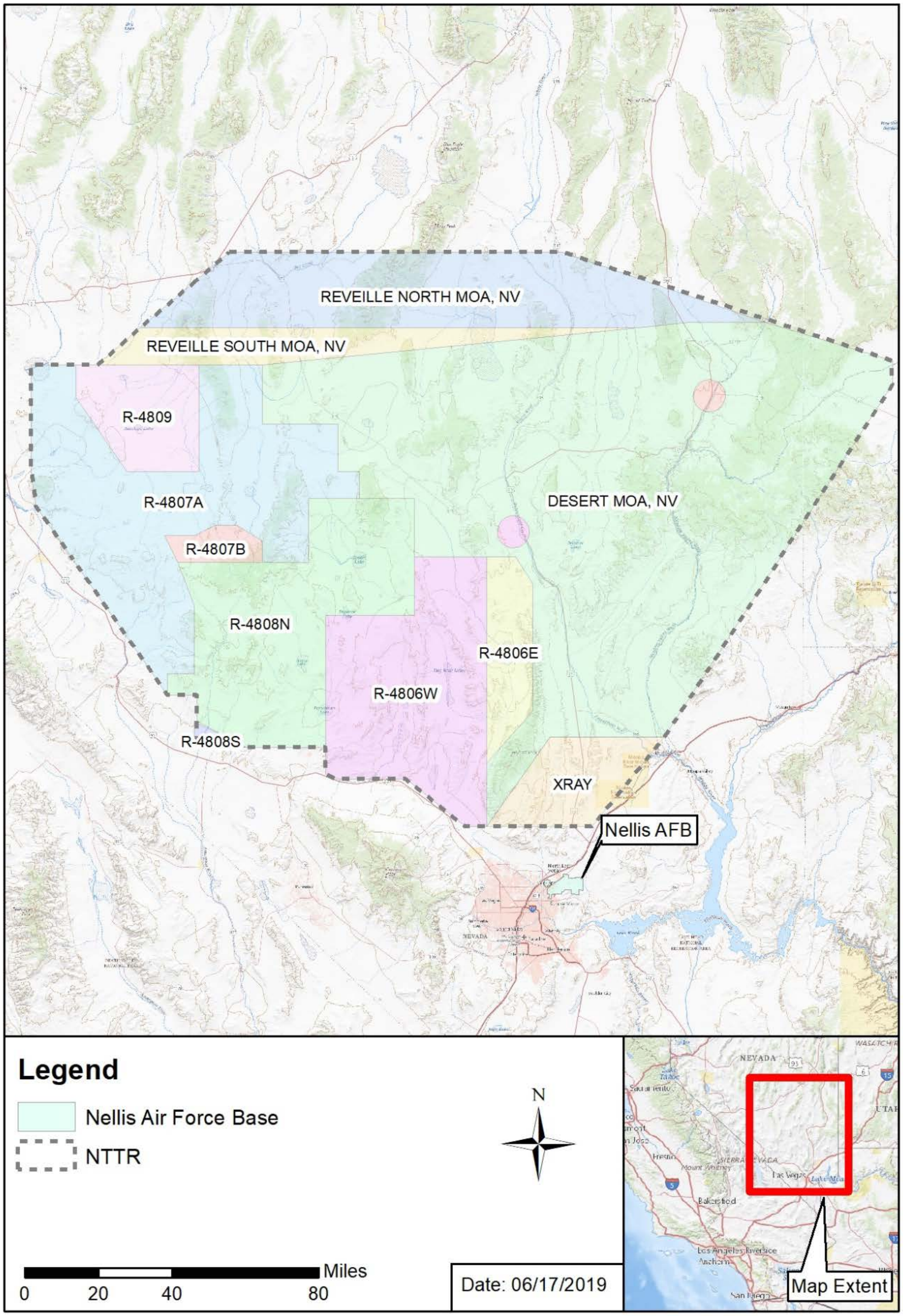

Figure 2-3. Location of NTTR Airspace

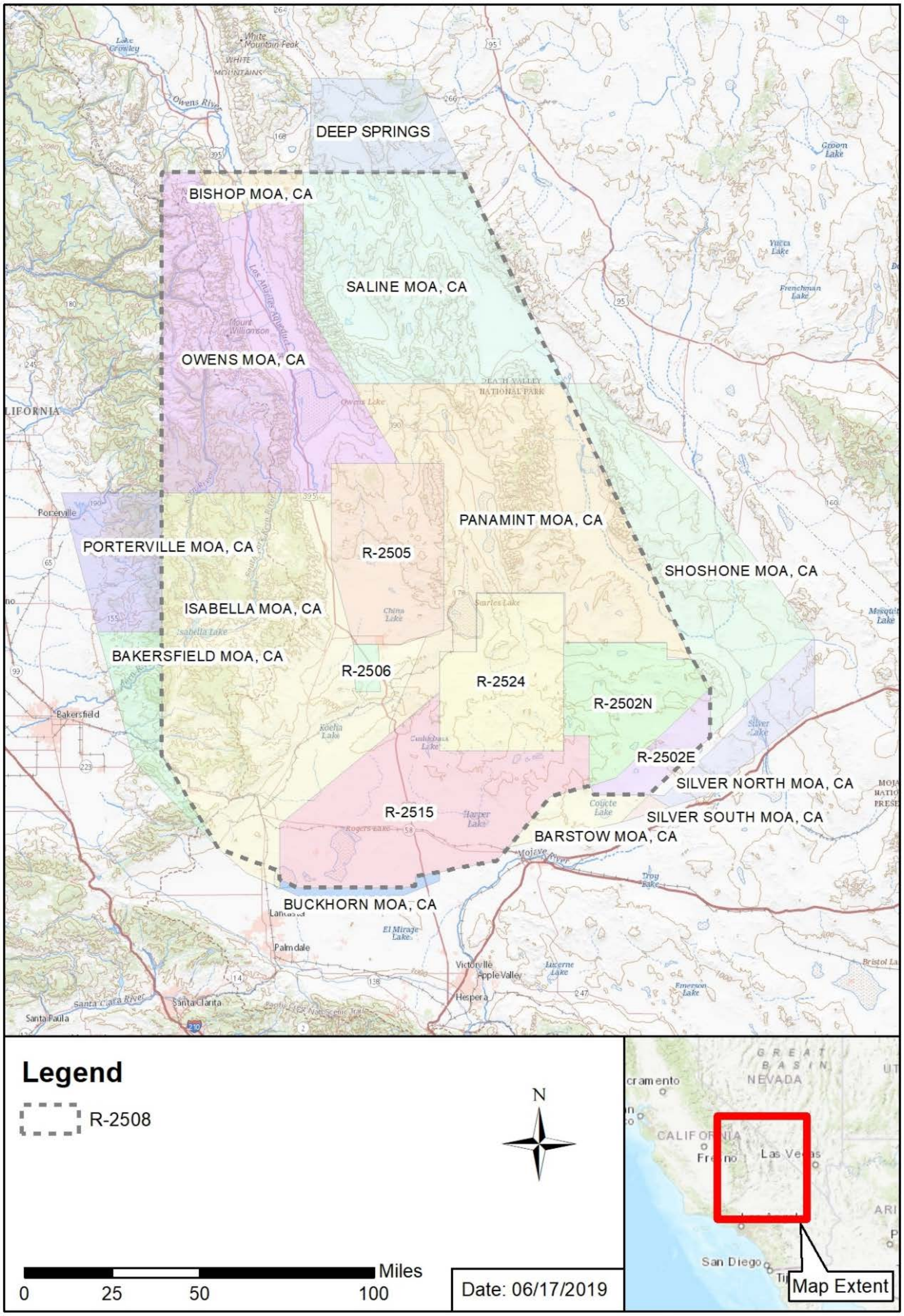

Figure 2-4. R-2508 Complex

2.1.8 Ordnance and Defensive Countermeasures

2.1.8.1 Addition of F-35 Joint Strike Fighter Aircraft

Personnel at Nellis AFB control, maintain, and store all ordnance and munitions required for mission performance on NTTR. This includes training and inert bombs and rockets, live bombs and rockets, chaff, flares, gun ammunition, small arms ammunition, and other explosive and pyrotechnic devices.

Table 2-9 provides existing and proposed defensive countermeasure use by the 65th AGRS, 422nd TES, and COCO ADAIR. Flares are a principal defensive countermeasure dispensed by military aircraft to avoid detection or attack by enemy air defense systems. 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, and anti-aircraft artillery. If the No. 17 TES relocates with three F-35B aircraft to Nellis AFB, the additive F-35A aircraft analyzed for the 422 TES would be reduced by three. The three F-35Bs would utilize the same amount of ordnance and defensive countermeasures as three F-35As.

Table 2-9.
Existing and Proposed Defensive Countermeasure Use

Special Use Airspace	Unit	Aircraft Type	Countermeasure Type	Current Baseline Use	Proposed Additional Use	Total Estimated Future Use
NTTR	64th AGRS	F-16	Flares[a]	40,000	0	40,000
			Chaff	0	0	0
	65th AGRS	F-35	Flares[b]	0	22,770	22,770
			Chaff[c]	0	0	0
	422nd TES	F-35	Flares[d]	165	60	225
			Chaff	0	0	0
	COCO ADAIR	A4/TBD	Flares	0	0	0
			Chaff	0	0	0
	Total Flares in NTTR			**40,165**	**22,770**	**62,995**
	Total Chaff in NTTR			**0**	**0**	**0**
R-2508 Complex	64th AGRS	F-16	Flares	0	0	0
			Chaff	0	0	0
	65th AGRS	F-35	Flares	0	0	0
			Chaff	0	0	0
	422nd TES	F-35	Flares	0	0	0
			Chaff	0	0	0
	COCO ADAIR	A4/TBD	Flares	0	0	0
			Chaff	0	0	0
	Total Flares in R-2508			0	0	0
	Total Chaff in R-2508			0	0	0

Notes:
a. 64th AGRS baseline flare usage is estimated as one 15x flare pack per sortie (15x 2500 sorties/year = 40,000)
b. 65th AGRS usage is similarly estimated as 15x 1514 sorties/year = 22,710
c. F-35 does not currently expend chaff. While it is planned to do so in the future, exact chaff composition and quantities are unknown at this time.
d. The 422nd TES uses flares on fewer than 1% of missions (15 x 11 sorties/year = 165 current and 15 x 4 sorties/year = 60 for add).
e. If the No. 17 TES relocates to Nellis AFB with three F-35B, the six additive F-35As for the 422 TES would be reduced by three. The total number of proposed additional flares would remain the same for six F-35As or three F-35As/three F-35Bs.

AGRS = Aggressor Squadron; COCO ADAIR = contractor-owned contractor-operated Adversary Air; NTTR = Nevada Test and Training Range; TES = Test and Evaluation Squadron

2.1.8.2 Addition of F-22A Raptor Aircraft

Under the Proposed Action, the additional three F-22As would not be flying additional sorties and would therefore not increase the expenditure of ordnance in support of their mission requirements.

2.1.8.3 Contract Adversary Air

Under the Proposed Action, COCO ADAIR aircraft would not use chaff and/or flares during training sortie operations.

2.2 SELECTION STANDARDS

NEPA and CEQ regulations mandate the consideration of reasonable alternatives for the Proposed Action. “Reasonable alternatives” are those that also could be utilized to meet the purpose of and need for the Proposed Action. Per the requirements of 32 CFR § 989, selection standards are used to identify alternatives for meeting the purpose and need for the Air Force action.

2.2.1 Addition of F-35 Joint Strike Fighter Aircraft

The Proposed Action alternatives must meet the following selection standards associated with the addition of F-35 aircraft:

1) Mission. The location must be optimized for F-35 tactics and training
    a. Weather
        i. 350 days/year of visibility greater than or equal to 3,000’ above ground level and 3 miles distance).
        ii. ≥3,000/3 for >240 days/year
    b. Training Infrastructure. Airspace must support tactics development and training requirements
        i. Supersonic. Ability for aircraft to fly at supersonic speeds
        ii. Range must be equipped with Air Combat Maneuvering Instrumentation
        iii. Live drops. Ability to employ live air to ground munitions
        iv. Electronic warfare (EW) training range availability. Equipped with threat simulators that allow aircraft to exercise their EW equipment and tactics
    c. Range availability
2) Capacity for 17 PAA F-35 and 218 personnel
    a. Operations facilities
        i. Operations and AMU facilities
        ii. Simulator facilities
    b. Ramp/parking
    c. Logistics facilities
        i. Hangars
        ii. Backshop functions
        iii. LRS (Logistics Readiness Squadron) – Supply
        iv. LRS – POL (Petroleum, Oil, Lubricants)
        v. Corrosion control capability
        vi. Munitions Storage Area
    d. BOS (Base Operating Support)
3) Cost
    a. MILCON
    b. O&M one-time and O&M recurring
    c. Area locality costs (Basic Allowance for Housing)
4) Environmental
    a. Air quality
    b. Encroachment

2.2.2 Addition of F-22A Raptor Aircraft

As discussed in **Section 1.3.2**, the purpose of the Proposed Action is to reassign three F-22A Raptor aircraft from the 95th FS from Tyndall AFB, Florida. The selection standards below specifically address the use of those three aircraft.

The Proposed Action alternatives must meet the following selection standards:

1) Collocate with existing F-22A operations.
2) Keep F-22A operations squadrons at an effective, efficient size.
3) Enhance F-22A fleet capabilities.
4) Enable increased fighter pilot production.

2.2.3 Contract Adversary Air

As discussed in **Section 1.3.3**, the purpose of the Proposed Action is to provide COCO ADAIR support to fill an existing aggressor training deficit. The following selection standards were applied specifically to address COCO ADAIR:

1) Mission: In addition to supporting AF-prioritized missions as described in **Section 1.3.3**, COCO ADAIR alternatives must not displace, interfere with, detract from, or reduce other Air Force missions or combat operations worldwide.
2) Airspace Capacity: Alternatives must have the airspace capacity to support force-on-force training engagements and must be able to safely support the additional COCO 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) Location: The location must be central to Air Force exercises, test, and advanced tactical training. The location must provide the ability to provide training to the maximum number of Air Force operations squadrons.
4) Time: 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 year, therefore, do not meet the purpose and need for the initiative.

2.3 SCREENING OF ALTERNATIVES

2.3.1 Addition of F-35 Joint Strike Fighter Aircraft

The Air Force determined that the enterprise of bases to consider for alternatives would be defined as active duty installations with existing missions of tactics development, existing Weapons School, operational test, Red Flag, and existing Aggressor Squadron(s). After considering the selection standards and enterprise definition, the Air Force concluded that a single location, Nellis AFB, would meet the majority of the standards and best fit the purpose and need of the Proposed Action.

The rationale for the selection of Nellis AFB as the only viable alternative includes:

- All graduate level WIC training occurs at Nellis.
- All CAF fighter tactics development occurs at Nellis.
- Currently, if the 422 TES needs 5th Generation adversaries, they have to come from Weapons School resulting in decreased instructor training. CAF training would benefit significantly from 5th Generation adversaries:
    - Would support WIC, CIG, Red Flag exercises and provide exposure opportunity to all CAF units when attending Red Flag and other training events.
    - Face-to-face briefs/debriefs enhances overall training.
- Nellis has existing leadership, structure, and facilities in 64th and 65th AGRS complex.
- Nellis has existing F-35 support infrastructure in place:
    - Contract Maintenance (Mx) / Contract ALIS support.
    - Distributed Mission Operations (DMO) capable F-35 simulators.

2.3.2 Addition of F-22A Raptor Aircraft

The following potential alternatives that might meet the purpose and need for reassignment of three PAA F-22As from the 95th FS include:

1) Alternative 1 – Assign three PAA F-22As to Nellis AFB for use as test and Weapons Instructor Course aircraft.
2) Alternative 2 – Assign one PAA F-22A to three different F-22A operations squadrons.
3) Alternative 3 – Assign three PAA F-22As to a single F-22A operations squadron.
4) Alternative 4 – Recode three PAA F-22As to Backup Aircraft Inventory and assign one each to existing F-22A operations squadrons.

Application of the screening criteria is presented in **Table 2-10.**

Table 2-10.
Comparison of Selection Standards for Addition of F-22A Raptor Aircraft at Nellis Air Force Base

Alternative Descriptions	Selection Standards			
	Colocation with existing F-22A operations	Effective, efficient F-22A operations squadron size	Enhance F-22A fleet capabilities	Enable increased fighter pilot production
	(1)	(2)	(3)	(4)
Alternative 1 – Assign three PAA F-22As to Nellis AFB.	Yes	Yes	Yes	Yes
Alternative 2 – Assign one PAA F-22A	Yes	No	No	Yes
Alternative 3 – Assign three PAA F-22A	Yes	No	No	Yes
Alternative 4 – Recode three PAA F-22As	Yes	No	No	No

Notes:
AFB = Air Force Base; PAA = Primary Aerospace Vehicles Authorized

Alternative 1 meets all the selection standards. This alternative collocates three PAA F-22As at Nellis AFB with existing F-22A force structure, providing F-22A Raptor aircraft that could be used by both the 422nd TES for test purposes, enhancing fleet capabilities, and the F-22A WIC for pilot development and production. **Section 2.4** provides more details on the rationale for eliminating Alternatives 2, 3, and 4.

2.3.3 Contract Adversary Air

The following potential alternatives that might meet the purpose and need for COCO ADAIR training include:

1) Alternative 1 – Establish ADAIR capabilities (an estimated 30 aircraft) providing an estimated 3,500 annual training sorties at Nellis AFB for support in the NTTR and R-2508 operating out of an expansion to Building 1770B.
2) Alternative 2 – Establish an additional Air Force AGRS of military pilots to fly ADAIR aircraft (an estimated 30 aircraft) providing a maximum of 3,500 annual training sorties at Nellis AFB for support in the NTTR and R-2508.

3) Alternative 3 – Establish ADAIR capabilities (an estimated 30 aircraft) providing an estimated 3,500 annual training sorties at Nellis AFB for support in the NTTR and R-2508 constructing new facilities.
4) Alternative 4 – Establish ADAIR capabilities by tasking existing Air Force fighter squadrons to provide the capability.

Application of the screening criteria is presented in **Table 2-11.**

Table 2-11.
Comparison of Selection Standards for Contract Adversary Air at Nellis Air Force Base

Alternative Descriptions	Selection Standards			
	Mission	Airspace	Location	Time
	(1)	(2)	(3)	(4)
Alternative 1 – Establish COCO ADAIR with expansion of 1770B	Yes	Yes	Yes	Yes
Alternative 2 – Establish additional AGRS squadron	No	Yes	Yes	No
Alternative 3 – Establish COCO ADAIR with new facilities	Yes	Yes	Yes	No
Alternative 4 – Establish COCO ADAIR with organic Air Force units	No	Yes	Yes	Yes

Notes:
AGRS = Aggressor Squadron; COCO ADAIR = contractor-owned contractor-operated Adversary Air

Alternative 1 meets all the selection standards. This alternative provides contract adversary air support at Nellis AFB to address ADAIR training capacity shortfalls at a location that can maximize training across the greatest number of pilots and units. **Section 2.4** provides more details on the rationale for eliminating Alternatives 2, 3, and 4.

2.4 Alternative Actions Eliminated From Further Consideration

2.4.1 Addition of F-35 Joint Strike Fighter Aircraft

Nellis AFB was the only location that met the selection criteria listed in 2.2.1. The Air Force did not identify alternatives other than Nellis AFB.

2.4.2 Addition of F-22A Raptor Aircraft

Three alternatives were considered and eliminated from further consideration because they would not meet the purpose and need for the Proposed Action or the selection standards (refer to **Section 2.3**). These alternatives included the following:

- Alternative 2 does not meet standards 2 and 3. This alternative would result in three F-22A operations squadrons sized at 25 PAA, which is not an effective size to meet global taskings. It would also result in one active duty base having one squadron sized at 24 PAA and one squadron sized at 25 PAA. Two different-sized squadrons in the same wing would result in reduced efficiency. This alternative also would not enhance fleet capabilities.
- Alternative 3 also does not meet standards 2 and 3. It would result in one F-22A operations squadron sized at 27 PAA, which would not be efficient for global taskings. It would also result in one active duty base having one squadron sized at 24 PAA and one squadron sized at 27 PAA.

Two different-sized squadrons in the same wing would result in reduced efficiency. This alternative also would not enhance fleet capabilities.

- Alternative 4 does not meet standards 2, 3, or 4. An aircraft that is coded as PAA has programmed resources (flying hours, manpower) to support the aircraft. Aircraft that are coded Backup Aircraft Inventory do not have any programmed resources. Therefore, the amount of support resources does not increase when assigning additional Backup Aircraft Inventory aircraft above the minimum number needed for normal fleet operations. Assigning additional Backup Aircraft Inventory would not meet standard 2 since it forces the same resources to be spread out among more aircraft, reducing effectiveness and efficiency. Additional Backup Aircraft Inventory would not enhance F-22A fleet capabilities.

2.4.3 Contract Adversary Air

Consideration of the selection standard for location results in the conclusion that Nellis AFB is the only location at which contract adversary air in this context can be efficiently established. Nellis AFB is the AF center for operational test, advanced tactical training, and exercises. Nellis AFB provides the best opportunity to provide adversary training to the maximum number of operations squadrons across the Air Force, which is why it was selected to host dedicated military aggressor squadrons. Contract adversary air in this context is intended to fill training gaps created by previous force structure decisions at Nellis AFB. Therefore, no other locations were considered.

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 2.3**). These alternatives included the following:

- Alternative 2 does not meet standards 1 or 4. This alternative would establish an additional Air Force AGRS. Establishing a new Air Force AGRS of 4^{th} Generation aircraft would meet some 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 3 does not meet standard 4. Establishing the COCO ADAIR mission with new facilities construction does not provide support in the timely manner needed to address the pilot readiness crisis, and as such does not meet Selection Standard 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 4 would not meet standard 1. Tasking organic 4^{th} Generation 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 4^{th} 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 SCREENING OF ALTERNATIVES AT NELLIS AFB

The location alternatives presented in **Section 2.3** narrowed the location for the Proposed Action to Nellis AFB. Subsequently, site-specific alternatives were considered at Nellis AFB. These site-specific alternatives include the following:

2.5.1 Nellis Alternative A (Preferred Alternative)

Nellis Alternative A would add 17 F-35 Joint Strike Fighter aircraft to support the 422nd TES, 65th AGRS, and the No. 17 TES; add three F-22A Raptor aircraft into the 422nd TES; and operate COCO ADAIR. Facility renovation and addition, as well as an increase in personnel, would be necessary to support the new aircraft. Renovations and/or additions to Buildings 1770A, 278, 423, 451, 878, and 10301, and siting of a temporary facility would be needed under this alternative. In addition, this alternative includes implementation of Option 1 for F-35 maintenance hangar facilities as described in **Section 2.1.4**, which includes renovation and addition to Buildings 283, 257, and 262. It also includes the use of existing and temporary facilities to support the No. 17 TES F-35Bs.

2.5.2 Nellis Alternative B

Nellis Alternative B would add 17 F-35 Joint Strike Fighter aircraft to support the 422nd TES, 65th AGRS, and the No. 17 TES; add three F-22A Raptor aircraft into the 422nd TES; and operate COCO ADAIR. Facility demolition, renovation, construction, addition, as well as an increase in personnel, would be necessary to support the new aircraft. Like Alternative A, this alternative would include the renovations and/or additions to Buildings 1770A, 278, 423, 451, 878, and 10301, and siting of a temporary facility. This alternative includes implementation of Option 2 for F-35 maintenance hangar facilities as described in **Section 2.1.4**, which includes construction of a new 65 AGRS hangar (six bays for 17 PAA F-35s) and AMU facilities, and associated demolition of Building 250. The current occupants of Building 250 (Eagle AMU personnel) would be moved to three existing buildings – Hangar 245, Building 246, and Building 248. Interior renovations would occur at the three buildings because they are not currently configured for administrative functions, and a 4,000 ft^2 addition would be made to Build 246. This alternative also includes the use of existing and temporary facilities to support the No. 17 TES F-35Bs.

2.5.3 Nellis Alternative C

Nellis Alternative C would add 17 F-35 Joint Strike Fighter aircraft to support the 422nd TES, 65th AGRS, and the No. 17 TES, add three F-22A Raptor aircraft into the 422nd TES, and operate COCO ADAIR. Facility demolition, renovation, construction, addition, as well as an increase in personnel would be necessary to support the new aircraft similar to Alternatives A and B, except the 65 AGRS hangar facilities would be located near the opposite end of the ramp at Building 295. This alternative also includes the use of existing and temporary facilities to support the No. 17 TES F-35Bs.

2.5.4 Nellis Alternative D

Nellis Alternative D would add 17 F-35 Joint Strike Fighter aircraft to support the 422nd TES, 65th AGRS, and the No. 17 TES; add three F-22A Raptor aircraft into the 422nd TES; and operate COCO ADAIR. Facility demolition, renovation, construction, addition, as well as an increase in personnel would be necessary to support the new aircraft similar to Alternatives A and B, except the 65 AGRS hangar facilities would be located on the opposite (east) side of the airfield. This alternative also includes the use of existing and temporary facilities to support the No. 17 TES F-35Bs.

2.6 ALTERNATIVE ACTIONS ELIMINATED FROM FURTHER CONSIDERATION AT NELLIS AFB

Four alternatives at Nellis AFB were considered. Two alternatives were eliminated from further consideration because they would not meet the purpose and need for the action or the selection standards (refer to **Section 2.3**). These alternatives included the following:

- Nellis Alternative C would locate the 65th AGRS AMU near the opposite end of the ramp (Building 295). Alternative C was not carried forward since it is the proposed site for the MILCON project to support another proposed action.
- Nellis Alternative D would locate the 65th AGRS hangar on the opposite (east) side of the airfield. Alternative D was not carried forward due to cost of construction in that area (additional

infrastructure, utilities, communications, pavements) and the 3.5 miles of separation that would be created between operations and their aircraft and associated maintenance, which would result in inefficiency in daily operations.

2.7 Detailed Description of the Selected Alternatives

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.

2.7.1 Proposed Action Alternatives

Two alternatives are carried forward for analysis:

- Nellis Alternative A is the preferred alternative. Details of Alternative A are described in **Section 2.1** and include Option 1 for facilities actions.
- Alternative B is also carried forward and is described in **Section 2.1**, choosing Option 2 for facilities actions. The only difference between Alternative A and B is the selection of Options for facilities actions.

2.7.2 No Action Alternative

Analysis of the No Action Alternative provides a benchmark, enabling decision-makers to compare the magnitude of the potential environmental effects of the Proposed Action. NEPA requires an EA to analyze the No Action Alternative. No action means that an action would not take place at this time, and the resulting environmental effects from taking no action would be compared with the effects of allowing the proposed activity to go forward. No action for this EA reflects the status quo, where no additional aircraft assets would be transferred or reallocated at Nellis AFB.

As the nine F-35s at Eglin are replaced by newer aircraft, those aircraft would either be retired or another use would have to be found for them that does not include the capability to use the internal cannon. No F-35 aircraft would be reassigned from Edwards AFB and no new F-35s would be assigned to Nellis AFB. The No. 17 TES would not relocate to Nellis AFB and would remain at Edwards AFB. This would result in additional facility costs for the United Kingdom. Without 5th Generation Aggressors, the Air Force would not have the ability to train and develop tactics against adversary 5th Generation aircraft.

The 422nd TES would not receive the additional three PAA F-22A. Those three aircraft would be distributed to one or more operational squadrons, which would not improve Air Force capability to train weapons instructor pilots or test capability. As a result, one or more operational squadrons would have more than 24 PAA, making force management more difficult as deployable force modules are normally based on a 24-PAA squadron size.

Under the No Action Alternative, COCO ADAIR would not operate at Nellis AFB. The 57th OG would continue to experience an aggressor training deficit of 5,600 flight hours annually.

2.8 Summary of Potential Environmental Consequences

The potential impacts associated with the Proposed Action and the No Action Alternative are summarized in **Table 2-12.** The summary is based on information discussed in detail in **Chapter 4 (Environmental Consequences)** of the EA and includes a concise definition of the issues addressed and the potential environmental impacts associated with each alternative action.

2.9 MITIGATION AND ENVIRONMENTAL COMMITMENTS

The EA analysis concluded that the Proposed Action and Alternatives would not result in significant environmental impacts; therefore, no mitigation measures are required.

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Table 2-12.
Summary of Potential Environmental Consequences

Alternative	Resource												
	Airspace Management and Use	**Noise**	**Safety**	**Air Quality**	**Biological Resources**	**Water Resources**	**Soils**	**Land Use**	**Socioeconomics**	**Environmental Justice -Protection of Children**	**Cultural Resources**	**Hazardous Materials and Wastes, Contaminated Sites, and Toxic Substances**	**Infrastructure, Transportation, and Utilities**
Alternative A:	**Nellis AFB** Negligible impacts **SUAs** Negligible impacts	**Nellis AFB** Negligible to minor impacts **SUAs** Negligible impacts Impacts associated with sonic booms would be negligible	**Nellis AFB** No impacts to ground, explosive, or flight safety **SUAs** No impacts to ground, explosive, or flight safety	**Nellis AFB** Minor increase in criteria pollutant emissions. While, CO emissions are below *de minimus* thresholds, they are within 1.5 tons of the threshold. **SUAs** No impact on the region's ability to meet NAAQS for all regulated pollutants	**Nellis AFB** Negligible, short-term and long-term impacts to wildlife Minor impacts to birds from potential aircraft/bird collisions No impacts to federally listed species **SUAs** No impacts to wildlife from use of countermeasures. . Negligible short- and long-term impacts to wildlife and listed species from noise, including sonic booms Negligible impacts to wilderness areas.	**Nellis AFB** Non-construction-related overflights of resource areas may have negligible impacts to floodplains, wetlands, surface water, and stormwater management; no other impacts to this Resource Area are expected **SUAs** No impacts from deposition and transport of flare release No impacts from emergency fuel dumps	**Nellis AFB** Negligible impacts **SUAs** No direct impacts to soils from flare deposition Negligible indirect impacts from flare deposition	**Nellis AFB** No changes to existing land use **SUAs** N/A	**Nellis AFB** No impacts to population, economic environment, employment, housing, or educational resources **SUAs** N/A	**Nellis AFB** No disproportionate impact to minority or low-income populations No disproportionate impacts to children **SUAs** No disproportionate impact to minority or low-income populations No disproportionate impacts to children	**Nellis AFB** No impact to historic buildings or archaeological deposits No known traditional cultural resources or sacred sites are present **SUAs** No impact to historic buildings or archaeological deposits	**Nellis AFB** No impacts to hazardous waste management No impacts to asbestos-containing materials and lead-based paint management Long-term, minor beneficial impact to managing and disposal of polychlorinated biphenyls No impacts from radon Construction occurs above ERP sites but no impact. **SUAs** N/A	**Nellis AFB** Minor impacts to local traffic Negligible impacts to utilities **SUAs** N/A
Alternative B:	**Nellis AFB** Same as Alternative A **SUAs** Same as Alternative A	**Nellis AFB** Same as Alternative A **SUAs** Same as Alternative A	**Nellis AFB** Same as Alternative A **SUAs** Same as Alternative A	**Nellis AFB** Same as Alternative A **SUAs** Same as Alternative A	**Nellis AFB** Same as Alternative A **SUAs** Same as Alternative A	**Nellis AFB** N/A **SUAs** Same as Alternative A	**Nellis AFB** N/A **MOAs** Same as Alternative A	**Nellis AFB** Same as Alternative A **SUAs** Same as Alternative A	**Nellis AFB** Same as Alternative A **SUAs** Same as Alternative A	**Nellis AFB** Same as Alternative A **SUAs** Same as Alternative A	**Nellis AFB** Same as Alternative A **SUAs** Same as Alternative A	**Nellis AFB** Same as Alternative A **SUAs** N/A	**Nellis AFB** Same as Alternative A **SUAs** N/A

Alternative	Resource												
	Airspace Management and Use	**Noise**	**Safety**	**Air Quality**	**Biological Resources**	**Water Resources**	**Soils**	**Land Use**	**Socioeconomics**	**Environmental Justice -Protection of Children**	**Cultural Resources**	**Hazardous Materials and Wastes, Contaminated Sites, and Toxic Substances**	**Infrastructure, Transportation, and Utilities**
No Action Alternative	No change to airspace management and use at Nellis AFB or in the SUAs	No change to noise setting at Nellis AFB or in the SUAs	No change to ground, flight, or explosive safety at Nellis AFB or in the SUAs	No change to air quality at Nellis AFB or in the SUAs	No change to biological resources at Nellis AFB or in the SUAs	No change to water resources in the SUAs	No change to soil resources in the SUAs	No change to land use at Nellis AFB or in the M SUAs	No change to socioeconomic conditions at Nellis AFB or in the SUAs	No change to disproportionate impacts for minority, low-income, or children in the community at Nellis AFB or in the SUAs	No change to cultural resources at Nellis AFB or in the SUAs	No change to hazardous materials and wastes, contaminated sites, and toxic substances	No change to infrastructure, transportation, or utilities at Nellis AFB

Notes:
AFB= Air Force Base, N/A = not applicable; SUA= Special Use Airspace

CHAPTER 3 AFFECTED ENVIRONMENT

Existing environmental conditions could be affected by the proposed and alternative actions. The existing conditions for relevant resources are defined to provide a meaningful baseline from which to compare potential future effects. In this chapter, each resource is defined, the geographic scope is identified, followed by a description of the existing conditions for that resource. The expected geographic scope of potential consequences is referred to as the ROI. The ROI boundaries will vary depending on the nature of each resource. For example, the ROI for some resources, such as socioeconomics and air quality, extend over a larger jurisdiction unique to the resource. In addition, some resources discuss the available baseline data, installation (Base) and airspace, in the same section and some discuss these elements separately, depending on the complexity of the ROI and the relationship of the Base to the airspace. The scope of the environmental analysis, including resources to be assessed and resources eliminated from detailed analysis are described in **Section 1.4**.

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, USC § 40103, Sovereignty and Use of Airspace and Public Law No. 103-272, the US government has exclusive sovereignty over the nation's airspace. The FAA has the responsibility to plan, manage, and control the structure and use of all airspace over the United States. FAA rules govern the national airspace system, and FAA regulations establish how and where aircraft may fly. Collectively, the FAA uses these rules and regulations to make airspace use as safe, effective, and compatible as possible for all types of aircraft, from private propeller-driven planes to large, high-speed commercial and military jets.

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

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

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

The ROI for airspace management and use includes the Nellis AFB airfield and environs as well as the SUA used by Nellis AFB over the NTTR and within the R-2508 Complex, as depicted in **Figure 1-2**.

3.1.2 Existing Conditions – Nellis AFB

Nellis AFB airfield airspace environment comprises part of the Class B airspace that the FAA designates around the nation's busiest airports. Designed for air traffic operating under instrument flight rules, Class B airspace for Nellis AFB extends around Nellis AFB and Las Vegas' McCarran International Airport. Class B airspace requires that all aircraft operating within the area be in contact with the controlling air traffic control facility. Upon departure from Nellis AFB, aircraft typically transit to NTTR using various airspace, military training routes (MTRs), MOAs, and ATCAA overlying the MOAs (USAF, 2011a).

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, departures, and closed patterns by based military aircraft and transient aircraft. Annual operations at Nellis AFB are described in **Table 3-1**.

Table 3-1.
Annual Operations at Nellis Air Force Base

Use	Annual Operations1	Percentage of Use
Based Military	37,618	64
Transient	21,536	36
Total	**59,154**	**100**

Notes:
Annual operations were determined through the data collection process with Nellis AFB representatives.

3.1.3 Existing Conditions – Special Use Airspace

The affected environment for airspace management includes SUA used by Nellis AFB over the NTTR and within the R-2508 Complex (**Figure 1-2**). Both NTTR and R-2508 include restricted airspace that overlies the military lands adjacent to the MOA airspace. The restricted areas contain SUA within which the FAA has determined that potentially hazardous activities occur, including air-to-ground ordnance delivery. Regulations prohibit nonparticipating military and civil/commercial aircraft from flying within this airspace without authorization. Training activities within both NTTR and R-2508 predominantly involve subsonic flight, but supersonic flight is authorized in all NTTR and R-2508 airspace units, although at differing altitudes (FAA, 2012). NTTR occupies 12,000 nm^2 of airspace. The component MOAs within NTTR generally have a floor of 100 ft AGL and a ceiling of 18,000 ft MSL. The ATCAAs above NTTR have a floor of 18,000 ft MSL and a ceiling of either 60,000 ft MSL or unlimited. R-2508 occupies 20,000 nm^2 of airspace. The largest component MOAs within R-2508 have a floor of 200 ft AGL and a ceiling of 18,000 ft MSL. The ATCAAs above R-2508 have a floor of 18,000 ft MSL and a ceiling of either 60,000 ft MSL or unlimited.

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 EA, 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.

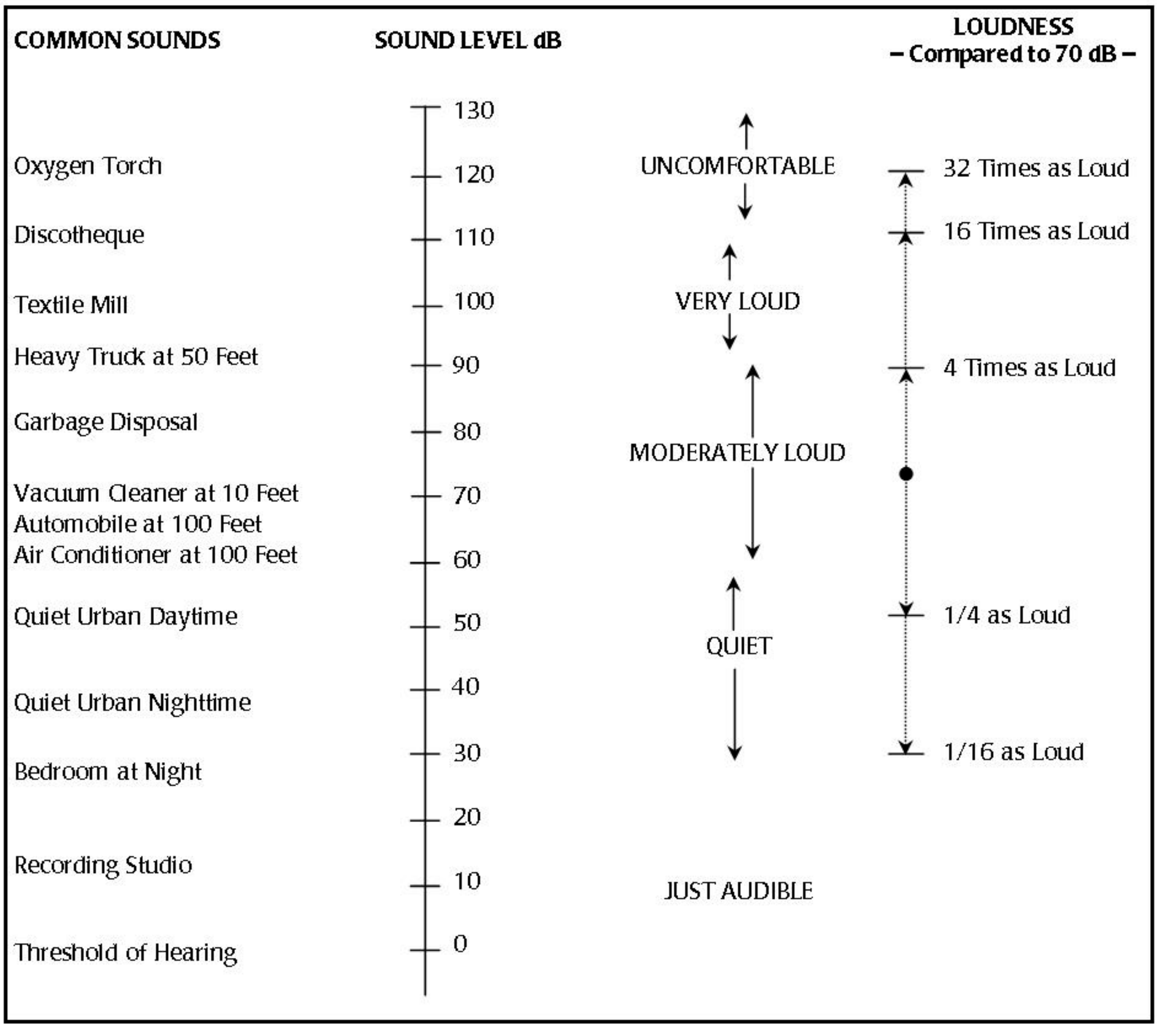


Figure 3-1. Typical A-weighted Sound Levels of Common Sounds (Source: Harris, 1979)

Very loud or impulsive sounds, such as explosions or sonic booms, can sometimes be felt and can cause secondary effects, such as shaking of a structure or rattling of windows. These types of sounds can add to annoyance and are best measured by C-weighted sound levels, denoted dBC. C-weighting is nearly flat throughout the audible frequency range and includes low frequencies that may not be heard but cause shaking or rattling. C-weighting approximates the human ear's sensitivity to higher-intensity sounds.

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) causes 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 (e.g., turns, dives) also affect the amplitude of particular booms.

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. A more robust discussion of noise metrics and noise models can be found in **Appendix C**.

Single Event Metrics

Maximum Sound Level

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

L_{max} is the maximum level that occurs over a fraction of a second. For aircraft noise, the "fraction of a second" is one-eighth of a second, denoted as "fast" response on a sound level measuring meter (ANSI, 1988). L_{max} is important in judging if a noise event will interfere with conversation, television, radio listening, or other common activity. Although it provides some measure of the event, L_{max} 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. The SEL for an example event, representing it as if all the sound energy were contained within 1 second, is indicated on **Figure 3-2**.

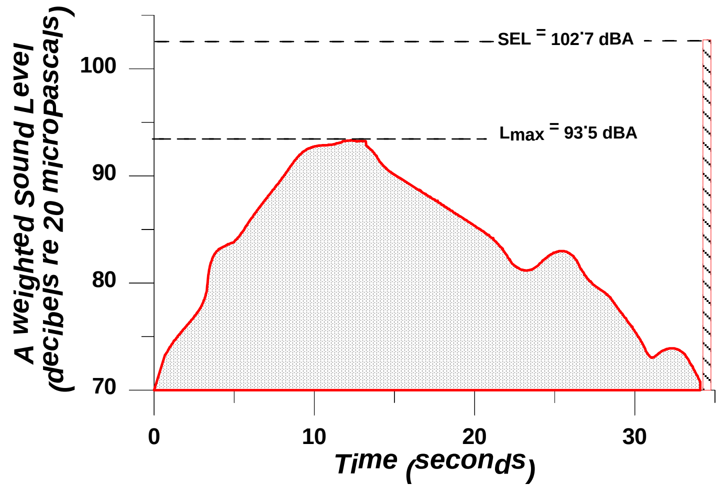


Figure 3-2. Example of Maximum Sound Level and Sound Exposure Level from an Individual Event

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.

C-Weighted Sound Exposure Level (CSEL) is SEL computed with C frequency weighting. C-weighting places more emphasis on low frequencies below 1,000 hertz and is used to discuss noise levels of supersonic aircraft activity.

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. 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 am to 3 pm 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) 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 humans' increased sensitivity to noise at night, DNL applies a 10 dB penalty to events during the nighttime period, defined as 10 pm to 7 am. 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 pm and 7 am 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).

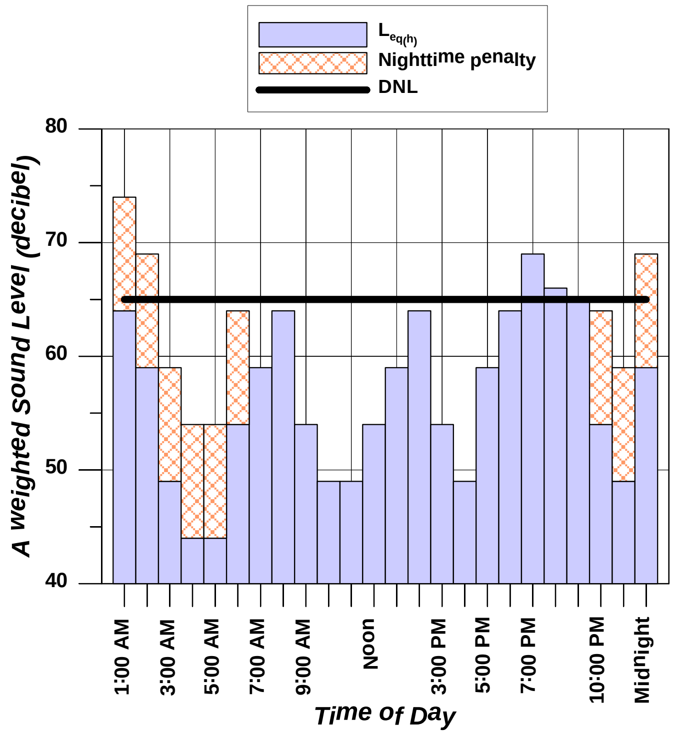


Figure 3-3. Example of Day-Night Average Sound Level (DNL) Computed from Hourly Average Sound Levels ($L_{eq[h]}$)

C-Weighted Day-Night Average Sound Level (CDNL) is DNL computed with C frequency weighting. C-weighting places more emphasis on low frequencies below 1,000 hertz and is used to discuss noise levels of supersonic aircraft activity and blast noise from munitions.

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

The cumulative daily noise metric devised to account for the “surprise” effect of the sudden onset of aircraft noise events on humans and the sporadic nature of SUA activity is known as 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, i.e., the busiest month.

3.2.1.2 Noise Models

This section summarizes the analysis tools used to calculate the noise levels for the EIAP. Per AFI 32-7070 *Air Force Noise Program*, these software programs are approved for Air Force noise analyses (USAF, 2016a).

NOISEMAP

Analyses of aircraft noise exposure and compatible land uses around US Department of Defense (DoD) airfield-like facilities are normally accomplished using a group of computer-based programs, collectively called NOISEMAP (Czech and Plotkin, 1998; Wasmer and Maunsell, 2006a, 2006b). The core computational program of the NOISEMAP suite is NMAP. The analysis in this EA used NMAP Version 7.3 to assess 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 MTRs with wide corridors or MOAs, the Air Force uses the DoD-approved MR_NMAP program (Lucas and Calamia, 1997). The analysis in this EA used MR_NMAP Version 3.0 to model subsonic aircraft noise in SUAs. 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. The analysis in this EA used the Air Force and DoD-approved PCBoom program to assess sonic boom exposure due to military aircraft operations in supersonic airspace. The analysis used PCBoom Version 4 to calculate sonic boom ground signatures and overpressures from supersonic vehicles performing steady, level flight operations (Plotkin and Grandi, 2002).

BooMap

The analysis in this EA used the Air Force- and DoD-approved BooMap program to assess cumulative sonic boom exposure under supersonic air combat training arenas. The analysis used BooMap96 to calculate cumulative CDNL exposure based on long-term measurements in a number of airspaces (Plotkin et al., 1992; Frampton et al., 1993).

BNOISE

The analysis in this EA used BNOISE to compute noise from muzzle blast, projectile supersonic shockwave, and detonation of munitions. This analysis used BNOISE2 to calculate cumulative CDNL exposure for munitions usage in military ranges (US Army Corps of Engineers [USACE], 2008).

The ROI for noise includes the Nellis AFB airfield and environs as well as the SUA used by Nellis AFB over the NTTR and within the R-2508 Complex, as depicted in **Figure 1-2**. Noise analysis at Nellis AFB was conducted to update the airfield noise contours and the SUAs described in **Sections 3.1.2** and **3.1.3**, respectively, to reflect the most recent and accurate aircraft operations and flying conditions.

3.2.2 Existing Conditions – Nellis AFB

As is normal for military installations with a flying mission, the primary driver of noise at Nellis AFB is aircraft operations. Standard aircraft operations include departures, arrivals, closed patterns, and static run-ups.

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

Base military aircraft such as the A-10, F-15, F-16, F-22, and F-35 airframes make up the majority of flight operations at Nellis AFB. There are 59,154 existing annual aircraft operations at Nellis AFB, as summarized in **Table 3-2**. An operation is defined as a single takeoff or landing. Closed patterns consist of two operations, one departure and one arrival (e.g., two closed pattern circuits consist of four total operations).

Table 3-2.
Existing Annual Aircraft Operations Summary at Nellis Air Force Base

Aircraft Type	Departures	Arrivals	Closed Patterns	Total
Based Military	16,069	16,069	5,480	37,618
Transient	10,768	10,768	0	21,536
Total	**26,837**	**26,837**	**5,480**	**59,154**

Note:
Annual operations were determined through the data collection process with Nellis AFB representatives.

The table pattern numbers are operation counts, not pattern circuit counts. A more detailed existing annual aircraft operations table can be found in **Appendix C**. The term “sortie” is also often used to discuss aircraft flight activities. A single sortie is defined as two operations, one departure and one arrival.

The resultant 65- to 85-dBA DNL contours in 5-dBA increments for the existing daily flight events at Nellis AFB are displayed in **Figure 3-4**. In accordance with Air Force Handbook (AFH) 32-7084, *AICUZ Program Manager's Guide*, 65-dBA DNL is the noise level below which generally all land uses are compatible with noise from aircraft operations (USAF, 1999). 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 also can experience levels of appreciable noise depending upon training intensity or weather conditions. In addition, DNL contours may vary from year to year due to fluctuations in operational tempo due to unit deployments, funding levels, and other factors. Static run-up operations, such as maintenance and pre/post-flight run-ups, were also modeled. A more detailed discussion of run-up operations at Nellis AFB can be found in **Appendix C**.

The prominent features from **Figure 3-4** are the extents of the DNL contours along the extended centerline of Runways 3L/21R and 3R/21L and extending along the flight paths turning northwest. The 65-dBA DNL contour extends beyond the Base boundary, approximately 6 miles to the north and 3 miles to the south from the end of the runways. The 65-dBA DNL contour also extends approximately from 4 to 5 miles from the Base boundary along the northwest flight paths. The 70-dBA DNL contour extends approximately 2.5 miles to the north and 2 miles to the south from the Base boundary. The 75-dBA DNL contour extends approximately 0.1 mile to the north and 1.7 miles to the south from the Base boundary. The area within each DNL noise contour for the existing conditions as shown on **Figure 3-4** is listed in **Table 3-3**.

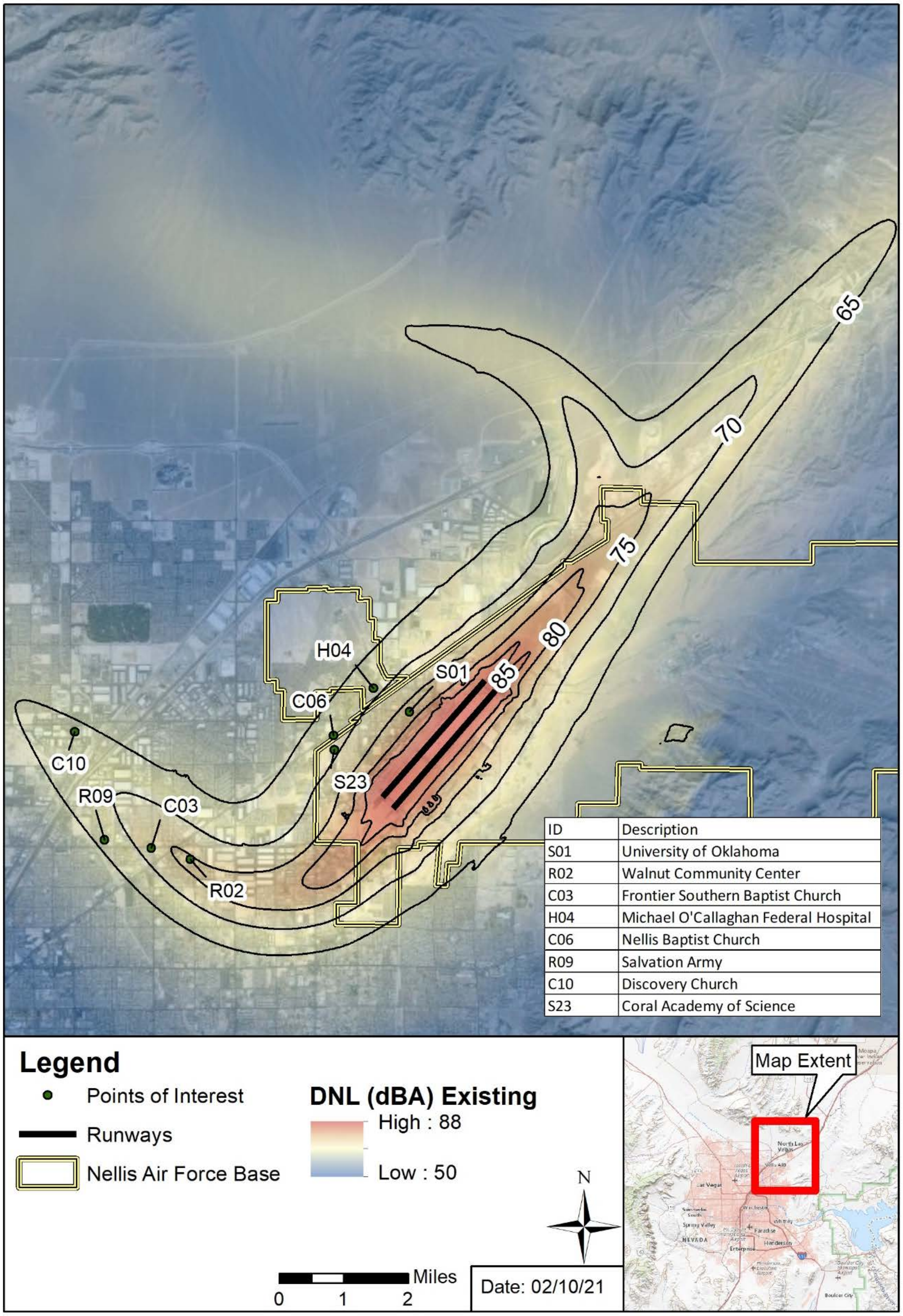


Figure 3-4. Existing Day-Night Average Sound Level Contours at Nellis AFB

Table 3-3.
Existing Day-Night Average Sound Level Acreage Affected at Nellis Air Force Base

Noise Level (dBA DNL)	Total Area Within DNL Contour (acres)	Off Base Area Within DNL Contour (acres)
>65	16,782	10,007
>70	8,134	3,400
>75	3,918	812
>80	1,880	160
>85	895	0

Notes:
Area (total and off Base) was based on noise contours modeled with NOISEMAP used to calculate the amount of land within each noise contour; off-Base areas exclude Nellis AFB and Creech AFB land areas. The amounts shown are cumulative, i.e., the acreage within the >85-dBA DNL 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) in the vicinity of Nellis AFB was identified and examined. These POIs are made up of noise-sensitive receptors such as schools, hospitals, residences, and places of worship. **Table 3-4** lists the DNL as a result of existing aircraft operations at Nellis AFB at a subset of representative POIs. Of the 23 representative POIs, 11 are exposed to DNL between 60 and 64 dBA and 9 of the POIs are exposed to DNL equal to or higher than 65 dBA.

Table 3-4.
Existing Day-Night Average Sound Level at Points of Interest at Nellis Air Force Base

Point of Interest		DNL (dBA)
ID	Description	
S01	University of Oklahoma	79
R02	Walnut Community Center	75
C03	Frontier Southern Baptist Church	73
H04	Michael O'Callaghan Federal Hospital	70
C06	Nellis Baptist Church	69
R09	Salvation Army	66
C10	Discovery Church	66
S11	Mary Lowman Elementary School	65
C12	Iglesia Christiana Shalom	64
C13	Maranatha Adventist Church	64
S14	Raul P Elizondo Elementary School	64
C15	Antiochian Orthodox Church	63
S16	Ed Von Tobel Middle School	63
S17	Dr. William H Bob Bailey Middle School	61
S18	Helen Herr Elementary School	60
C19	Gateway Baptist Church	61
S20	Canyon Springs High School	61
S21	Lee Antonello Elementary School	61
S22	Clifford O Findlay Middle School	61
S23	Coral Academy of Science	70

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

3.2.3 Existing Conditions – Special Use Airspace

The primary SUAs used by Nellis AFB aircraft are NTTR and R-2508. The primary contributors to the airspace noise environment are subsonic aircraft operations, supersonic aircraft operations, and blast noise from munitions.

3.2.3.1 NTTR

Over a 12-month period in 2017 and 2018, NTTR received more than 31,000 aircraft sorties. Per recent NEPA analysis, this level of subsonic sorties generates noise levels between 45 and 70 dBA L_{dnmr} throughout the NTTR airspace (USAF, 2018a).

NTTR experiences up to 20 sonic booms per day from supersonic aircraft operation. These supersonic operations correlate to a cumulative annual CDNL of 52 to 62 dBC throughout the NTTR airspace. Individual sonic booms generate overpressures between 3.8 and 4.8 psf (corresponding to noise levels of 113- to 115-dBC CSEL) when aircraft are operating at Mach 1.2 and altitudes of 15,000 ft AGL. As the aircraft's altitude increases, the overpressure and resulting sound level decreases. Detailed sonic boom modeling results for a variety of typical aircraft, airspeeds, and altitudes are presented in **Appendix C**.

NTTR regularly experiences noise exposure from large-caliber weapons and munitions firing. The 57-dBC CDNL noise contours from blast noise exposure extends approximately from 2 to 3 nm from each target area. The 57 dBC CDNL level is the threshold for a Land Use Planning Zone (LUPZ) Noise Zone I, which is where noise sensitive land uses such as housing, schools, and medical facilities need to be carefully managed. There are no areas where the LUPZ extends beyond the NTTR.

3.2.3.2 R-2508

Over a 12-year period (1990-2002), the R-2508 Complex received an annual average of 46,525 aircraft sorties (USAF, 2006a). Approximately 759 sorties per year were from F-16, F-22, and F-35 aircraft based at Nellis AFB, which represents less than 1.7 percent of the total aircraft sorties in R-2508. The noise contribution from these Nellis AFB aircraft operating in R-2508 was less than 45 dBA L_{dnmr}. R-2508 is authorized for supersonic flight and experiences overpressure levels and supersonic noise levels from individual sonic booms similar to those of NTTR.

3.3 SAFETY

3.3.1 Definition of the Resource

This section discusses safety concerns associated with ground, explosive, and flight activities. 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. Clear Zones and Accident Potential Zones (APZs) around the airfield restrict the public's exposure to areas where there is a higher accident potential. Although ground and flight safety are addressed separately, in the immediate vicinity of the runway, risks associated with safety-of-flight issues are interrelated with ground safety concerns.

Explosives safety relates to the management and safe use of ordnance and munitions. Flight safety considers aircraft flight risks such as midair collision, bird/wildlife-aircraft strike hazard (BASH), and in-flight emergency. The Air Force has safety procedures and aircraft-specific emergency procedures produced by the original equipment manufacturer of the aircraft. Basic airmanship procedures also exist for handling any deviations to air traffic control procedures due to an in-flight emergency; these procedures are defined in Volume 3 of AFI 11-202, *General Flight Rules*, and established aircraft flight manuals. The Flight Crew Information File is a safety resource for aircrew day-to-day operations and contains air and ground operation rules and procedures.

Existing conditions are organized by ground, explosive, and flight safety. The ROI includes Nellis AFB 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 – Nellis AFB and Special Use Airspace

The safety of the public with respect to aircraft operations at Nellis AFB is a primary concern for the Air Force. The areas surrounding Nellis AFB have established Air Installation Compatibility Use Zone (AICUZ) guidelines to define those areas with the highest potential for aircraft accidents and aircraft noise impacts, and to establish flight rules and flight patterns that will have the least impacts on the civilian population of Las Vegas and North Las Vegas with regard to safety and noise effects. With regard to potential aircraft accidents, Clear Zones and APZs have been established to identify the areas with the greatest risk for aircraft accidents and to guide off-Base development away from these higher-risk areas.

As shown in **Figure 3-5**, Clear Zones extend approximately 3,000 feet from the end of each runway and are completely contained within Nellis AFB. APZ I is an extension of the Clear Zone; it is about 4,000 feet wide and 5,000 feet long (i.e., extends 8,000 feet from the end of the runway). APZ II retains the width of 4,000 feet, but extends another 7,000 feet from the end of APZ I. The greatest potential for aircraft accidents occur within the Clear Zone; risks are reduced as distances from the runway increase. Thus, aircraft accidents are lower in APZ II. While aircraft accident potential within APZ I and APZ II, which are mostly located off Base, does not warrant land acquisition by the Air Force, land use planning and controls are strongly encouraged in these areas for the protection of the public (Nellis AFB, 2017a).

The Air Force identifies categories of aircraft mishaps. Class A mishaps are those that result in a human fatality or permanent total disability, the destruction of an aircraft, or a total cost in excess of $2 million ($1 million for mishaps occurring before FY10) for injury, occupational illness, or destruction of an aircraft. Class B mishaps are those that result in a permanent partial disability, in-patient hospitalization of three or more personnel, or a total cost in excess of $200,000 but less than $1 million for injury, occupational illness, or property damage. Class C mishaps are those that result in total damage in excess of $20,000 but less than $200,000, an injury resulting in a lost workday (i.e., duration of absence is at least 8 hours beyond the day or shift during which the mishap occurred), or occupational illness that causes loss of time from work at any time.

The mishap rates for all aircraft are calculated based on worldwide deployment of the aircraft type. The mishap rates are based on the number of mishaps per 100,000 flying hours for each type of aircraft. The mishap rate is dependent on the number of each aircraft type deployed, the time elapsed since the aircraft type has been in operation, the number of hours flown for each type, and the location of the operations. The mishap rates can then be converted to a risk factor for each aircraft type based on the number of hours flown by aircraft type. The F-22 has been in operation since 2003, and for the last 10 years has an annual flight-hour average of 28,566, with a lifetime Class A mishap rate of 7.32 (AFSEC, 2019a). The F-35 is the newest fighter to be operated by the Air Force. The F-35 has been in operation since 2011. The F-35 has 96,313 cumulative flight hours since its introduction in 2011. The Class A mishap rate for the F-35 is 3.11 over the lifetime of the aircraft (AFSEC, 2019b). Historically, when a new airframe was introduced, the mishap rate was typically elevated due to the relatively low number of flight hours combined with the use of unfamiliar aircraft. However, with modern advances in engineering and testing and increased realism in simulator training, elevated mishap rates in the newly introduced F-35 are somewhat lower than expected. As an airframe is flown more and more, the mishap rates tend to drop over the long term, as maintenance issues are solved and as pilots and training become more efficient and effective.

Within the NTTR, Nellis AFB maintains a Wildland Fire Management Plan (Nellis AFB, 2020a). This plan contains the procedures and directives necessary in the event that an aircraft mishap or accidental fire from aircraft operations or training occurs within the NTTR. The plan also lays out various Memoranda of Agreement (MOUs) with the City of North Las Vegas and the US Bureau of Land Management (BLM) that define roles and responsibilities in the event of a wildland fire in NTTR. Additionally, the plan specifies ways to reduce the likelihood of fire within NTTR through actions such as fuel reduction, fuel moisture monitoring, and minimization steps.

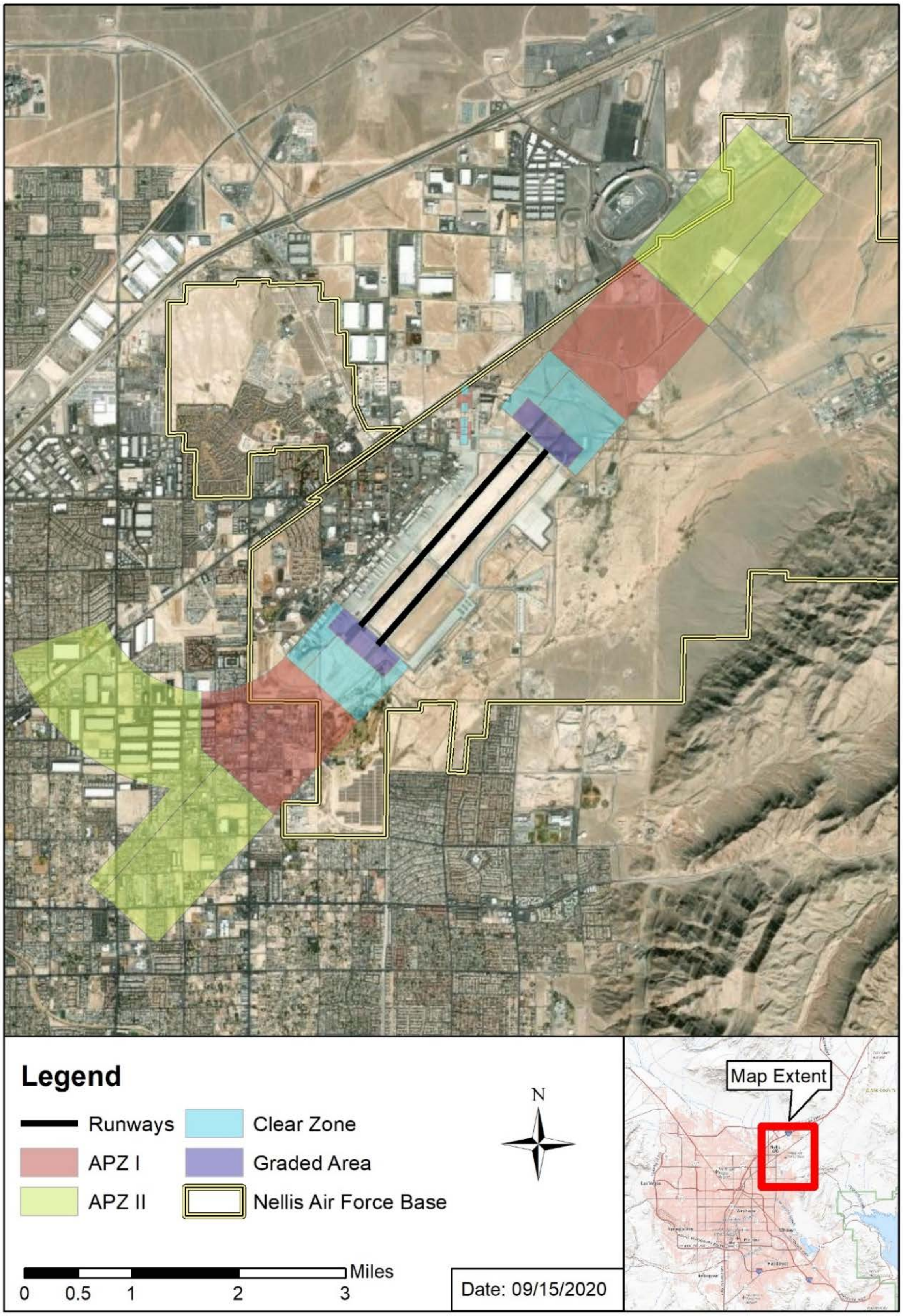


Figure 3-5. Nellis AFB Safety Zones

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. Air Force Manual (AFMAN) 91-201, *Explosives Safety Standards*, defines the guidance and procedures dealing with munition storage and handling.

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

Defined distances are maintained between munitions storage areas and a variety of other types of facilities. These distances, called Quantity-Distance (Q-D) arcs, are determined by the type and quantity of explosive material to be stored. Each explosive material storage or handling facility has Q-D arcs extending outward from its sides and corners for a prescribed distance. Within these Q-D arcs, development is either restricted or prohibited altogether to ensure personnel safety and to minimize potential for damage to other facilities in the event of an accident. In accordance with AFMAN 91-201, *Explosives Safety Standards*, Paragraphs 12.47.2 and 12.47.3, chaff and flares stored within the aircraft parked on the parking ramp are exempt from the Q-D arc requirements.

Nellis AFB also maintains an active BASH plan, as required under AFI 91-212, *Bird/Wildlife Aircraft Strike Hazard (BASH) Management Program*. This plan is continually updated to address any potential changes in conditions at Nellis AFB or within the NTTR. The goal of the BASH plan is to reduce the likelihood of an aircraft colliding with a bird or other wildlife, thereby causing potentially catastrophic damage to the aircraft or potentially the loss of life of the pilot from the damage. BASH avoidance measures include notices to pilots of bird activity within the area, seasonal notifications during bird migrations, and wildlife management within the airfield environment.

Bird aircraft strikes constitute a safety concern because they can result in damage to aircraft or injury to aircrews or local populations if an aircraft crashes. Aircraft may encounter birds at altitudes of FL300 or higher. However, most birds fly closer to the ground. Over 98 percent of reported bird strikes occur below 5,000 ft AGL (AFSEC 2018a). Approximately 49 percent of bird strikes happen in the airport environment (climb-out, traffic pattern, approach, and landing), and about 42 percent occur during low-altitude flight training (AFSEC 2018b).

Migratory waterfowl (e.g., ducks, geese, and swans) are the most hazardous birds to low-flying aircraft because of their size and their propensity for migrating in large flocks at a variety of elevations and times of day. Waterfowl vary considerably in size, from 1 to 2 pounds for ducks, 5 to 8 pounds for geese, and up to 20 pounds for most swans. There are two normal migratory seasons: fall and spring. Waterfowl are usually only a hazard during migratory seasons. These birds typically migrate at night and generally fly between 1,500 and 3,000 ft AGL during the fall migration and from 1,000 to 3,000 ft AGL during the spring migration.

In addition to waterfowl, other birds, such as raptors, shorebirds, gulls, herons, and songbirds also pose a hazard. In considering severity, the results of bird aircraft strikes in restricted areas show that strikes involving raptors result in the majority of Class A and Class B mishaps. Peak migration periods for raptors, especially eagles, are from October to mid-December and from mid-January to the beginning of March. In general, flights above 1,500 ft AGL would be above most migrating and wintering raptors.

Songbirds are small birds, usually less than one pound. During nocturnal migration periods, they navigate along major rivers, typically between 500 and 3,000 ft AGL. The potential for bird aircraft strikes is greatest in areas used as migration corridors (flyways) or where birds congregate for foraging or resting (e.g., open water bodies, rivers, and wetlands).

While any bird aircraft strike has the potential to be serious, many result in little or no damage to the aircraft, and only a minute portion result in a Class A mishap. During the years 1985–2014, the Air Force BASH

Team documented 108,670 bird strikes worldwide (AFSEC 2018c). Of these, 16 resulted in Class A mishaps where the aircraft was destroyed (AFSEC 2018d).

Defensive countermeasures (i.e., chaff and flare) are authorized for use within NTTR and R-2508. Training with actual chaff and flares is vitally important for battle realism and the safety of the pilot, as well as the large monetary investment of the aircraft. Chaff are small bundles of fibers that confuse enemy radar, allowing the aircraft to potentially escape a radar-guided weapon. There is no change in chaff usage as part of the proposed or alternative actions. Flares are used to create a false heat signature to confuse a heat-seeking weapon. Flare deployment in authorized airspace is governed by regulations that are based on safety and environmental considerations and limitations. Among these regulations are the following:

- AFI 13-201, *Airspace Management*, establishes practices to decrease disturbances from flight operations and protect the public from the hazards and effects associated with flight operations.
- AFI 13-212, *Range Planning and Operations*, outlines procedures governing weapons range use of flares.
- AFI 11-214, *Air Operations Rules and Procedures*, delineates procedures for flare employment.

Fire risk associated with flares stems from an unlikely, but possible, scenario of a flare reaching the ground or vegetation while still burning. If a flare struck the ground while still burning, it could ignite surface material and cause a fire. The approved altitude from which flares are dropped is regulated by the airspace manager and is based on a number of factors including flare burnout rate. Defensive flares typically burn out in 3.5 to 5 seconds, during which time the flare will fall between 200 and 400 feet.

3.4 AIR QUALITY

3.4.1 Definition of the Resource

Under the authority of the Clean Air Act of 1963 (42 USC § 7401) (CAA) and subsequent amendments, 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). Nellis AFB is located in Clark County, Nevada, which is in the Las Vegas Intrastate AQCR (40 CFR § 81.80). The NTTR is located in Clark, Lincoln, and Nye counties in Nevada, and includes the Nevada AQCR (40 CFR § 81.276). The R-2508 Complex lies in both Nevada and California, and includes portions of Fresno, Inyo, Kern, San Bernardino, Tulare, and Los Angeles counties in California and part of Esmeralda County in Nevada. The AQCRs that cover this large, trans-state area include San Joaquin Valley Intrastate AQCR (40 CFR § 81.165), Great Basin Valley Intrastate AQCR (40 CFR § 81.159), and Southeast Desert Intrastate AQCR (40 CFR § 81.167) in California and the Nevada AQCR. Localities in California are further organized into air pollution control or management districts. San Bernardino County and the western part of Kern County fall under the Mojave Desert Air Quality Management District. The Eastern Kern Air Pollution Control District covers a separate portion of Kern County. Fresno County, Tulare County, and the San Joaquin Valley Air Basin portion of Kern County all fall under the San Joaquin Air Pollution Control District. Inyo County is in the Great Basin Unified Air Pollution Control District. Los Angeles County is part of the South Coast Air Quality Management District.

For air quality there are three ROIs: one that includes the Las Vegas Intrastate AQCR, a second that covers the NTTR and R-2508 airspace portions of the Nevada AQCR, and a third that includes that portion of the R-2508 airspace that overlies the California air quality Districts. For purposes of analyzing potential air quality impacts from criteria air pollutants and hazardous air pollutants (HAPs), this section considered the volume of air extending up to the mixing height (3,000 ft AGL) and coinciding with the spatial distribution of the ROIs. 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, mixing height is typically defined as 3,000 ft AGL as an acceptable default value (40 CFR § 93.153[c][2]).

Greenhouse gas (GHG) emissions would be relevant for all of the atmospheric horizon. GHG emissions from the entire flight path of aircraft are applicable because mixing height is not relevant for these pollutants; however, thousands of sorties are performed annually and data on individual sorties are unavailable. As a result, the GHG emission estimates are also limited to activities below the mixing height.

3.4.1.1 Criteria Pollutants

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

The CAA directed the USEPA to develop, implement, and enforce environmental regulations that would ensure clean and healthy ambient air quality. To protect public health and welfare, the USEPA developed numerical concentration-based standards (i.e., 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 the 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 3-5**.

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 emission 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.

Nellis AFB is located in Clark County, which maintains the following designations for the NAAQS (USEPA, 2016b):

- Unclassifiable/attainment for Pb, NO_2, SO_2, and $PM_{2.5}$
- Maintenance/attainment for CO and PM_{10}
- Nonattainment for O_3

**Table 3-5.
National Ambient Air Quality Standards**

Pollutant	Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide (CO)	primary	8 hours	9 ppm	Not to be exceeded more than once per year
		1 hour	35 ppm	
Lead (Pb)	primary and secondary	Rolling 3-month average	0.15 μg/m^3	Not to be exceeded
Nitrogen Dioxide (NO_2)	primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	primary and secondary	1 year	0.053 ppm	Annual Mean
Ozone (O_3)	primary and secondary	8 hours	0.070 ppm	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particle Pollution (PM) ($PM_{2.5}$)	primary	1 year	12 μg/m^3	annual mean, averaged over 3 years
	secondary	1 year	15 μg/m^3	annual mean, averaged over 3 years
	primary and secondary	24 hours	35 μg/m^3	98th percentile, averaged over 3 years
Particle Pollution (PM) (PM_{10})	primary and secondary	24 hours	150 μg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO_2)	primary	1 hour	75 ppb	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
	secondary	3 hours	0.5 ppm	Not to be exceeded more than once per year

Source: USEPA, 2016a
Notes:
Primary Standards: the levels of air quality necessary, with an adequate margin of safety to protect the public health. Each state must attain the primary standards no later than 3 years after that state's implementation plan is approved by the USEPA.
Secondary Standards: the levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.
Concentrations are expressed first in units in which they were promulgated.
mg/m^3 = milligrams per cubic meter; μg/m^3 = micrograms per cubic meter; ppm = parts per million; ppb = parts per billion

The entire NTTR airspace is located in Clark, Lincoln, and Nye counties in Nevada. Lincoln and Nye counties are designated as unclassifiable/attainment for all NAAQS (USEPA, 2016b).

The R-2508 Complex lies in both Nevada and California and includes portions of Fresno, Inyo, Kern, San Bernardino, Tulare, and Los Angeles counties in California and part of Esmeralda County in Nevada. The attainment status of the various locations are presented in **Table 3-6**.

The CAA required that USEPA draft general conformity regulations that are applicable in nonattainment areas, or in designated maintenance areas (attainment areas that were reclassified from a previous nonattainment status and are required to prepare a maintenance plan for air quality). These regulations are designed to ensure that federal actions do not impede local efforts to achieve or maintain attainment with the NAAQS. The General Conformity Rule and the promulgated regulations found in 40 CFR § 93, *Determining Conformity of Federal Actions to State or Federal Implementation Plans*, 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. These 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 results are compared to the *de minimis* thresholds to determine if General Conformity applies to the action.

Table 3-6
Airspace Attainment Status for Nellis AFB and Military Operation Areas by County

County	O_3	CO	NO_2	SO_2	PM_{10}	$PM_{2.5}$	Pb
Nellis AFB and NTTR, Nevada							
Clark	NA	A/M-P			A/M		
Nye							
Lincoln							
R-2508 California Counties and Esmeralda County, NV							
Fresno	NA				A/M	NA	
Inyo					NA-P; A/M-P		
Eastern Kern w/in Mojave Desert Air Basin	NA				NA-P		
Western Kern w/in San Joaquin Air Basin	NA				A/M-P	NA-P	
Los Angeles	NA	A/M-P			A/M-P	NA-P	NA-P
San Bernardino	NA	A/M-P			NA	NA-P	
Tulare	NA				A/M	NA	
Esmeralda, NV							

Source: USEPA, 2016b
Note:
A/M = attainment/maintenance, NA = nonattainment, P = partial, Blue denotes the designated maintenance areas, Orange denotes the designated non-attainment areas, Grey denotes areas that are attainment/unclassified; A/M = attainment/maintenance; NA = nonattainment; P = partial; blue denotes the designated maintenance areas; orange denotes the designated non-attainment areas.

Title I of the CAA Amendments of 1990 (Public Law 101-549) requires the federal government to reduce emissions from the combustion of fuels for transportation, utilities, and industries as well as to curb emissions from industrial and commercial sources to address urban air pollution problems of O_3, CO, and PM_{10}. Under Title I, the federal government is tasked with developing 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.

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 defined under Title V as a facility (e.g., plant, base, activity) that has the potential to emit (PTE) more than 100 tons annually of any one criteria air pollutant, 10 tons per year (tpy) of a hazardous air pollutant, or 25 tpy of any combination of hazardous air pollutants; however, lower pollutant-specific “major source” permitting thresholds apply in nonattainment areas. The purpose of the permitting rule is to establish regulatory control over large, industrial-type activities and monitor their impact on air quality.

Federal Prevention of Significant Deterioration (PSD) regulations also define air pollutant emissions from proposed major stationary sources or modifications to be “significant” if a proposed project’s net emissions increase:

- meets or exceeds the rate of emissions listed in 40 CFR § 52.21(b)(23)(i);
- occurs within 10 kilometers (km) of any Class I area (wilderness area greater than 5,000 acres (ac) or national park greater than 6,000 ac), and/or
- would cause an increase in the 24-hour average concentration of any regulated pollutant in the Class I area of 1 μg/m3 or more [40 CFR § 52.21(b)(23)(iii)].

PSD regulations also define ambient air increments, limiting the allowable increases to any area’s baseline air contaminant concentrations, based on the area’s designation as Class I, II, or III [40 CFR § 52.21(c)].

3.4.1.2 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 contribute to global climate change. Primary GHGs include water vapor, methane, NO_x, hydrofluorocarbons, 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 CO_2 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. The potential effects of proposed GHG emissions are by nature global and result in cumulative impacts because most individual anthropogenic sources of GHG emissions are not large enough to have a noticeable effect on climate change. Therefore, the impact of proposed GHG emissions to climate change is discussed in the context of cumulative impacts in **Section 5.3.4**.

The USEPA promulgated a mandatory GHG reporting rule for specific types of stationary sources if they emit 25,000 metric tons or more of CO_2e per year (40 CFR § 98.2[a][2]). None of these source types applies to Nellis AFB or the airspaces.

3.4.2 Existing Conditions – Nellis AFB

3.4.2.1 Regional Climate

Nevada lies on the eastern side of the Sierra Nevada mountain range, which blocks moisture from the Pacific Ocean. The majority of the population lives in two concentrated urban areas—Washoe and Clark counties, supported by water from Lake Tahoe and the Colorado River, respectively. Nevada is the driest state in the United States, with a statewide average annual precipitation of only 10 inches. Locally, average annual precipitation varies from 4 inches to more than 50 inches on high mountain peaks of the Sierra Nevada Mountains.

Temperatures in Nevada have increased about 2 degrees Fahrenheit (°F) since the beginning of the 20th century. From 2000 to 2014, the annual number of days of extreme heat (above 95°F), averaged over the state, has been above average, with the highest 5-year averages occurring between 2000 and 2004 and 2005 and 2009, partly because of very high values in 2002, 2003, and 2007. In addition to a general daytime warming, Nevada has experienced an above average occurrence of warm nights (minimum temperature greater than 70°F) since 2000. The state is the most urbanized in the nation, with 94 percent of the population living in high-density areas. The urban heat island effect has likely exacerbated these trends in Las Vegas, in particular, where explosive growth has taken place (NOAA, 2017).

3.4.2.2 Source Air Emissions at Nellis AFB

Nellis AFB currently maintains a Title V air quality permit for stationary source emissions from Base operations. These stationary sources include fuel storage tanks, loading racks, dispensing equipment, boilers, aggregate and concrete plants, emergency and nonemergency power generators, a hush house for engine testing, paint spray booths, media blasting equipment, degreasers, cooling towers, a hospital incinerator, woodworking operations, fugitive dust, and miscellaneous chemical usage.

Mobile source emissions are generated by aircraft, vehicles, equipment, and other sources that move or have the potential to move from place to place. Flying operations that generate emissions include aircraft landings and takeoffs, taxiing from the hangar, returning post-flight, and on-ground engine maintenance activities. Vehicle emissions include both government-owned vehicles (GOVs) and privately owned vehicles (POVs). Equipment emissions come from forklifts, backhoes, tractors, and other onsite construction equipment. Aerospace Ground Equipment (AGE) used to service aircraft include generators, light carts, compressors, bomb lifts, hydraulic test stands, and other portable equipment required for aircraft operations. The most recent mobile and stationary source emissions inventories for Nellis AFB is presented in **Table 3-7**.

**Table 3-7.
Nellis Air Force Base Mobile and Stationary Source Emission Summary**

Source Category	VOC	CO	NO_X	SO_2	PM_{10}	$PM_{2.5}$
Stationary Source	18.94	13.68	25.26	0.57	22.51	4.7
Aerospace Ground Equipment	5.31	79.79	36.52	2.46	2.18	2.10
Aircraft Operations	25.63	115.37	103.40	9.03	18.77	16.34
Non-road Engines	21.68	331.19	22.44	0.22	3.03	2.88
On-road Vehicles	4.98	46.09	23.01	0.06	0.80	0.73
Total	**76.54**	**586.12**	**210.63**	**12.34**	**47.29**	**26.75**

Sources: USAF, 2018b; 2020, USEPA 2020a
Notes:
CO = carbon monoxide; NO_x = nitrogen oxides; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound

3.4.3 Existing Conditions – Special Use Airspace

3.4.3.1 Regional Climate

The Eastern Mojave Desert is characterized by wide day-night temperature fluctuations, seasonal strong winds, and bright, clear skies. Days with temperatures in excess of 100°F typically begin in May and can last into October. Temperatures in excess of 120°F are frequent on the valley floor during summer. During July and August, minimum nocturnal temperatures in the low to mid 90s can be expected on several nights. Relative humidity is low, below 40 percent most of the year and above 50 percent on most winter nights, during precipitation, and on summer evenings after a rain. On a typical summer afternoon, the relative humidity is approximately 10 percent; on a winter afternoon, approximately 30 percent. Strong, substantial winds in excess of 25 mph are common, with gusts reaching 75+ mph. While wind is common in all months, November, December, and January are the calmest. The Mojave Desert is the driest desert in North America, receiving less than 2 inches of rain a year, on average.

3.4.3.2 Current Mobile Source Emissions in the Special Use Airspace

The SUA is composed of the NTTR in Nevada and R-2508, which is largely located in several counties in California. **Table 3-6**, above, identifies the attainment status of each of the relevant counties. For these airspaces, the attainment status is relevant for flight operations that occur below the mixing height of 3,000 ft AGL.

Current NTTR low-altitude airspace emission estimates are from the Nevada Test and Training Range (NTTR) Land Withdrawal Legislative Environmental Impact Statement (USAF, 2018a) and is provided in **Table 3-8**.

**Table 3-8.
Current Emission Estimates for Low Altitude Airspace Activities in NTTR in Tons Per Year**

Source	VOCs	CO	NOx	SO_2	PM_{10}	$PM_{2.5}$
NTTR						
Aircraft	0.28	1.09	5.79	0.29	0.33	0.30
Flares	0.01	0.03	0.00	0.00	0.12	0.12
Total	**0.29**	**1.12**	**5.79**	**0.29**	**0.45**	**0.42**
R-2508						
Aircraft	0.05	0.20	1.14	0.06	0.07	0.06
Flares	0	0	0	0	0	0
Total	**0.05**	**0.20**	**1.14**	**0.06**	**0.07**	**0.06**

Source: USAF, 2018a
Note:
CO = carbon monoxide; NO_x = nitrogen oxides; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = particulate matter less than or equal to 2.5 microns in diameter; SO_2 = sulfur dioxide; VOC = volatile organic compound

Emissions in the training airspaces are very low with time spent below 3,000 ft AGL ranging from 6 percent to slightly more than 7 percent of total sortie time depending on the aircraft (KBR, 2020). Flares are typically released at higher altitudes and the NTTR has restrictions on low altitude use of flares for more than 70 percent of the area the range covers (USAF, 2018c). However, because it is not possible to know precisely where flares may have been released and at what height, the use of flares has been conservatively estimated to assume all are released between 500 and 3,000 feet AGL. Emissions from flare detonation were estimated using emission factors published in Chapter 15 of USEPA's Emission Source Guide, AP-42 (USEPA, 2009).

3.5 Biological Resources

3.5.1 Definition of the Resource

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

The ROI for biological resources on the installation includes the land surrounding the facilities proposed for use, the land within the airfield noise contours and safety zones, and the SUA used by Nellis AFB (see **Figure 1-2**).

3.5.1.1 Endangered Species Act

ESA established protection over and conservation of threatened and endangered species and the ecosystems upon which they depend. Sensitive and protected biological resources include plant and animal species listed as threatened, endangered, or special status by the USFWS and the NMFS. Under the ESA, 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 ESA. ESA also allows the designation of geographic areas as critical habitat for threatened or endangered species. Although candidate species receive no statutory protection under ESA, the USFWS has attempted to advise government agencies, industry, and the public that these species are at risk and may warrant protection under ESA.

3.5.1.2 Migratory Bird Treaty Act

The Migratory Bird Treaty Act of 1918 (MBTA) (16 USC § 703) makes it unlawful for anyone to take migratory birds or their parts, nests, or eggs unless permitted to do so by regulations. Per the MBTA, "take" is defined as "pursue, hunt, shoot, wound, kill, trap, capture, or collect" (50 CFR § 10.12). Birds protected under the MBTA include nearly all species in the US, with the exception of nonnative/human-introduced species and some game birds.

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 MBTA. EO 13186 directs federal agencies to develop an MOU with the USFWS that promotes the conservation of migratory birds. On 5 September 2014, the DoD signed a five-year MOU with the USFWS. In accordance with the MOU, and to the extent possible under 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. Further, in October of 2012, the Authorization of Take Incidental to Military Readiness Activities was published in the *Federal Register* (50 CFR § 21.15), authorizing incidental take during military readiness activities unless such activities may result in significant adverse effects on a population of a migratory bird species.

In December 2017, the US Department of the Interior issued M-Opinion 37050, which concluded that the take of migratory birds from an activity is not prohibited by the MBTA when the underlying purpose of that activity is not the take of a migratory birds, eggs, or nests. On August 11, 2020, the U.S. District Court, Southern District of New York, vacated M-37050. Thus, incidental take of migratory birds is again prohibited. The interpretation of the MBTA remains in flux, and additional court proceedings are expected.

3.5.1.3 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act of 1940 (BGEPA) (16 USC §§ 668–668c) prohibits actions to “take, possess, sell, purchase, barter, offer to sell, purchase or barter, transport, export or import, at any time or any manner, any bald eagle [or any golden eagle], alive or dead, or any part, nest, or egg thereof.” Further, the BGEPA defines “Take” 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 BGEPA Act also prohibits activities around an active or inactive nest site that could result in disturbance to returning eagles.

3.5.1.4 Wetlands

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

3.5.2 Existing Conditions – Nellis AFB and Special Use Airspace

The information presented in this section was primarily gathered from the Nellis AFB Integrated Natural Resources Management Plan (Nellis AFB, 2019a). Data were also gathered from the USFWS, USEPA, and Edwards AFB resources.

3.5.2.1 Regional Biological Setting

Ecoregion Description

Ecoregions are used to describe areas of similar type, quality, and quantity of environmental resources (USEPA, 2019). Ecoregions are assigned hierarchical levels to delineate regions spatially based on different levels of planning and reporting needs. The ROI for the Proposed Action is located within five Level III Ecoregions (**Figure 3-6**). Nellis AFB is located entirely within the Level III Mojave Basin and Range Ecoregion. This EA uses Level III Ecoregions to describe the ecosystems within the ROI. Level III ecoregion descriptions were selected because they provide a regional perspective and are more specifically oriented for environmental monitoring, assessment and reporting, and decision-making than Level II (Commission for Environmental Cooperation, 1997).

Vegetation and Wildlife

The Nellis AFB complex supports a wide diversity of plants of more than 500 species. The vegetative communities on Nellis AFB outside of the developed areas consists of mostly of creosote bush (*Larrea tridentata*)/white bursage (*Ambrosia dumosa*) communities (Nellis AFB, 2019a).

Bird species with the potential to occur at Nellis AFB include species typically associated with Mojave Desert scrub ecosystems. Species present in bajada communities (i.e., hillside alluvial fans formed by mountain runoff) within Nellis AFB include common raven (*Corvus corax*), horned lark (*Eremophila alpestris*), loggerhead shrike (*Lanius ludovicianus*), mourning dove (*Zenaida macroura*), sage sparrow (*Amphispiza belli*), black-throated sparrow (*Amphispiza bilineata*), burrowing owl (*Athene cunicularia*), golden eagle (*Aquila chrysaetos*), bald eagle (*Haliaeetus leucocephalus*), greater roadrunner (*Geococcyx californianus*), lesser nighthawk (*Chordeiles acutipennis*), and Gambel's quail (*Callipepla gambelii*). In areas where Joshua trees, riparian vegetation, and cacti are present, bird species diversity increases, to include cactus wren (*Campylorhyncus brunneicapillus*), Scott's oriole (*Icterus spurius*), phainopepla (*Phainopepla nitens*), ashthroated flycatcher (*Myiarchus cinerascens*), and blacktailed gnatcatcher (*Polioptila melanura*) (Nellis AFB, 2019a).

Common reptiles known to occur at Nellis AFB include side-blotched lizard (*Uta stansburiana*), western whiptail (*Cnemidophorous tigris*), zebra-tailed lizard (*Callisaurus draconoides*), yellow-backed spiny lizard (*Sceloporus uniformis*), desert night lizard (*Xantusia vigilis*), desert horned lizard (*Phyronosoma platyrhinos*), coachwhip (*Coluber flagellum*), western patch-nosed snake (*Salvadora hexalepis*), gopher snake (*Pituophis catenifer*), western shovel-nosed snake (*Chionactis occipitalis*), and Mojave rattlesnake (*Crotalus scultulatus*) (Nellis AFB, 2019a). Amphibians are scarce within the installation. The most common species include Woodhouse's toad (*Anaxyrus woodhousii*), commonly found near man-made perennial water sources (e.g., golf course ponds), and red-spotted toad (*Anaxyrus punctatus*), which inhabits desert streams and canyons (Stebbins, 2003).

The only fish species known to occur on Nellis AFB are nonnative koi (*Cyprinus* spp.) and carp (*Cyprinus carpio*), which were introduced to ponds on the Sunrise Vista Golf Course (Nellis AFB, 2019a). Numerous arthropods occur in the Mojave Desert, and arthropods can be abundant and diverse in urban landscapes such as Nellis AFB (McIntyre et al., 2001). Arthropods within the Mojave Desert are represented by insects including the orders Coleoptera (beetles), Lepidoptera (butterflies and moths), Diptera (flies), Orthoptera (grasshoppers and crickets), Hymenoptera (bees, wasps, and ants), Arachnids (mites, spiders, and tarantulas), Opiliones (harvestmen), Pseudoscorpions (pseudoscorpions), Scorpiones (true scorpions), Ricnulei (hooded tickspiders), and Thelyphonida (vinegarroons and tailed whip scorpions).The NTTR spans the Great Basin and Mojave Deserts, with transitional vegetation occurring between the areas. The North Range of the NTTR consists predominantly of cold desert scrub vegetative communities, typified by shadscale (*Atriplex confertifolia*) and greasewood (*Sarcobatus vermiculatus*) in the valleys; horsebush (*tetradymia* spp), rabbitbrush (*Chrysothamnus* spp.), greasewood, shadscale, and bud sagebrush (*Picrothamnus desertorum*) at intermediate elevations; and pinyon/juniper at higher elevations, transitioning to White fir (Abies concolor) above 8,200 ft. The South Range of the NTTR lies along the northeastern portion of the Mojave Desert and is dominated by creosote bush and saltbush (*Atriplex* spp.). The transitional zone is interspersed with plants from both deserts (Nellis AFB, 2019a).

The NTTR shares many of the wildlife species observed on Nellis AFB. Species only observed on NTTR include Great Basin spadefoot toad (*Spea intermontana*), Western red-tailed skink (*Plestiodon gilberti*), yellow-backed spiny lizard (Sceloporus uniformis), Great Basin fence lizard (*Sceloporus occidentalis*), sagebrush lizard (*Scloporus graciosus*), Great Basin skink (*Plestidon skiltonianus*), Great Basin rattlesnake (*Crotalus oreganus lutosus*), Panamint rattlesnake (*Crotalus stephensi*), and the striped whipsnake (*Coluber taeniatus*). Ephemeral water sources on the NTTR provide habitat for waterfowl, and canyons and cliffs provide nesting habitat for cliff-nesting avian species including golden eagle, prairie falcon (*Falco mexicanus*), and Peregrine falcon (*Falco peregrinus*).

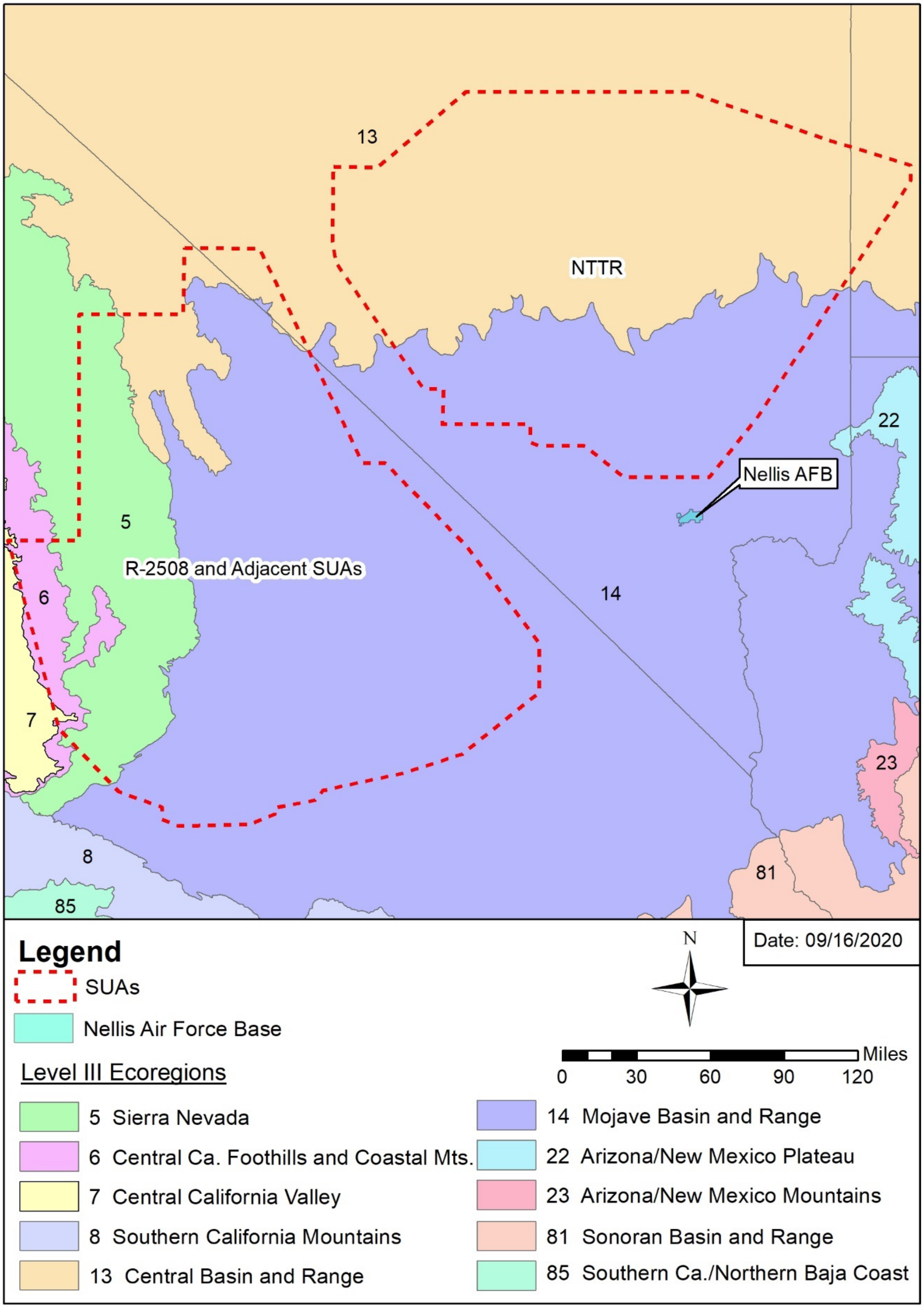


Figure 3-6. Ecoregions for Nellis Air Force Base, R-2508 Complex, and NTTR

Other raptor species documented on NTTR include Swainson's hawk (*Buteo swainsoni*), ferruginous hawk (*Buteo regalis*), Northern Goshawk (*Accipiter gentilis*), all listed as sensitive by the BLM, and the state-endangered bald eagle (*Haliaeetus leucocephalus*). Several important mammalian species also occur on NTTR, including game species such as Desert bighorn sheep (*Ovis canadensis nelsoni*), mule deer (*Odocoileus hemionus*), and elk (*Cervus canadensis*), along with over 20 bat species and more than 20 small mammals, including several species of kangaroo rat (*Dipodomys* spp.) (Nellis AFB 2019c and 2020b). A complete list of flora and fauna documented to occur, or potentially occur, on the Nellis AFB and NTTR is available in Appendices B and C of the Nellis AFB Integrated Natural Resources Management Plan (Nellis AFB, 2019a).

The majority of the R-2508 Complex exists within the Mojave Desert and is occupied by vegetative communities adapted to those environments, including creosote bush scrub, Joshua tree woodland, arid-phase saltbush, halophytic phase saltbush scrub, xerophytic saltbrush scrub, and mesquite woodland. In addition, the western portion of the R-2508 Complex is in the Sierra Nevada Range and San Joaquin Valley. Vegetation in these regions includes high-elevation pines and alpine habitats at the high elevations of the Sierra Nevada Range, while lower elevations are characterized by foothill grasslands and woodlands dominated by oaks at lower elevations and pines at higher elevations (USAF, 2006a).

Wildlife on the R-2508 Complex includes red-tailed hawk (*Buteo jamaicensis*), killdeer (*Charadrius vociferus*), white-crowned sparrow (*Zonotrichia leucophrys*), and many other migratory bird species. Several species of salamander, toad, and frog occur, along with black bear (*Ursus americanus*), mountain lion (*Puma concolor*), rabbits, foxes, woodrats, weasles, squirrels, mule deer (*Odocoileus hemionus*), bats, and yellow-bellied marmots (*Marmota flaviventris*) (USAF, 2006a).

3.5.2.2 Threatened and Endangered Species and/or Species of Concern

A list of threatened and endangered species and/or species of concern that could potentially be found in the ROI was obtained from the following sources: USFWS's Information for Planning and Consultation service, California Natural Diversity Database, Nevada Natural Heritage Program, State of Utah Department of Natural Resources Division of Wildlife Resources, and the BLM for Utah are provided in **Appendix D** (USFWS, 2019a; CNDDB, 2019; NNHP, 2019; UDNR, 2019; BLM, 2019).

Of these species, five are considered to potentially occur in the ROI according to the USFWS's Information for Planning and Consultation service: southwestern willow flycatcher (*Empidonax traillii extimus*), Yuma clapper rail (*Rallus logirostris yumanensis*), Mojave desert tortoise (*Gopherus agassizii*), Pahrump poolfish (*Empetrichthys latos*), and razorback sucker (*Xyrauchen texanus*) (USFWS, 2020). Only the desert tortoise has been documented to occur in the ROI (Nellis AFB, 2019a).

Because no ground-disturbing activities would occur in NTTR or the R-2508 Complex, there is the potential for impacts associated with aircraft overflights, where noise and visual cues could impact some species. However, impacts are not expected in these areas on listed aquatic species (i.e. fish), invertebrates, or crustaceans, so additional description of these resources is not presented.

In addition to the listed species potentially present on Nellis AFB, NTTR includes Mexican spotted owl (*Strix occidentalis lucida*). Listed species potentially occurring in the R-2508 Complex include Amargosa vole (*Microtus californicus scirpensis*), fisher (*Pekania pennanti*), San Joaquin kit fox (*Vulpes macrotis mutica*), Sierra Nevada bighorn sheep (*Ovis canadensis sierrae*), Tipton kangaroo rat (*Dipodomys nitratoides nitratoides*), California condor (*Gymnogyps californianus*), Inyo California towhee (*Pipilo crissalis eremophilus*), southwestern willow flycatcher, western snowy plover (*Charadrius nivosus nivosus*), least bell's vireo (*Vireo bellii pusillus*), yellow-billed cuckoo, blunt-nosed leopard lizard (*Gambelia silus*), giant garter snake (*Thamnophis gigas*), desert tortoise, California red-legged frog (*Rana draytonii*), mountain yellow-legged frog (*Rana muscosa*), Sierra Nevada yellow-legged frog (*Rana sierrae*), and Yosemite toad (*Anaxyrus canorus*). There are several listed plant species in these areas that are described in **Appendix D**.

Currently, there is no designated critical habitat for any federally protected species on Nellis AFB (USFWS, 2020); however, suitable habitat does exist on the NTTR and under the R-2508 Complex for the following species: Amargosa vole, desert tortoise, Inyo California towhee, Lane Mountain milk-vetch (*Astragalus jaegerianus*), and southwestern willow flycatcher. According to data retrieved from the NOAA Fisheries' West Coast Region, no species, critical habitats, or essential fish habitat (EFH) managed by NOAA are known to occur at Nellis AFB or in the SUAs (NOAA, 2019).

3.5.2.3 Invasive Species

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

No federally listed noxious weeds have been documented on Nellis AFB or NTTR (Nellis AFB, 2019a), but three state-listed weeds are known to occur: salt cedar (*Tamarix* spp.), African mustard (*Brassica tournefortii*), and yellow starthistle (*Centaurea solstitalis*). Other invasive species on Nellis AFB and/or NTTR include cheatgrass (*Bromus tectorum*), red brome (*Bromus rubens*), salt lover (*Halogeton glomeratus*), and Russian thistle (*Salsola tragus*). Invasive species known to occur in the R-2508 Complex include Russian thistle, red brome, tansy mustard (*Descurainia pinnata*), tamarisk (*Tamarix* spp.), and split grass (*Schismus barbatus*) (USAF, 2006a).

3.5.2.4 Wetlands

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

Although there are man-made ponds located on Nellis AFB's Sunrise Vista Golf Course, these ponds are not subject to wetlands protection under the CWA because they were anthropogenically constructed, are artificially filled with treated groundwater, and due to their isolation and lack of connectivity to other water bodies (USACE, 2020). The remainder of the installation is arid scrub or developed land that contains no jurisdictional wetlands (Nellis AFB, 2019a). No wetlands occur in areas designated for construction and thus not construction-related impacts will occur.

Because there would be no potential for impacts to wetlands or waters of the United States from overflight activities under the proposed and alternative actions, additional description of this resource is not presented.

3.5.2.5 Wilderness Areas

Inclusion of land into the National Wilderness Preservation System is intended to preserve areas in a primitive state that possess little evidence of human activity. The Wilderness Act of 1964 identified criteria for evaluating areas for wilderness characteristics and gave direction on how designated wilderness areas should be managed.

There are 14 Wilderness Areas and 3 Wilderness Study Areas that underlie the NTTR. Additionally, there are 26 Wilderness Areas managed by the BLM and USFS under the R-2508 Complex. Death Valley National Park, located under the R-2508 Complex is approximately 90 percent a Wilderness Area (about 3.19 million acres).

3.6 WATER RESOURCES

3.6.1 Definition of the Resource

The water resource discussed in this section is surface water, which includes all lakes, ponds, rivers, streams, impoundments, and wetlands within a defined area or watershed (refer to **Section 3.5.2.4** for Wetlands discussion). Surface water may be affected by stormwater infiltration and runoff generated during precipitation events.

Water resources are vulnerable to contamination and quality degradation. For this reason, the Federal Water Pollution Control Act, as amended by the CWA, was enacted to protect these valuable, irreplaceable resources. The Water Pollution Prevention and Control Act (33 USC § 26), also known as the CWA Amendments, set the national policy objective to "restore and maintain the chemical, physical, and biological integrity of the Nation's waters." The CWA provides the authority to establish water quality standards, control discharges into surface and subsurface waters (including groundwater), develop waste treatment management plans and practices, and issue permits for discharges. A National Pollutant Discharge Elimination System (NPDES) permit under Section 402 of the CWA is required for discharges into navigable waters. The USEPA oversees the issuance of NPDES permits at federal facilities as well as water quality regulations (Section 401 of the CWA) for both surface and groundwater. The CWA also regulates the discharge of pollutants seaward for 3 miles.

The ROI for water resources is the Nellis AFB airfield and environs. Because there would be no potential for impacts to groundwater from activities at Nellis AFB or in the SUA, additional description of this resource is not presented.

3.6.1.1 Surface Water

USEPA defines surface waters as waters of the United States and are primarily lakes, rivers, estuaries, coastal waters, and wetlands. Jurisdictional waters, including surface water resources, as defined in 33 CFR § 328.3, are regulated under Sections 401 and 404 of the CWA and Section 10 of the Rivers and Harbors Act. Man-made features not directly associated with a natural drainage, such as upland stock ponds and irrigation canals, are generally not considered jurisdictional waters. Federal protection of wetlands is also promulgated under EO 11990, *Protection of Wetlands*, the purpose of which is to reduce adverse impacts associated with the destruction or modification of wetlands. This order directs federal agencies to provide leadership in minimizing the destruction, loss, or degradation of wetlands. Wetlands are described in Biological Resources (**Section 3.5**).

3.6.1.2 Floodplains

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

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

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

Standard and Process for Further Soliciting and Considering Stakeholder Input, signed in January 2015, established a Federal Flood Risk Management Standard and a process for further soliciting and considering stakeholder input; however, this EO was revoked in 2017 by Section 6 of EO 13807, *Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure*. EO 13807 did not revoke or otherwise alter EO 11988.

3.6.2 Existing Conditions – Nellis AFB

3.6.2.1 Surface Water

Nellis AFB is located in the northeastern portion of the Las Vegas Valley, an intermountain basin of approximately 1,600 square miles within the Basin and Range Province of the United States, which extends southeasterly through the Las Vegas Wash into Lake Mead (Nellis AFB, 2019a). No natural perennial streams, rivers, springs, or lakes occur on Nellis AFB due to low precipitation, high evaporation rates, and low humidity. Several unnamed ephemeral streams and washes occur on Nellis AFB, including known washes that traverse the construction activity areas (**Figure 3-7**). Most of the ephemeral streams, which typically only contain water during storm events, found on Nellis AFB are connected to navigable waters of the United States (i.e., Las Vegas Wash, Lake Mead, and Colorado River) and may be considered jurisdictional by the USACE (Nellis AFB, 2019a; USFWS, 2019b). According to the 2015 Clean Water Rule: Definition of Waters of the United States, ephemeral streams and washes occurring within the construction activity areas on the Nellis AFB would be considered jurisdictional if an ordinary high water mark is present and the ephemeral stream or the wash can be shown to have a significant nexus with traditional navigable waters (Volume 80 of the *Federal Register*, page 37054 [80 FR 37054], June 29, 2015). However, the 2015 Clean Water Rule was repealed by final rule on December 23, 2019, and the rule reverted to the 1986/1988 regulatory definition for Waters of the United States, resulting in the ephemeral streams on Nellis AFB likely not qualifying as waters of the United States. These rules may continue to remain in flux if legal challenges to the repeal occur.

In accordance with NPDES regulations, Nellis AFB is required to obtain coverage under a stormwater permit and has been issued coverage under the Nevada Industrial Stormwater General Permit based on the types of industrial activities conducted. According to the Nellis Stormwater Pollution Prevention Plan (SWPPP), construction activities that consist of one or more acres, are excluded from the Nevada Industrial Stormwater General Permit and must obtain a state-issued general permit for stormwater discharges associated with construction activity.

Surface water impoundments on Nellis AFB consist entirely of artificially constructed ponds within the Sunrise Vista Golf Course located in the southwestern corner of the installation. As stated previously , these impoundments are unlikely to be jurisdictional. Stormwater drainage channels have been excavated within and adjacent to the airfield, as well as within the residential areas to the west of the airfield. Water in the golf course ponds is reclaimed water from the City of North Las Vegas. That water is used to maintain the golf course and is regulated by permit.

Municipal wastewater from Nellis AFB is treated by the Clark County Water Reclamation District and discharged into the Las Vegas Wash (Nellis AFB, 2019a).

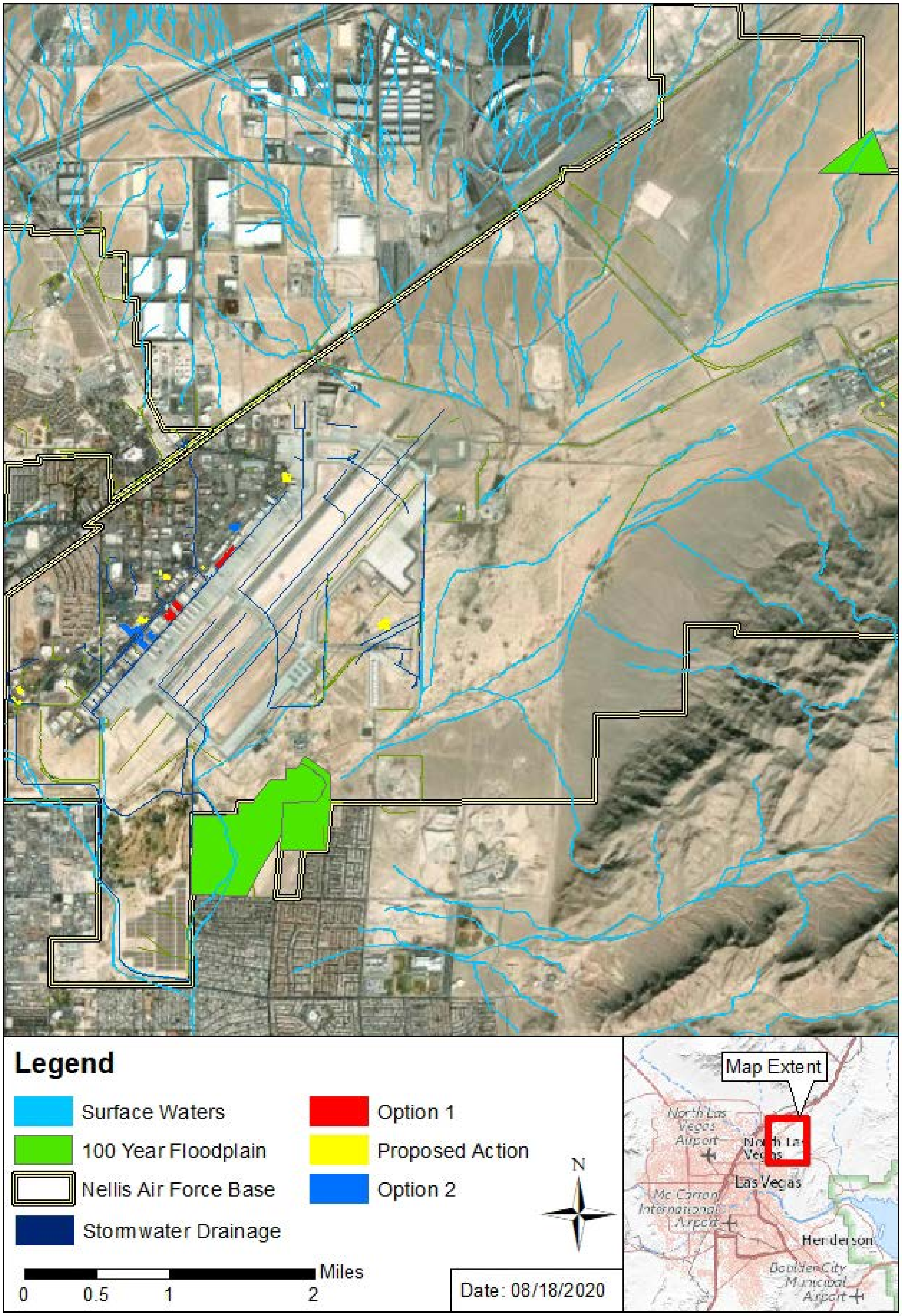


Figure 3-7. Surface Waters and 100-Year Floodplain at Nellis AFB

3.6.2.2 Floodplains

Nellis AFB lies within the Upper Colorado River Basin Hydrological Region of Nevada. The portion of the watershed in which Nellis AFB is located is characterized by few perennial streams and numerous ephemeral washes that are drained by the Las Vegas Wash, and is connected to the Colorado River by Lake Mead (Nellis AFB, 2019a). The construction activity areas are not within a 100-year floodplain as illustrated in **Figure 3-7**. Local rainstorms can be severe enough to cause flash flooding within the vicinity of the project areas on Base, and development in the form of asphalt paving formerly porous surfaces may increase flash-flood risk in the project area and low-lying adjacent areas. Developed nonporous surfaces increase flood risk by increasing the volume and flow rate of stormwater in localized areas. Stormwater flows through ephemeral streams and washes often create small localized floodplains known as alluvial fans around the Base of topographic features. In these areas soil tends to be more friable, and erosion due to water movement is usually higher than in the surrounding area. Alluvial fans are potentially jurisdictional surface water features.

3.7 SOILS

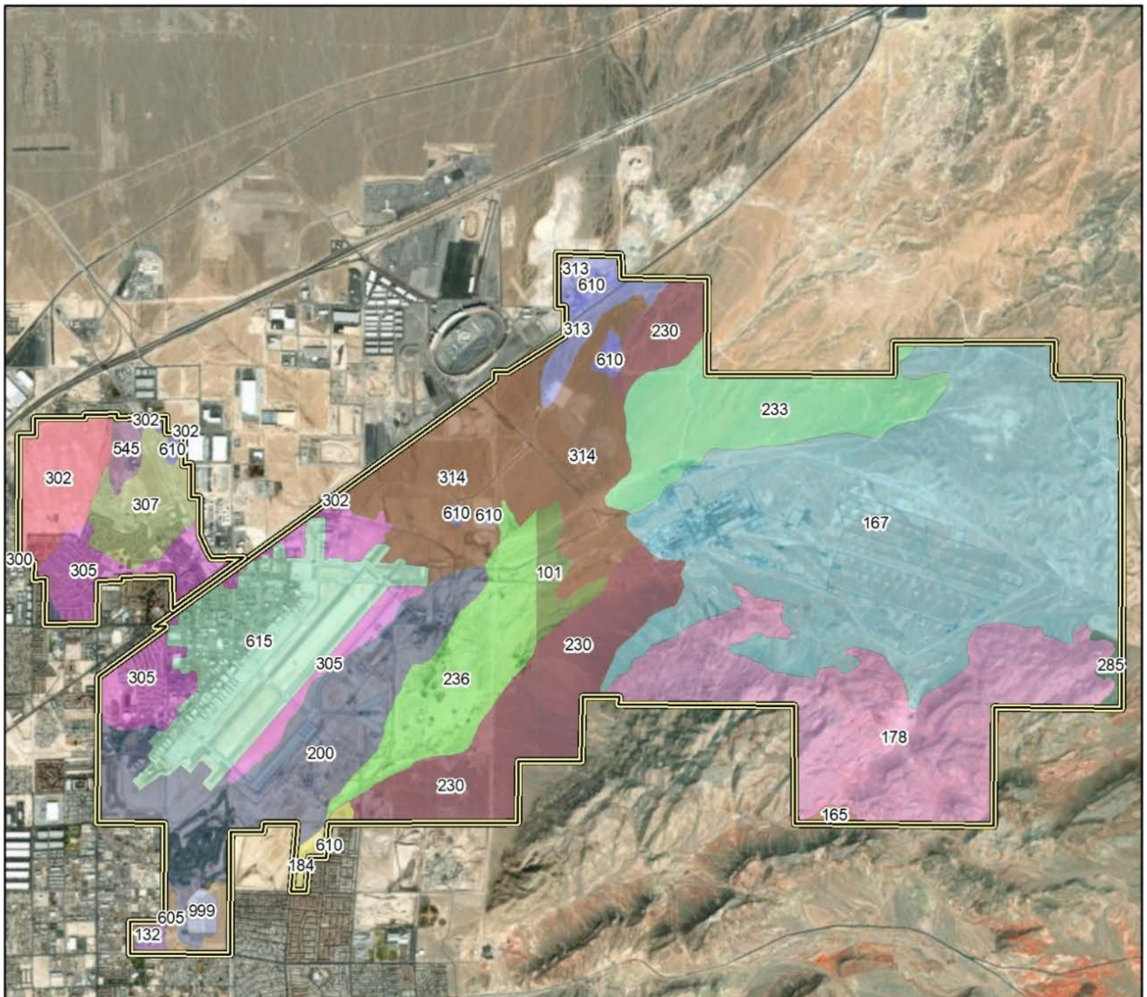
3.7.1 Definition of the Resource

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

The ROI for soil resources is the Nellis AFB airfield and environs as well as the SUA used by Nellis AFB over the NTTR and within the R-2508 Complex, as depicted in **Figure 1-2**. The Proposed Action does not have the potential to alter physiography, topography, or geology in the ROI; therefore, additional description of these resources is not presented.

3.7.2 Existing Conditions – Nellis AFB

Nellis AFB lies in the Las Vegas Valley, which is predominantly made up of sedimentary formations and alluvial deposits. Eighteen native soil types and three artificial land cover types are mapped on Nellis AFB (**Figure 3-8**). Most of the construction areas associated with the proposed and alternative actions occur in previously disturbed urban land with no native soil types mapped. A portion (approximately 1 acre) of the parking lot expansion near the 246 Building is classified as Las Vegas-DeStazo complex, 0–2 percent slopes. The construction area on the east side of the runway is composed of Las Vegas-DeStazo complex (approximately 1.5 acres), 0–2 percent slopes; Glencarb silt loam (approximately 80 acres); and Glencarb very fine sandy loam, saline (approximately 11 acres). The area around the 1770 Buildings is classified as Glencarb silt loam (approximately 1 acre).



Code	Soil Type	Code	Soil Type
101	Glencarb very fine sandy loam, saline	300	Las Vegas gravelly fine sandy loam, 0-2 % slopes
132	Bracken very gravelly fine sandy loam, 2-8 % slopes	302	Las Vegas-McCarran-Grapevine complex, 0-4 % slopes
165	Upperline-Weiser-Whitebasin association	305	Las Vegas-DeStazo complex, 0-2 % slopes
167	Upperline-St. Thomas-Upperline association	307	Las Vegas-Skyhaven complex, 0-4 % slopes
178	St. Thomas-Iceberg-Rock outcrop association	313	Weiser-Oldspan-Wechech association
184	Caliza very gravelly sandy loam, 2-8 % slopes	314	Weiser-Wechech association
200	Glencarb silt loam	545	Weiser-Goodsprings complex, 2-4 % slopes
230	Wechech-Weiser association	605	Dumps
233	Wechech-Ifteen association	610	Pits, gravel
236	Glencarb very fine sandy loam, saline	615	Urban land
285	Heleweiser-Carrizo-Teebar association	999	Water

Legend

Nellis Air Force Base

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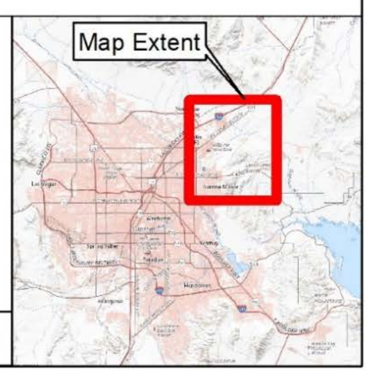

Figure 3-8. Soil Types Classified at Nellis Air Force Base

3.7.3 Existing Conditions – Special Use Airspace

In the NTTR, the mountain ranges in the South Range are dominated by Paleozoic carbonate rocks mixed with smaller amounts of quartzite, sandstone, and shale. Valleys in this area contain thick deposits of alluvium originating from erosion of adjacent mountain ranges. Sedimentary rocks from lakes and rivers have been deposited in shallow basins and outcrop in several areas within the NTTR, particularly in the southern Spotted Range, the Pintwater Range, and the Desert Range. Older Tertiary valley fill sediments, which were uplifted with the underlying Paleozoic bedrock, are exposed on the flanks of the mountains (Nellis AFB, 2019a).

In the Mojave Desert section of R-2508 Complex, the mountains rise abruptly from outwash aprons and alluvial fans. Near the bases of some mountains, gravel or bare rock covers the ground. Little soil accumulates on the steep slopes due to erosion from heavy desert rainstorms. Entisols (weakly developed soils developed in unconsolidated parent material with usually no genetic horizons except an A horizon) occur on terraces, older alluvial fans, and better-drained basins. The rest of the province is dominated by aridisols (calcium carbonate-containing soils of arid regions that exhibit at least some subsurface horizon development). In the California portion of the R-2508 Complex, ultisols (strongly leached, acid forest soils with relatively low native fertility) are extensive on mountain slopes where air is humid and dry; alfisols (moderately leached forest soils that have relatively high native fertility) predominate at lower elevations. Entisols characterize soils occupying the narrow floodplains and alluvial fans of the valleys. In the Great Basin portion of the R-2508 Complex, the lower parts of many basins have heavy accumulations of saline and alkaline soils. Aridisols are dominant in all basin and low-lying areas. Salt flats and playas are extensive in the lower parts of basins with interior drainage. Forest soils are found at high elevations, and narrow bands of entisols lie in the rocky landscapes and stream floodplains (USAF, 2006b).

3.8 LAND USE

3.8.1 Definition of the Resource

The term "land use" refers to real property classifications that indicate either natural conditions or the types of human activity occurring on a parcel. In many cases, land use descriptions are codified in local zoning laws; however, no nationally recognized convention or uniform terminology has been adopted for describing land use categories. As a result, the meanings of various land use descriptions, labels, and definitions vary among jurisdictions. The Installation Development Plan is the Base's planning tool to guide future development on Nellis AFB to be aligned to current and programmed mission requirements and was prepared in response to AFI 32-7062, Comprehensive Planning. Goals and objectives of land use planning are to maintain mission readiness; achieve and maintain compliance with operational, safety, environmental, energy, and security regulations and requirements; maximize functional capabilities through the utilization and adaption of existing areas; incorporate LEED guidelines; achieve environmental compliance through reduction of the installation environmental footprint; and foster awareness of the installation by community stakeholders (Nellis AFB 2018a).

To address land use with respect to noise, an AICUZ report was developed in 2017 for Nellis AFB. Aviation easements guide land use around the installation to applications that are compatible with an operational Air Force base and the AICUZ Program. An AICUZ report typically includes land use guidelines that help guide development in the neighboring jurisdictions. **Section 3.2** provides a detailed description of existing noise environment, and **Section 3.3** provides a description of the safety zones associated with Nellis AFB.

The location(s) and extent of the proposed and alternative actions need to be evaluated for their potential effects on the proposed sites and land uses adjacent to project areas on Nellis AFB. 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 includes the land surrounding the facilities proposed for use and the land within the airfield noise contours and safety zones.

3.8.2 Existing Conditions – Nellis AFB

Nellis AFB is located northeast of the city of North Las Vegas in Clark County, Nevada. It occupies approximately 14,163 acres of land and is divided into three areas: Area I (the Main Base); Area II; and Area III. The majority of the Proposed Action would occur within Area I, which is located east of Las Vegas Boulevard and contains 30 percent of the total Base land area. Area I contains the greatest variety of land use activities including runways, industrial facilities, housing areas, and most of the Base's administrative, training, and support facilities. Inside Area I, there are more than 2,000 buildings that include family housing units (enlisted and officers), dormitories, and billeting facilities. Industrial and open space accounts for about 39 and 36 percent of all Nellis AFB land, respectively. Most of the area designated as industrial is mandatory open space to provide safety zones around munitions storage or similar facilities.

Area II is located northeast of the Main Base and accounts for 60 percent of the total Base land area. The majority of Area II is undeveloped acreage. RED HORSE and Security Forces are the primary occupants of the developed acreage. Building 10301 of the Proposed Action is located in Area II.

Area III, west of Las Vegas Boulevard, comprises 10 percent of the total Base land area. The majority of Base family housing units and recreational facilities is located in Area III. Area III also houses the Mike O'Callaghan Medical Center Campus, which occupies the hospital facilities vacated by the Veterans Administration. A large solar photovoltaic array covers much of the remaining undeveloped land in Area III.

The AICUZ report classified the existing land uses into the following six categories: residential, commercial, industrial, public/quasi-public, recreation, and open/agriculture/low density (Nellis AFB, 2017a). Nellis AFB is primarily surrounded by residential, commercial, and undeveloped land uses, with most of the undeveloped land to the south and west of Nellis AFB privately held. The lands to the north and east of Nellis AFB are public lands, mainly controlled by the BLM. The land to the south, west, and northwest of Nellis AFB is primarily mixed commercial and residential, with some residential development occurring east of the Base on the slopes of Frenchman's Peak (Nellis AFB, 2017a). North of Nellis AFB, near Interstate 15, is Las Vegas Motor Speedway. The rest of the space north of Area II is primarily open space, and the land surrounding Area III is open space, industrial, mixed residential, and/or commercial (Nellis AFB, 2018a).

The construction activities under the proposed and alternative actions would occur entirely on existing Nellis AFB military lands. All areas that would be affected by construction activities are within the current perimeter fence boundaries of Nellis AFB. Nellis AFB has a mix of land use categories.

The proposed facilities would be located on previously disturbed land adjacent to existing buildings and infrastructure on Nellis AFB grounds in Area I. Buildings 278, 423, 451, and 878 are all located on previously disturbed land, with land use designation of Airfield Ops (Nellis AFB, 2017). The existing land use for Buildings 1770A and 10301 is Administrative, as shown in **Figure 3-9**. Facilities unique to Alternative A include Buildings 257, 262, and 283, which are located on previously disturbed land with land use designation of Airfield Ops. Facilities unique to Alternative B include Buildings 250, 245, 246, and 248, which are all located on previously disturbed land with land use designation of Airfield Ops.

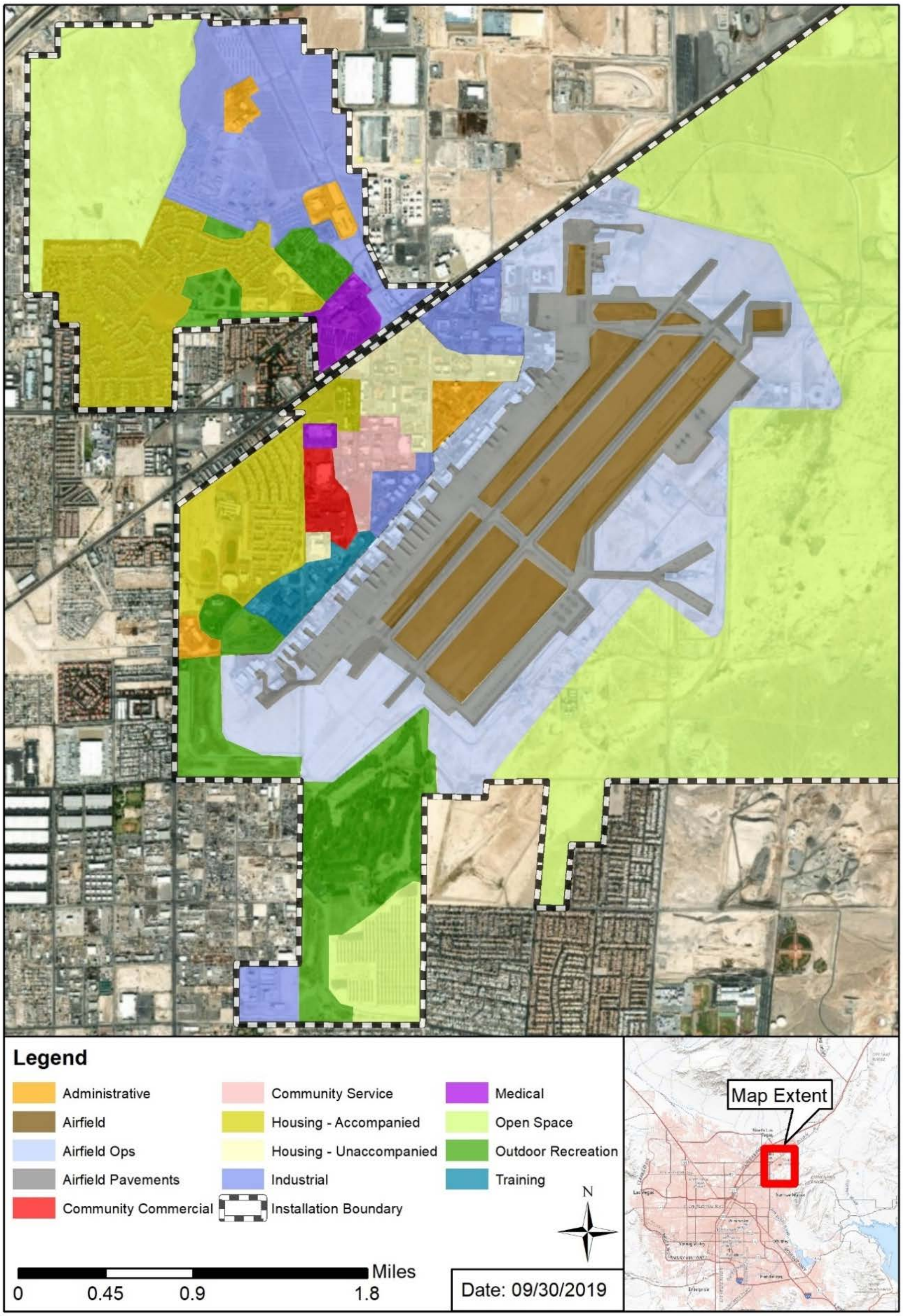

Figure 3-9. Land Use at Nellis AFB

3.9 SOCIOECONOMICS

3.9.1 Definition of the Resource

Socioeconomics is the relationship between economics and social elements, such as population levels and economic activity. There are several factors that can be used as indicators of economic conditions for a geographic area, such as demographics, median household income, unemployment rates, percentage of families living below the poverty level, employment, and housing data. Data on employment identify gross numbers of employees, employment by industry or trade, and unemployment trends. Data on industrial, commercial, and other sectors of the economy provide baseline information about the economic health of a region. Socioeconomic data are typically presented at county, state, and national levels to characterize baseline socioeconomic conditions in the context of regional, state, and national trends. The ROI for socioeconomics includes Nellis AFB and the surrounding environs (i.e., Las Vegas and Clark County).

3.9.2 Existing Conditions – Nellis AFB

3.9.2.1 Population

Clark County has grown dramatically since 2000 (**Table 3-9**), experiencing growth rates that have far outpaced the average population growth rates for the nation. Clark County grew approximately 56 percent from 2000 to 2018, compared to about 46 percent for Nevada and about 15 percent for the US. In 2018 (the most recently published population data), Clark County had a population of more than 2.1 million (US Census Bureau [USCB], 2020a). Of the total population of Nevada, approximately 73 percent reside in Clark County. Clark County's population is approximately 56.5 percent minority (USCB, 2020a).

Table 3-9.
Population in the Nellis AFB Region of Influence as Compared to Nevada and the United States (2010–2018)

Geographic Area	2000	2010	Average Annual Growth Rate 2000-2010 (Percent)	2018	Average Annual Growth Rate 2010-2018 (Percent)	Total Growth 2000-2018 (Percent)
City of Las Vegas	478,434	583,756	2.2	626,637	0.9	31.0
Clark County	1,375,765	1,951,269	4.2	2,141,574	1.2	55.7
Nevada	1,998,257	2,700,551	3.5	2,922,849	1.0	46.3
United States	281,421,906	308,745,538	1.0	322,903,030	0.6	14.7

Source: USCB, 2020a, 2020b, and 2020c

More than 42,000 active duty military, dependents, Reserve/Air National Guard, and civilian and contract employees are associated with Nellis AFB, Creech AFB, and the NTTR (**Table 3-10**), and annual payroll exceeds $1 billion. Approximately 17 percent of active duty military and their dependents live on Base, with the remaining 83 percent living in the region (Nellis AFB, 2017b).

Table 3-10.
Personnel and Nellis AFB, Creech AFB, and the NTTR 2017

Personnel	Living On Base	Living Off Base	Total
Active Duty Military	2,054	7,773	9,827
Military Dependents	4,108	23,253	27,361
Reserve/Air National Guard		1,449	1,449
Civilian and Contract Employees		3,556	3,556
Total	**6,162**	**36,031**	**42,193**

Source: Nellis AFB, 2017b
Notes:
AFB = Air Force Base; NTTR = Nevada Test and Training Range

3.9.2.2 Employment

The annual average labor force in 2018 in Clark County was 1,101,978 total people, and the average unemployment rate was 4.7 percent (51,401 unemployed). The Clark County unemployment rate was slightly greater than the average unemployment rate for Nevada (4.4 percent) and was well above the 3.9 percent national average unemployment rate (U.S. Bureau of Labor Statistics [BLS], 2018a, 2018b).

U.S. Bureau of Economic Analysis (BEA) data and information on the region's largest employers show that employment in the area is dominated by the Accommodation and Food Services sectors, which reflects the importance of the hotel/casino industry in the region. The Accommodation and Food Services sector accounts for 21 percent of employment in Clark County and 19 percent of employment in the state of Nevada, compared to only 7 percent for the nation (BEA, 2017).

Despite Accommodation and Food Services sectors accounting for such a large portion of the workforce, the single largest employer in Clark County is the Clark County School District, which is reported to have more than 33,000 employees (Nevada Department of Employment, Training & Rehabilitation Research & Analysis Bureau [Nevada DETR], 2019). By comparison, the top Accommodation and Food Services employer in Clark County (Wynn Las Vegas) employs a little more than 8,000 employees (Nevada DETR, 2019).

3.9.2.3 Housing

USCB estimates show that housing vacancy rates in Clark County for both homeowner and rental housing in 2018 were above the national average (**Table 3-11**). There are more than 120,000 vacant units in Clark County, with almost 25 percent of these units located within the city of Las Vegas (USCB, 2020d). The percentage of homes that are owner-occupied for Clark County (54.2), the city of Las Vegas (53.3), and Nevada (56.8) is well below the US average of 63.9 percent. Almost 14 percent of the housing units in Clark County are vacant, well above the national average of 12.2 percent (USCB, 2020d).

**Table 3-11.
Housing**

	City of Las Vegas	Clark County	Nevada	U.S.
Total Units	255,611	888,556	1,235,096	136,384,292
Owner-occupied	53.3%*	54.2%	56.8%	63.9%
Renter-occupied	46.7%*	45.8%	43.2%	36.1%
Vacant Units	29,215	120,602	159,166	16,654,164
Homeowner Vacancy Rate[a]	2.0%	2.3%	2.1%	1.7%
Rental Vacancy Rate[b]	6.4%	8.9%	8.0%	6.0%
Median Value[c]	$204,900	$242,400	$238,300	$234,700

Source: USCB 2020d
Notes:
a. Homeowner vacancy rate is the proportion of the homeowner inventory that is vacant "for sale."
b. Rental vacancy rate is the proportion of the rental inventory that is vacant "for rent."
c. Median value of owner-occupied units.

3.9.2.4 Schools

Clark County School District (CCSD) encompasses 226 elementary schools, 59 middle schools, 49 high schools, 19 alternative schools, and 7 special schools. Enrollment totaled 321,648 students in the most recent fully recorded school year (2017–2018), a slight increase in enrollment over the past several years (CCSD, 2018). Most children associated with Nellis AFB and Creech AFB attend public schools in the CCSD, with children living on Base generally attending schools in the Area Service Center 1 zone, which includes Coral Academy of Science (a magnet school located on Nellis AFB), Mary and Zel Lowman Elementary, Carroll M. Johnston Middle School, and Mojave High School (Nellis AFB, 2018b). There are also more than 100 private schools and 20 public charter schools in the area (Nellis AFB, 2018b). This includes the Coral Academy of Science (CAS), which operates a charter school located on Nellis AFB for grades K–7 (CAS, 2019). Institutions of higher education in the region include the University of Nevada – Las Vegas, Nevada State College, the College of Southern Nevada, and the Desert Research Institute.

3.10 Environmental Justice and Protection of Children

3.10.1 Definition of the Resource

Executive Orders 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 analysis, 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 populations include persons living below the poverty threshold as determined by the USCB; and youth populations are children under the age of 18 years.

Minority, low-income, and youth populations that could be disproportionately impacted by the project are addressed for the counties in the ROIs (Nellis AFB airfield and environs as well as the SUA used by Nellis AFB over the NTTR and within the R-2508 Complex as depicted in **Figure 1-2)**, and are compared with those populations in Nevada and the United States. For further discussion of the specific Native American tribes associated with the ROIs, see Cultural Resources (**Section 3.11**).

3.10.2 Existing Conditions – Nellis AFB

An evaluation of minority and low-income populations in Clark County and in the city of Las Vegas forms a baseline for the evaluation of the potential for disproportionate impacts on these populations from the proposed and alternative actions. In 2018, the state of Nevada, Clark County, and the city of Las Vegas had a much higher percentage of minorities in the population compared to the US (USCB, 2020a). The same trend occurred for the percent of the population that is Hispanic or Latino; however, the state of Nevada, Clark County, and the city of Las Vegas had a comparable percentage of American Indian or Alaska Native population (2.1 percent, 1.6 percent, and 1.7 percent, respectively) and Black or African American (10.6 percent, 13.4 percent, and 14.1 percent, respectively) compared to the entire US (1.7 percent American Indian or Alaskan Native and 14.0 percent Black or African American).

Over the same period, the city of Las Vegas had a higher rate of poverty than Clark County, the state of Nevada, and the US (**Table 3-12**), while the rate of poverty in Clark County and the state of Nevada was similar to the US. The percentage of children in the city of Las Vegas was slightly higher, but similar to the percentage of children in Clark County and the state of Nevada and was higher than the US as a whole (**Table 3-12**) (USCB, 2020e).

**Table 3-12.
Total Population and Populations of Concern**

	Total Population	Percent Minority	Percent Hispanic or Latino	Percent Below Poverty	Percent Youth	Percent Elderly
City of Las Vegas	626,637	55.8	32.9	15.8	24.1	14.5
Clark County	2,922,849	56.5	30.9	14.1	23.6	14.1
State of Nevada	3,034,392	50.1	28.5	13.7	23.1	15.0
United States	322,903,030	38.9	17.8	14.1	22.8	15.2

Source: USCB, 2020a, 2020e
Note:
Hispanic and Latino denote a place of origin and percent youth are all persons under the age of 18.

3.10.3 Existing Conditions – Special Use Airspace

The training airspace that would be used by the additional aircraft would be the NTTR airspace and the R-2508 Complex (**Figure 2-2** and **2-3**). The major work areas for the NTTR airspace include the Desert and Reveille North/South MOAs, covering parts of Clark, Nye, and Lincoln counties in Nevada, while the major work areas for the R-2508 Complex consist of Isabella, Owens, Saline, and Panamint MOAs, covering large portions of Inyo, Kern, San Bernardino, and Tulare counties in California. Counties and MOAs with less area impacted for the R-2508 Complex include Fresno and Los Angeles counties in California, Esmeralda County in Nevada, and the Bakersfield, Barstow, Bishop, Buckhorn, Deep Springs, Porterville, Shoshone, and Silver North/South MOAs in California.

3.10.3.1 Desert MOA

An evaluation of minority and low-income populations in the Desert MOA forms a baseline for the evaluation of the potential for disproportionate impacts on these populations from the proposed and alternative actions. The Desert MOA falls within Clark and Lincoln counties. The percentage of minorities in the population in 2018 was higher in Clark County (56.5 percent) than in the state of Nevada (50.1 percent) and the US (38.9 percent). However, the percentage of minorities in the population in Lincoln County (13.8 percent) was far less than the state of Nevada and the US (**Table 3-13**) (USCB, 2020a).

The percentage of the overall population that were children in the state of Nevada (23.1 percent) and the US (22.8 percent) as a whole were similar (USCB, 2020a). However, counties in the Desert MOA differed in percentage of children in the overall population, with Clark County (23.6 percent) similar to the state and US percentages, while Lincoln County (16.6 percent) was below the state and US percentages (**Table 3-13**) (USCB, 2020a). While the percentage of elderly in Nevada (15.0 percent) was similar to the US (15.2 percent), counties in the Desert MOA differed, with Clark County at a slightly lower percentage (14.1 percent) and Lincoln County substantially higher at 23.7 percent (**Table3-13**) (USCB, 2020a).

The percent below the poverty level for counties in the Desert MOA was similar to or below the percentages for Nevada and the US. The percent of the population below the poverty level in Clark County was 14.1 percent and in Lincoln County was 6.8 percent, while the percent of the population below the poverty level was 13.7 in the state of Nevada and 14.1 for the US (USCB, 2020e).

3.10.3.2 Reveille North/South MOA

An evaluation of minority and low-income populations in the Reveille North/South MOAs forms a baseline for the evaluation of the potential for disproportionate impacts on these populations from the proposed and alternative actions. The Reveille North/South MOAs fall within Nye County. The percentage of minorities in the population in 2018 was substantially lower in Nye County (23.2 percent) than in the state of Nevada (50.1 percent) and the US (38.9 percent) (**Table 3-13**) (USCB, 2020a).

Table 3-13.
Total Population and Populations of Concern for the Region of Influence for the Special Use Airspace (2017)

Location	Total Population	Percent Minority	Percent Hispanic or Latino	Percent Below Poverty	Percent Youth	Percent Elderly	Desert MOA	Reveille North/ South MOA	Isabella MOA	Owens MOA	Panamint MOA	Saline MOA
Inyo County, California	18,085	37.0	217	10.2	20.1	22.9				X		X
Kern, County, California	883,053	65.2	52.8	22.0	29.2	10.4			X			
San Bernardino County, California	2,135,413	70.8	52.8	17.3	26.8	10.9			X		X	
Tulare County, California	460,477	71.0	64.1	25.5	31.2	10.9				X		
Clark County, Nevada	2,141,574	56.5	30.9	14.1	23.6	14.1	X					
Lincoln County, Nevada	5,174	13.8	8.5	6.8	16.6	23.7	X					
Nye County, Nevada	43,705	23.2	14.4	16.2	17.1	28.9		X				
California	39,148,760	62.5	38.9	14.3	23.2	13.6						
Nevada	2,922,849	50.1	28.5	13.7	23.1	15.0						
United States	322,903,030	38.9	17.8	14.1	22.8	15.2						

Source: USCB, 2020a, 2020e
Notes:
a. NTTR Complex
b. R-2508 Complex
Hispanic and Latino denote a place of origin and percent youth are all persons under the age of 18.
MOA = Military Operations Area

The percentage of the overall population that were children in the state of Nevada (23.1 percent) and the US (22.8 percent) were similar (USCB, 2020a). However, in the Reveille North/South MOAs, Nye County (17.1 percent) had a substantially lower percentage of the overall population that were children compared to the state of Nevada and the US (**Table 3-13**) (USCB, 2020a). While the percentage of elderly in Nevada (15.0 percent) was similar to the US (15.2 percent), Nye County in the Reveille North/South MOA was substantially higher at 28.9 percent (**Table3-13**) (USCB, 2020a).

The percent below the poverty level for Nye County in the Reveille North/South MOAs was 16.2 percent, which is higher than the percent of the population below the poverty level in the state of Nevada (13.7 percent) and the US (14.1 percent) (USCB, 2020e).

3.10.3.3 Isabella MOA

An evaluation of minority and low-income populations in the Isabella MOA forms a baseline for the evaluation of the potential for disproportionate impacts on these populations from the proposed and alternative actions. The Isabella MOA falls within San Bernardino and Kern counties. The percentage of minorities in the population in 2018 was substantially higher in San Bernardino County (70.8 percent) than the state of California (62.5 percent), while Kern County (65.2 percent) was similar to the state of California (USCB, 2020a). The percentage of minorities in the population for San Bernardino and Kern counties, as well as the state of California, were all substantially higher than that of the US (38.9 percent) (**Table 3-13**) (USCB, 2020a).

The percentage of the overall population that were children in the state of California (23.2 percent) and the US (22.8 percent) were similar (USCB, 2020a). However, in the Isabella MOA, Kern County (29.2 percent) and San Bernardino County (26.8 percent) had a higher percentage of the overall population that were children compared to the state of California and the US (**Table 3-13**) (USCB, 2020a). As a whole, California had a lower percentage of elderly (13.6 percent) than the US (15.2 percent) and counties in the Isabella MOA had an even lower percentage of elderly—Kern County, 10.4 percent, and San Bernardino County, 10.9 percent (**Table 3-13**) (USCB, 2020a).

The percent below the poverty level for Kern County was 22.0 percent and the percent below the poverty level for San Bernardino County was 17.3 percent. These were both higher than the percent of the population below the poverty level in the state of California (14.3 percent) and the US (14.1 percent) (USCB, 2020e).

3.10.3.4 Owens MOA

An evaluation of minority and low-income populations in the Owens MOA forms a baseline for the evaluation of the potential for disproportionate impacts on these populations from the proposed and alternative actions. The Owens MOA falls within Inyo County. The percentage of minorities in the population in 2018 was higher in Tulare County (71.0 percent) and substantially lower in Inyo County (37.0 percent) than the state of California (62.5 percent) (USCB, 2020a). Compared to the percentage of minorities in the US (38.9 percent), Tulare County was substantially higher, while Inyo County was about the same (**Table 3-13**) (USCB, 2020a).

The percentage of the overall population that were children in the state of California (23.2 percent) and the US (22.8 percent) were similar (USCB, 2020a). However, Inyo County was slightly lower (20.1 percent), while Tulare County (31.2 percent) had a much higher percentage of the overall population that were children compared to the state of California and the US (**Table 3-13**) (USCB, 2020a). California (13.6 percent) had a lower percentage of elderly than the US (15.2 percent), and Tulare County in the Owens MOA was substantially lower (10.9 percent). However, Inyo County, also in the Owens MOA, had a significantly higher elderly population (22.9 percent) than both the state and US percentages (**Table 3-13**) (USCB, 2020a).

The percent below the poverty level for Inyo County was 10.2 percent, much lower than the percent of the population below the poverty level in the state of California (14.3 percent) and the US (14.1 percent) (USCB, 2020e). However, in Tulare County, the percent below the poverty level was 25.5, almost twice the California and US levels (USCB, 2020e).

3.10.3.5 Panamint MOA

An evaluation of minority and low-income populations in the Panamint MOA forms a baseline for the evaluation of the potential for disproportionate impacts on these populations from the proposed and alternative actions. The Panamint MOA falls within San Bernardino County. The percentage of minorities in the population in 2018 was substantially higher in San Bernardino County (70.8 percent) than in the state of California (62.5 percent) (USCB, 2020a). The percentage of minorities in the population for San Bernardino County, as well as the state of California, was substantially higher than that of the US (38.9 percent) (**Table 3-13**) (USCB, 2020a).

The percentage of the overall population that were children in the state of California (23.2 percent) and the US (22.8 percent) were similar (USCB, 2020a). However, San Bernardino County (26.8 percent) had a higher percentage of the overall population that were children compared to the state of California and the US (**Table 3-13**) (USCB, 2020a). California (13.6 percent) had a lower percentage of elderly than the US (15.2 percent), and San Bernardino County in the Panamint MOA was substantially lower (10.9 percent) (**Table 3-13**) (USCB, 2020a).

The percent below the poverty level for San Bernardino County was 17.3 percent, which was higher than the percent of the population below the poverty level in the state of California (14.3 percent) and the US (14.1 percent) (USCB, 2020e).

3.10.3.6 Saline MOA

An evaluation of minority and low-income populations in the Saline MOA forms a baseline for the evaluation of the potential for disproportionate impacts on these populations from the proposed and alternative actions. The Saline MOA falls within Inyo County. The percentage of minorities in the population in 2018 was substantially lower in Inyo County (37.0 percent) than in the state of California (62.5 percent) (USCB, 2020a). Compared to the percentage of minorities in the US (38.9 percent), Inyo County was about the same (**Table 3-13**) (USCB, 2020a).

The percentage of the overall population that were children in the state of California (23.2 percent) and the US (22.8 percent) were similar; however, Inyo County was slightly lower (20.1 percent) than both of the state of California and the US (**Table 3-13**) (USCB, 2020a). California (13.6 percent) had a lower percentage of elderly than the US (15.2 percent). However, Inyo County in the Saline MOA had a significantly higher elderly population (22.9 percent) than both the state and US percentages (**Table 3-13**) (USCB, 2020a).

The percent below the poverty level for Inyo County was 10.2 percent, lower than the state of California (14.3 percent) and the US (14.1 percent) (USCB, 2020e).

3.10.3.7 Other Impacted Areas

Additional MOAs that may be impacted by this project included the Bakersfield, Barstow, Bishop, Buckhorn, Deep Springs, Porterville, Shoshone, and Silver North/South MOAs. These include small portions of Esmeralda County in Nevada and Fresno and Los Angeles counties in California.

In Esmerelda County, the percentage of minorities in the population in 2018 (20.1 percent) was much lower than the state of Nevada (50.1 percent) and the US (38.9 percent), as was the poverty rate (7.2 percent) compared to the state of Nevada (13.7 percent) and the US (14.1 percent). The percentage of the overall population that were children in Esmeralda County (20.0 percent) was slightly lower than both the state of Nevada (23.1 percent) and the US (22.8 percent). The percentage of elderly in Esmerelda County (27.4 percent) was substantially higher than both the state of Nevada and US (15.0 and 15.2 percent, respectively) (USCB, 2020a).

Fresno and Los Angeles counties both had higher percentages of minorities in the population in 2018 (70.2 percent and 73.7 percent, respectively) than the state of California (62.5 percent) and the US (38.9 percent). In Los Angeles County, the percentage of the population that were children was 22.2 percent, which was similar to the state of California (23.2 percent) and the US (22.8 percent), while the percentage in Fresno County was higher (28.6 percent) (USCB, 2020a). The percentage of elderly in Los Angeles County (12.9 percent) and Fresno County (11.7 percent) was lower than the state of California (13.6 percent) and much lower than the US (15.2 percent) (USCB, 2020a). The poverty rate in Los Angeles was slightly higher (16.0 percent) than the state of California (14.3 percent) and the US (14.1 percent), while the rate in Fresno County was substantially higher (24.1 percent) (USCB, 2020e).

3.11 CULTURAL RESOURCES

3.11.1 Definition of the Resource

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

Cultural resources include the following subcategories:

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

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

- 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 Criteria 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 (Criteria 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 (16 USC § 469) as amended, the American Indian Religious Freedom Act of 1978 (42 USC § 1996), the Archaeological Resources Protection Act of 1979 (16 USC § 470aa–470mm), the Native American Graves Protection and Repatriation Act of 1990 (25 USC § 3001, et seq.), and the NHPA, as amended through 2016, and associated regulations (36 CFR § 800). The NHPA requires federal agencies to consider effects of federal undertakings on historic properties prior to making a decision or taking an action and integrate historic preservation values into their decision-making process. Federal agencies fulfill this requirement by completing the NHPA Section 106 consultation process, as set forth in 36 CFR § 800. Section 106 also requires agencies to consult with federally recognized American Indian tribes with a vested interest in the undertaking.

Section 106 of the NHPA requires all federal agencies to seek to avoid, minimize, or mitigate adverse effects to historic properties (36 CFR § 800.1[a]). For cultural resources analysis, the ROI is the Area of Potential Effects (APE), 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 the Proposed Action: 1) the area of proposed use at Nellis AFB, as described in **Section 3.11.2.2** and 2) the SUA used by Nellis AFB over the NTTR and within the R-2508 Complex, as depicted in **Figure 1-2**.

3.11.2 Existing Conditions – Nellis AFB

3.11.2.1 Cultural Context

A comprehensive discussion of the prehistoric and historic record for Nellis AFB is well beyond the scope of the current investigation. The following discussion is intended to be general in nature and does not discuss or debate the divergent opinions and interpretations of other specialists. The major trends in regional cultural history derived from the 2017 Integrated Cultural Resource Management Plan (ICRMP) for Nellis, Creech, and NTTR are outlined briefly below; a more detailed discussion can be found in the 2017 ICRMP (USAF, 2017).

Lake Mojave Period (10,000–7000 Before Present [BP; i.e., 1950])
Uncontested evidence of human occupation in southern Nevada and Arizona begins at the end of the late Pleistocene glaciations with the Lake Mojave Period circa 10,000 BP. The archaeological data from this period is sparse but implies that populations likely lived in small, highly mobile groups that moved across the landscape on a seasonal basis depending on plant and animal availability.

Pinto Period (7000–4000 BP)
A climatic shift brought about warmer and drier conditions in southern Nevada that resulted in essentially modern conditions by 7000 BP. Populations remained mostly nomadic, However, oval house pits outlined with postholes also appear in this period and suggest longer-duration habitation at some locations. With the extinction of Pleistocene megafauna, hunting was focused on deer, antelope, bighorn sheep, rabbits, tortoises, and lizards (Warren and Crabtree, 1986) with an increased reliance on plant resources (Warren, 1991).

Gypsum Period (4000–1500 BP)
The Gypsum Period exhibits greater diversity in the cultural assemblage due to the influence and movement of neighboring cultural groups into the southern Great Basin and Mojave Desert. Habitation sites with large middens indicate greater and more sustained occupation. Evidence of ceremonial sites located in caves also occurs during this period. Hunting of wild game continued to be a prominent subsistence activity, but the introduction of the mortar and pestle along with increased use of ground stone implements and hand stones suggests even greater reliance upon seeds and other plant resources (Warren and Crabtree, 1986).

Saratoga Springs Period (1500–800 BP)
The pattern of seasonal transhumance from earlier periods continued throughout the Saratoga Springs Period, yet large-scale settlements, or villages, were located along the major watersheds, while short-term, temporary habitation sites occur throughout the region (Warren and Crabtree, 1986). Projectile points are smaller than in earlier periods, reflecting greater reliance upon the bow and arrow for hunting large and small game such as deer, antelope, bighorn sheep, rabbits, and tortoises, as well as birds (Shutler, 1961; Warren and Crabtree, 1986). The greatest change in subsistence is the introduction of agriculture/horticulture from neighboring cultural areas (e.g., Patayan, Hohokam, and Ancestral Puebloan) to the east and south.

Numic Period (800–150 BP)

Limited horticulture continued to be practiced alongside the hunter/collector strategy seen in earlier periods. Populations remained semi-nomadic, seasonally exploiting available plant and animal resources in different environmental zones. Groups would likely aggregate and disperse periodically throughout the year depending on the abundance of seasonally available resources. The end of the period is marked by Euro-American settlement in the region and the displacement of Native American populations to reservations.

Spanish/Mexican Exploration (400–150 BP)

The Spanish were the first Europeans to explore the western United States and established missions throughout much of the American Southwest. An attempt to establish a travel route from coastal California to Santa Fe, New Mexico, was undertaken in 1829 by a Spanish citizen, Antonio Armijo. A portion of the Armijo and company would become a variant of the Old Spanish Trail, which passed through the Las Vegas Valley. The Old Spanish Trail would become a regular route of Mexican traders from 1830 to 1848. Ultimately, a portion of the Old Spanish Trail became Las Vegas Boulevard North, adjacent to the western boundary of Nellis AFB.

Euro-American Exploration (175–100 BP)

The earliest Euro-American exploration of the area was related to fur traders seeking to expand their territories, though records are sparse and often conflicting. Jebediah S. Smith's second expedition into the region in 1828 followed a route along the lower Colorado River and portions of the Old Spanish Trail (Fletcher, 1920). Other expeditions were made by other companies throughout portions of the Great Basin and the Mojave Desert. Publicity of the trappers' exploits would ultimately lure pioneers and emigrants to California, often passing through portions of Nevada on the way.

Euro-American Settlement (100–30 BP)

The Treaty of Guadalupe Hidalgo between the United States and Mexico and the discovery of gold in California in 1848 would lead to increased Euro-American settlement of the west. A company of Mormons, or Latter-Day Saints, established a mission in the Las Vegas Valley in 1855, where they constructed the Las Vegas fort, approximately 12 miles southeast of what is now Nellis AFB (Jensen, 1926; Myhrer et al., 1990). Elsewhere in Nevada, the discoveries of silver, and to a lesser extent gold, resulted in numerous boom towns being established in areas such as Carson City and Silver City. The influx of people led to Nevada being established as a separate territory in 1861 and a state in 1864. The Las Vegas settlement was abandoned by Mormons in the early 1860s but was appropriated by Octavius Decatur Gass and two partners who rebuilt the settlement and opened a supply store to service travelers. Las Vegas continued to grow through the late 1800s, though the mining boom went into decline during the 1880s and 1890s. The construction of the railroad through the Las Vegas Valley in the early 1900s and the auctioning of land adjacent to the railroad resulted in establishment of the town of Las Vegas. Completion of the railroad in 1909, coupled with increased population growth, resulted in the establishment of Clark County. The increased settlement in southern Nevada and the Las Vegas Valley had profound impacts on the Native American populations living in the region at the time. The Western Shoshone and Southern Paiute/Chemehuevi were largely displaced to reservations.

Southern Nevada Infrastructure Development (30 BP–Present [i.e., 1950])

With the advent of motorized automobiles, Nevada began constructing improved roads to connect the numerous towns and cities throughout the state between 1911 and 1930. Additional reservations were created as part the Indian Reorganization Act of 1934 (25 USC § 465), which affected several of the descendant communities with ties to Nellis AFB and the NTTR. While the Great Depression had significant effects on the economy, Nevada's economy and population continued to increase as a result of government projects, such as the construction of Hoover Dam. Many former speakeasies became clubs after prohibition, and the legalization of gambling in 1931 further contributed to the growth of Las Vegas and the development of the resort hotel industry (Dunar and McBride, 1993). The onset of World War II brought additional jobs to the region as national defense brought new demands for resources and personnel. After the Air Force was created as a separate military department, the Las Vegas AFB was created in the late 1940s. The Las Vegas AFB was renamed Nellis AFB in 1950, after First Lieutenant William H. Nellis of Searchlight, Nevada. Nellis AFB would continue to grow and expand in the last half of the twentieth century and to the present day.

3.11.2.2 Archaeological and Traditional Cultural Properties

A review of existing records from the 2017 ICRMP yielded the identification of 10 archaeological sites within the APE on Nellis AFB (USAF, 2017). This includes an examination of the direct APE, within 50 meters of the project, and the indirect APE, a range of approximately 800 meters around the APE (**Figure 3-10**).

Traditional Cultural Properties (TCPs) may include traditionally used plants and animals, trails, and certain geographic areas. Types of resources that have been specifically identified in recent studies include, but are not limited to, rock art sites; “power” rocks and locations; medicine areas; and landscape features such as specific peaks or ranges, hot springs, meadows, valleys, and caves. No TCPs, sacred areas, or traditional-use areas have been identified on Nellis AFB proper. Nellis AFB continues to consult with Tribal Historic Preservation Officers and tribal leaders.

3.11.2.3 Architectural Properties

No NRHP-eligible buildings were determined to be within the direct APE. Six NHRP-eligible buildings are located within the indirect APE (associated with Buildings 1770A and 245). These buildings are as follows: 201, 220, 222, 224, 292, and 620.

The following information about the facilities proposed for demolition, renovation and addition was provided by Nellis AFB Cultural Resources personnel from the Historical Building Inventory of Nellis AFB, Creech AFB, and the NTTR on November 2018 (USAF, 2018c) and other sources as noted:

- Building 245: constructed in 1954, determined not eligible for the NRHP with SHPO concurrence on 5 January 2015 (LaPierre, 2020),
- Building 246: constructed in 1969, determined not eligible for the NRHP (USAF, 2018c) with the SHPO concurrence on 2 June 2020.
- Building 248: constructed in 1969, determined not eligible for the NRHP (USAF, 2018c). Consultation on this finding with the SHPO is ongoing.
- Building 250: constructed in 1971, determined not to be eligible for the NRHP (USAF, 2009) with the SHPO concurrence on 1 December 2006.
- Building 257: constructed in 2018, therefore not pertinent to the NRHP (LaPierre, 2020).
- Building 262: constructed in 1954, determined not eligible for the NRHP (USAF, 2018c). Consultation on this finding with the SHPO is ongoing.
- Building 278: constructed in 1971, determined not eligible for the NRHP (USAF, 2018c). Consultation on this finding with the SHPO is ongoing.
- Building 283: constructed in 1977, determined not eligible for the NRHP (USAF, 2018c) with the SHPO concurrence on 5 January 2015.
- Building 423: constructed in 1981, determined not eligible for the NRHP (USAF, 2018c). Consultation on this finding with the SHPO is ongoing.
- Building 451: constructed in 1970, determined not eligible for the NRHP (USAF, 2018c). Consultation with SHPO on this finding is ongoing.
- Building 878: determined not eligible for the NRHP with the SHPO concurrence on 19 June 2020 (LaPierre, 2020).
- Building 1770: constructed in 2009, not eligible for the NRHP.
- Building 10301: determined not eligible for the NRHP with the SHPO concurrence on 19 June 2020 (LaPierre, 2020).

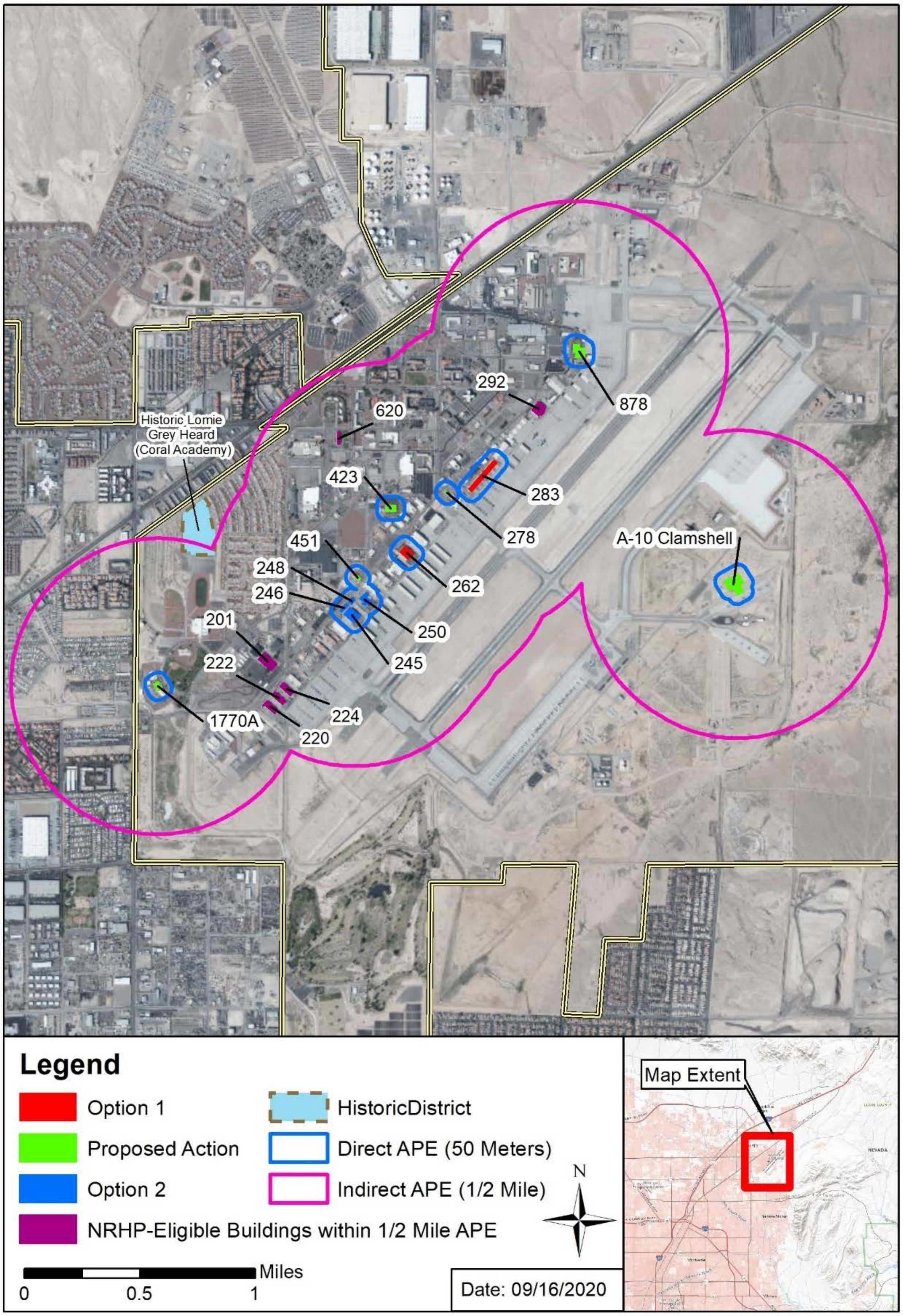

Figure 3-10. NRHP Eligible Buildings Sites Located within the Direct and Indirect Area of Potential Effect

3.11.3 Existing Conditions – Special Use Airspace

3.11.3.1 Environmental Setting

The airspace APE for the proposed and alternative actions includes the airspace as described in **Section 2.1.6.** Significant cultural resources under the NTTR and R-2508 Complex are described below.

Hundreds of structures, features, and a few towns associated with the mining and ranching history of Nevada are found throughout NTTR. Numerous mines and mining districts, many with associated campsites, were opened in what is now the withdrawn area of NTTR during the late 19th and early 20th. centuries (USAF, 2018c).

TCPs may include traditionally used plants and animals, trails, and certain geographic areas. Types of resources that have been specifically identified in recent studies include, but are not limited to, rock art sites; “power” rocks and locations; medicine areas; and landscape features such as specific peaks or ranges, hot springs, meadows, valleys, and caves. Since 1997, Nellis AFB’s Native American Program and ethnographic studies have identified ceremonial and sacred sites on the NTTR and have worked to protect them (US Air Force, 2011). Any TCP designation is initiated by the Nellis AFB in coordination with the various Native American groups.

3.11.3.2 National Register of Historic Places Listed Resources

There are 30 historic resources associated with the airspace APE listed in the NRHP. Of these, one each is associated with the Reveille North MOA, R-4808N site, and XRay/Nellis AFB site in Nevada, and seven are associated with the Desert MOA in Nevada. In California, there is one historic site each associated with the Barstow, Bishop, Porterville, and Saline MOAs, two each with Bakersfield and Panamint MOAs, four each with Isabella and Owens MOAs, and one associated with both Saline and Owens MOAs. In California, there are also two sites associated with the R-2502N area and one with the R2515 area. Resource types include three structures (i.e., bridges, light houses, infrastructure features), five sites (e.g., townsites cemeteries, mining-related sites), nine districts (e.g., townsites, historical districts), and 13 buildings (e.g., homes, government buildings, churches, theaters) (National Park Service [NPS], 2019) (**Table 3-14**).

Table 3-14.
National Register of Historic Places Listed Resources Under the Airspace[a]

Special Use Airspace	Resource	Type	Reference No.	State
Bakersfield	Gross, Courtlandt House	Building	87000669	CA
Bakersfield	Nuestra, Senora Reina de la Paz	District	11000576	CA
Barstow	Harvey House Railroad Depot	Building	75000458	CA
Bishop	Laws Narrow Gauge Railroad Historic District	District	81000149	CA
Isabella	Errea House	Building	97000809	CA
Isabella	Tehachapi Railroad Depot	Building	99001263	CA
Isabella	Bandit Rock	Site	75000431	CA
Isabella	Walker Pass	Structure	66000210	CA
Owens	Shorty Lovelace Historic District	District	78000293	CA
Owens	Smithsonian Institution Shelter	Building	77000119	CA
Owens	Manzanar War Relocation Center	Site	76000484	CA
Owens	Inyo Courthouse	Building	97001664	CA
Panamint	Eagle Borax Works	District	74000338	CA
Panamint	Skidoo	District	74000349	CA
Porterville	Elster, C.A. Building	Building	82002279	CA
R-2502N	Harmony Borax Works	District	74000339	CA
R-2502N	Pioneer Deep Space Station	Structure	85002813	CA
R-2515	Rogers Dry Lake	Site	85002816	CA
Saline	Death Valley Scotty Historic District	District	78000297	CA
Saline/Owens	Saline Valley Salt Tram Historic Structure	Structure	74000514	CA
Desert	1938 Lincoln County Courthouse	Building	02000820	NV

Special Use Airspace	Resource	Type	Reference No.	State
Desert	Lincoln County Courthouse	Building	78001724	NV
Desert	Brown's Hall-Thompson's Opera House	Building	84002074	NV
Desert	Smith Hotel – Cornelius Hotel	Building	08000510	NV
Desert	Caliente Railroad Depot	Building	74001146	NV
Desert	Hidden Forest Cabin	Building	75001106	NV
Desert	Mormon Well Spring	Site	74001143	NV
Reveille North	Bristol Wells Townsite	District	72000765	NV
R-4808N	Sedan Crater	Site	94000183	NV
XRay/Nellis AFB	Old Spanish Trail-Mormon Road	District	01000863	NV

Source: NPS, 2019
Note:
a. The condition is defined as "likely but not guaranteed to be extant" (or not guaranteed to be standing).

3.11.3.3 Tribal Lands

There are 19 federally recognized Native American tribes in Nevada and 110 in California (81 FR 5020, July 29, 2016). The airspace APE is directly associated with several federally recognized tribes, including the Southern Paiute Tribe and Western Shoshone Tribe in Nevada (Nevada Indian Territory, 2019) and the Southern Paiute Tribe, the Mono Indians Tribe, the Owens Valley Paiute Tribe, the Western Shoshone Tribe, the Yokut Tribe, and the Kitanemuk Tribe (through the Tejon Indian Tribe) in California (California Department of Water Resources [CDWR], 2018; Lotah Link, 2016). The airspace APE is also associated with several non-federally recognized tribes in California that are seeking federal recognition, including the Kawaiisu Tribe and the Tabatulabal Tribe (Lotah Link, 2016).

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

3.12.1 Definition of the Resource

The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (42 USC § 9601) (CERLA), as amended by the Superfund Amendments and Reauthorization Act (SARA) and the Toxic Substances Control Act (15 USC § 2601, et seq., as implemented by 40 CFR § 761) (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 the enforcement and implementation of federal laws and regulations pertaining to worker health and safety under 29 CFR § 1910. OSHA also includes the regulation of HAZMAT in the workplace and ensures appropriate training in their handling.

The Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976 (42 USC § 6901) (RCRA), which was further amended by the Hazardous and Solid Waste Amendments of 1984, defines hazardous wastes. Hazardous waste is defined as any solid, liquid, contained gaseous, or semi-solid waste, or any combination of wastes, that pose a substantial present or potential hazard to human health or the environment. In general, both HAZMAT and hazardous wastes include substances that, because of their quantity, concentration, physical, chemical, or infectious characteristics, might present substantial danger to public health and welfare or the environment when released or otherwise improperly managed.

AF Policy Directive (PD) 32-70, *Environmental Considerations in Air Force Programs and Activities*, 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) and aboveground storage tanks (ASTs), and associated piping, that store petroleum products and hazardous substances. Evaluation of HAZMAT and hazardous wastes focuses on USTs and ASTs as well as the storage, transport, and use of pesticides, fuels, oils, and lubricants. Evaluation might also extend to generation, storage, transportation, and disposal of hazardous wastes when such activity occurs at or near the project site of a proposed action. In addition to being a threat to humans, the improper release of HAZMAT and hazardous wastes can threaten the health and well-being of wildlife species, botanical habitats, soil systems, and water resources. In the event of release of HAZMAT or hazardous wastes, the extent of contamination varies based on type of soil, topography, weather conditions, and water resources.

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

Through the Environmental Restoration Program (ERP) initiated in 1980, a subcomponent of the Defense ERP that became law under SARA (formerly the Installation Restoration Program), 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 Amendments under the RCRA Corrective Action Program. The ERP provides a uniform, thorough methodology to evaluate past disposal sites, control the migration of contaminants, minimize potential hazards to human health and the environment, and clean up contamination through a series of stages until it is decided that no further remedial action is warranted.

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

Toxic substances might pose a risk to human health but are not regulated as contaminants under the hazardous waste statutes. Included in this category are asbestos-containing materials (ACMs), 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.

3.12.1.1 Asbestos

AFI 32-1052, Facility Asbestos Management, provides the direction for asbestos management at Air Force installations. This instruction incorporates by reference applicable requirements of 29 CFR § 669, 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 to document 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 USC § 669. 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.

3.12.1.2 Lead-Based Paint

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

3.12.1.3 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. 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).

3.12.1.4 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 US until they were banned in 1979. The disposal of PCBs is regulated under TSCA, which banned the manufacture and distribution of PCBs, with the exception of PCBs used in enclosed systems. Per Air Force policy, all installations should have been PCB-free as of 21 December 1998. In accordance with 40 CFR § 761 and Air Force policy, both of which regulate all PCB articles, PCBs 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

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 Nellis AFB.

3.12.2 Existing Conditions – Nellis AFB

3.12.2.1 Hazardous Materials and Wastes

Activities at Nellis AFB require the use and storage of a variety of hazardous materials that include flammable and combustible liquids, acids, corrosives, caustics, anti-icing chemicals, compressed gases, solvents, paints, paint thinners, and pesticides.

Hazardous and toxic substances used on Nellis AFB are tracked by the Hazardous Materials Pharmacy through the procurement, handling, storage, and dispensing of hazardous substances for construction and operations. Hazardous and toxic substances disposal procedures are identified in the Nellis AFB Hazardous Waste Management Plan (Nellis AFB, 2015b) and all wastes are disposed of in compliance with all Federal, state, and local regulations.

Nellis AFB is considered a large quantity generator by the EPA. Hazardous waste at Nellis AFB is accumulated at an approved 90-day storage area, or at satellite accumulation points. Approximately 100 satellite accumulation points and one 90-day storage area are operated at Nellis AFB (Nellis AFB, 2015b). A variety of activities on Base, including aircraft maintenance and support, civil engineering, and printing operations, have been identified as primary contributors to hazardous waste streams. Basic processes and waste handling procedures for general aircraft maintenance activities are identified in the Nellis AFB Hazardous Waste Management Plan (Nellis AFB, 2015b).

3.12.2.2 Environmental Restoration Program Sites

There are 26 ERP sites at Nellis AFB. These sites include former landfills, dump areas, the former sewage treatment plant, disposal and pit areas, fuel spills, the fire training area, radioactive waste storage, bulk jet fuel storage tanks, and USTs. Twelve sites required remediation and nine of those are still being remediated. The remaining sites require no further action.

A review of the Nellis AFB ERP site summary, as illustrated in **Figure 3-11**, found no active ERP sites on any land proposed for use under Alternative B. However, under Alternative A, two of these sites (SS-28 and ST-44) could be impacted by the proposed and alternative action construction. Site SS-28 is a historic fuel spill located near Building 941 and remedial action operations are ongoing for extraction of product/ground water and long-term monitoring to ensure CERCLA compliance. ST-44 is a fuel leak from two USTs at the AGE service island. Remedial action operations have continued with the injection of potassium permanganate to further degrade onsite contamination.

3.12.2.3 Asbestos and Lead-Based Paint

Nellis AFB has a program to identify asbestos and lead in all structures in order to reduce potential hazards to occupant, workers, and the environment during construction projects. Many buildings on Base date from the 1940s through the 1980s; asbestos-containing materials have been identified in many of these facilities. Renovation or demolition of on-Base structures is reviewed by Civil Engineering personnel to ensure appropriate measures are taken to reduce potential exposure to, and release of, friable asbestos. Nonfriable asbestos is not considered a hazardous material until it is removed or disturbed. The Nellis AFB *Asbestos Management and Operations Plan* (Nellis AFB, 2016a) and Nellis AFB *Lead-Based Paint Management Plan* (Nellis AFB, 2003) provide guidance on the proper handling and disposal of ACM and LBP.

3.12.2.4 Radon

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). The USEPA radon zone for Clark County, Nevada, is Zone 3 (low potential, predicted indoor average level less than 2 pCi/L); however, radon potential throughout the county can vary (USEPA, 2020b). Each zone designation reflects the average short-term radon measurement that can be expected in a building without the implementation of radon control methods.

3.12.2.5 Polychlorinated Biphenyls

PCBs are synthetic, organic chemicals once widely used in electrical equipment, specialized hydraulic systems, heat transfer systems, and other industrial products. PCBs are highly toxic and a potent carcinogen. Any hazardous wastes that contain more than 50 ppm of PCBs are subject to regulation under the TSCA.

Nellis AFB has met the criteria established by the Air Force as being " PCB-free." However, equipment that contains PCBs may still be present within the installation. Transformers and electrical equipment with PCB concentrations less than 50 ppm may be present on Base (Nellis AFB, 2003).

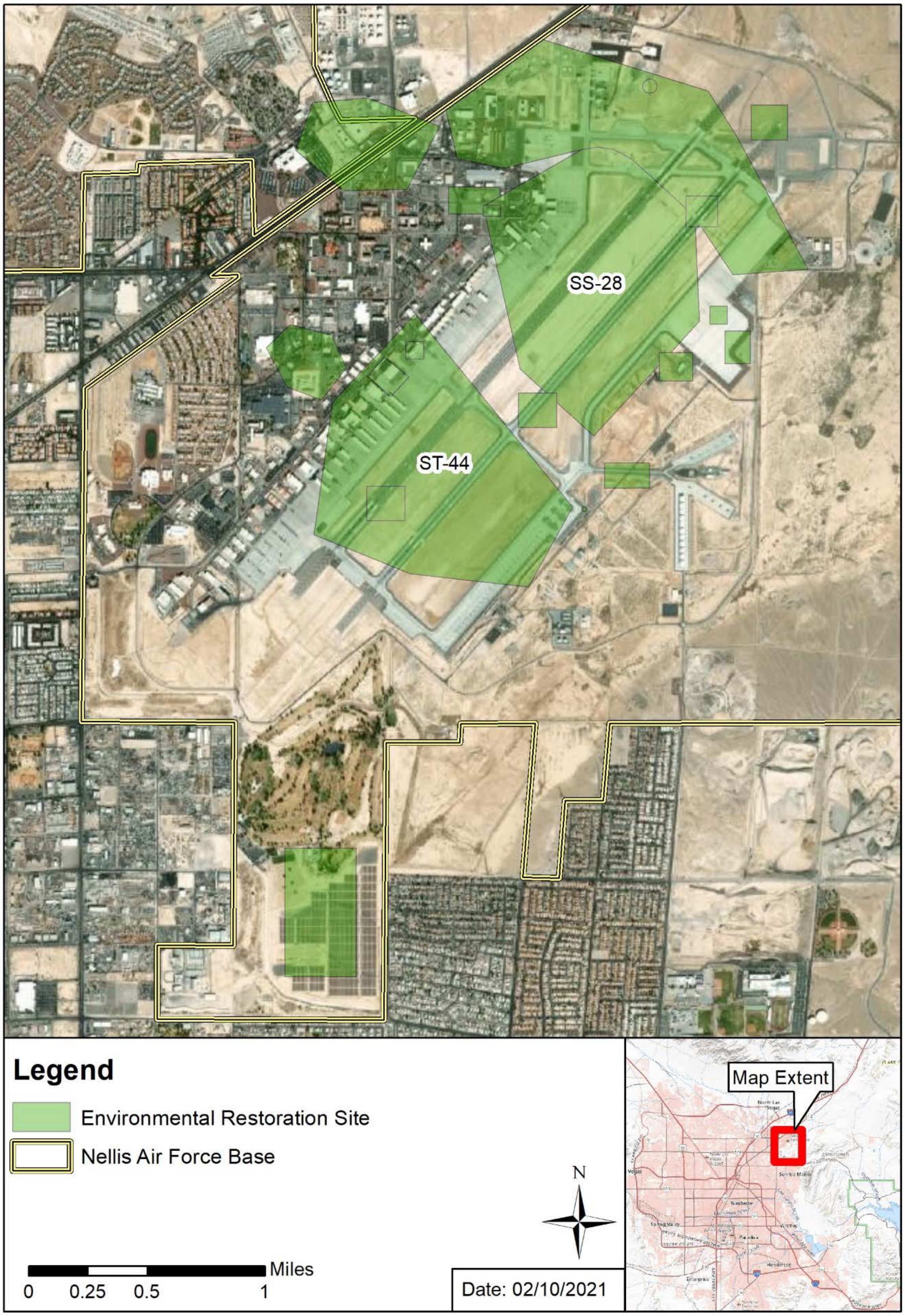

Figure 3-11. ERP Sites near Alternatives A and B

3.13 Infrastructure, Transportation, and Utilities

3.13.1 Definition of the Resource

Infrastructure consists of the systems and structures that enable a population in a specified area to function. Infrastructure is wholly man-made, with a high correlation between the type and extent of infrastructure and the degree to which an area is characterized as developed. The availability of infrastructure and its capacity to support more users, including residential and commercial expansion, are generally regarded as essential to the economic growth of an area.

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

The ROI for this resource is Nellis AFB.

3.13.2 Existing Conditions – Nellis AFB

3.13.2.1 Utilities

NV Energy provides the majority of electricity to Nellis AFB through the electrical grid. The remaining energy is provided by a large solar array stationed on Nellis AFB and owned by NV Energy, which was completed and became fully operational in 2015. The system encompasses approximately 140 acres and contains approximately 70,000 solar panels. In 2018, the production of the solar array equaled 26.910 gigawatts per hour (Energy Information Administration, 2020).

Southwest Gas Company distributes natural gas to the Base through approximately 200,000 linear feet (40 miles) of polyethylene pipes. The supply line distributes gas to Areas I, II, and III, while the Base hospital has a separate gas connection. Gas distribution to family housing was privatized in 2004. The Base hosts three 1,000-cubic-foot tanks for natural gas storage to be used for equipment (Nellis AFB, 2018a). Facilities east of the flight line are currently served by individual propane tanks, as there is no natural gas connection.

The Southern Nevada Water Authority (SNWA) provides potable water to the region of southern Nevada including Nellis AFB. The Las Vegas Valley gets about 90 percent of its water from the Colorado River, which is facing the worst drought in the river basin's recorded history. The SNWA delivers water from the Colorado River via an intake in Lake Mead to one of two treatment facilities: the Alfred Merritt Smith Water Treatment Facility or the River Mountains Water Treatment Facility. The water level of Lake Mead, which serves the source of most of our community's drinking water, has dropped more than 130 feet since January 2000. As the water level of Lake Mead declines, Nevada will have its allocation of water reduced. The SNWA connection is the primary supply connection to Nellis AFB. The water Nellis AFB receives from SNWA is supplemented by groundwater from wells on and near the installation (Nellis AFB, 2015a).

The Nellis AFB drinking water system provides water for domestic, irrigation, and fire protection. The system provides water to the entire Base, excluding military family housing areas, which have been privatized since 2008 (Nellis AFB, 2015a). Currently, the Base drinking water system consists of three supply connections (two North Las Vegas Water District [NLVWD] connections and one SNWA connection) and ten groundwater wells (four active wells, three inactive wells, and three emergency potable wells). The supply connections from SNWA and NLVWD are the primary sources of water on Base, while the groundwater wells are run sparingly to keep water permits active and to improve water quality.

Jet fuel, diesel, and gasoline are delivered to Nellis AFB by the CALNEV Pipeline (owned and operated by Kinder Morgan) (Clark County Planning Commission [CCPC], 2006). The CALNEV Pipeline moves fuel from California to Nellis AFB and McCarran International Airport via a 550-mile two-line pipe system. It provides Clark County with approximately 130,000 barrels of fuel per day (CCPC, 2006).

Nellis AFB manages a bulk storage system with four jet fuel (JP-8) aboveground tanks, with a total of 47,400 barrels or 1,990,800 gallons. Nellis AFB also manages two JP-8 operating storage tank facilities: the West Transient Ramp Type III Hydrant System and the Eastside Revetment modified Type III Hydrant System (Nellis AFB, 2018a). The West Transient Ramp system includes two 10,000-barrel tanks with six aircraft refueling fill stands and nine aircraft fueling outlets. This facility receives fuel from the four bulk operating storage tanks, just outside of the north gate (Nellis AFB, 2018a). JP-8 is provided by Kinder-Morgan, located just north of the Nellis AFB Bulk Fuel Storage Tank facility. NAFB has seven combined commercial and governmental fill stations that provide unleaded, diesel, biodiesel, and JP-8 products. Spill prevention, control, and countermeasures are specified in the *Nellis, Creech, and NTTR Facility Response Plan* (Nellis AFB, 2016b).

3.13.2.2 Solid Waste Management

On average, Nellis AFB generates 1,700 tons per year of nonhazardous waste (Nellis AFB, 2019b). The majority of solid waste is taken to an approved landfill by Republic Services.

3.13.2.3 Sanitary Sewer System

The Clark County Water Reclamation District (CCWRD) currently takes in approximately 1.5 million gallons per day from Nellis AFB (Nellis AFB, 2018a). Septic systems are in place for areas that have remote access or no access to pipes. The maximum capacity of Clark County's discharge connection is estimated at 26 million gallons per day, which allows for additional capacity if future capacity expansion is required. CCWRD is a member of the SNWA and governs the Clark County section of SNWA. The district services all areas in Clark County and collects influent of 108 million gallons of wastewater per day (CCWRD, 2019).

3.13.2.4 Stormwater Channels

Stormwater drainage channels have been excavated within and adjacent to the airfield, as well as within the residential areas to the west of the airfield (see **Figure 3-7** above). These channels facilitate the flow of stormwater from the installation into Clark County Regional Flood Control District (CCRFCD) channels, which in turn divert stormwater from Nellis AFB into the Las Vegas Wash.

3.13.2.5 Transportation

Nellis AFB is located northeast of the city of North Las Vegas, with Las Vegas Boulevard North connecting the Base area to downtown Las Vegas. Las Vegas Boulevard North runs northeast-southwest through Nellis AFB and separates Area I from Area III. East Craig Road intersects Las Vegas Boulevard North at the Nellis AFB Main Base gate. It also is a major artery that funnels traffic from Interstate 15 north of the Base to Las Vegas Boulevard North.

Daily traffic on East Craig Road, Las Vegas Boulevard North, and North Nellis Boulevard is relatively heavy on weekdays, particularly during morning and evening commute times for Base personnel. Average daily traffic counts for these streets are 11,700 vehicles for Las Vegas Boulevard North at the Range Road Gate, 22,800 vehicles for East Craig Road at the Salmon Drive Gate, and 23,100 vehicles for North Nellis Boulevard at the Tyndall Gate (Nevada Department of Transportation, 2019)

Nellis AFB has eight access control points (ACPs) across the installation: Main Gate, Beale South Gate, 215, Landings, Range Road, Speedway/Area II and Large Vehicle Inspection Station (LVIS), Tyndale, and closed Hollywood Gate. Traffic measured at each Nellis AFB gate in December 2018 to March 2019 is shown in **Table 3-15**. These traffic counts are incoming only.

**Table 3-15.
December 2018 to March 2019 Traffic Counts at Nellis AFB Gates**

Gate Location	Incoming Vehicles Per Day
Main Gate	6,840
Beale South Gate	4,409
215	2,901
Landings (Area III housing)	1,749
Range Road	1,262
Area II (LVIS)	698
Tyndall Avenue Gate	3,008

Source: Nellis AFB, 2018a
Note:
Traffic data are a daily average from December 2018 to March 2019.

Nellis AFB has approximately 147 miles of paved roads. Intersections are controlled by stop signs (there are no traffic lights on Base), which can cause minor traffic delays at these intersections. Traffic circles to facilitate vehicle flow have been planned and two have been installed thus far: one at the intersection of Ellsworth Avenue and Fitzgerald Boulevard and the other at Ellsworth and Beale Avenues. Unpaved roads are located in Areas II and III, with the majority located along the perimeter of the Base.

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CHAPTER 4 ENVIRONMENTAL CONSEQUENCES

This chapter presents a detailed analysis of the potential environmental impacts associated with the proposed and alternative actions as described in **Chapter 2**. Impacts are described for each ROI previously described in **Chapter 3**. The specific criteria for evaluating impacts and assumptions for the analyses are presented under each resource area. Evaluation criteria for most potential impacts were obtained from standard criteria; federal, state, or local agency guidelines and requirements; and/or legislative criteria. Proposed environmental commitments and best management practices (BMPs) to reduce potential impacts are included for each resource area, as appropriate.

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

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

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

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

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

4.1 AIRSPACE MANAGEMENT

4.1.1 Evaluation Criteria

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

4.1.2 Alternative A

Under the Alternative A, 17 F-35 Joint Strike Fighter and three F-22A Raptor aircraft would be transferred/reassigned to Nellis AFB, and up to 30 COCO ADAIR aircraft would be based on Nellis AFB. This action would result in the addition of an estimated 5,476 sorties (1,976 F-35 sorties and 3,500 COCO ADAIR sorties) at Nellis AFB, increasing the annual number of operations by approximately 20 percent by aircraft based at Nellis AFB. The three F-22A aircraft would be additive at Nellis AFB but would support the existing flying program with no planned increases in sorties, airspace use, or airfield operations. This change is not expected to impact the operational capacity or necessitate changes to airspace locations or dimensions of the airspace around Nellis AFB. Potential impacts to the airspace around the airfield are expected to be minor and long term.

Under Alternative A, proposed F-35, F-22A, and COCO ADAIR aircraft would provide an additional 5,476 annual training sorties in the NTTR and R-2508 Complex while all COCO ADAIR operations would be new to these airspaces. During night hours when the effects of aircraft noise are accentuated (10 pm to 7 am local time), the 422nd TES would fly approximately 10 percent of total departures and approximately 10 percent of total arrivals; the 65th AGRS would fly night sorties at approximately 4 percent of departures and approximately 10 percent of arrivals; and COCO ADAIR would fly up to a projected 4 percent of departures and 10 percent of arrivals. All proposed airspace sorties are expected to represent a minor increase in total sorties using the NTTR and R-2508 airspace.

Time spent within the airspace (over the NTTR and within the R-2508 Complex) would depend upon the specific training mission performed but would typically last from 45 to 60 minutes. Contractor operations would occur in these airspaces concurrent with the 65th AGRS and the 422nd TES, or other supported Air Force units. The airspace proposed for use has the capacity and is in locations with the dimensions necessary to support the additional sorties. Minor impacts to airspace are expected under Alternative A.

4.1.3 Alternative B

Aircraft operations under Alternative B would be the same as those described for Alternative A; therefore, potential impacts under Alternative B would be the same as those described for Alternative A.

4.1.4 No Action Alternative

Under the No Action Alternative, no aircraft would be added to Nellis AFB, COCO ADAIR would not operate at Nellis AFB, and no associated construction/demolition/renovation activities would occur. There would be no change to airspace use and management under the No Action Alternative.

4.2 NOISE

4.2.1 Evaluation Criteria

Noise impact analyses typically evaluate potential changes to existing noise environments that would result from implementation of a proposed action. At Nellis AFB, 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 (see **Figure 4-1**) can also experience levels of appreciable noise depending upon training intensity or weather conditions. In addition, DNL contours may vary from year to year due to fluctuations in operational tempo from unit deployments, funding levels, and other factors. In the airspace, supersonic flight operations in the overland MOAs have the potential to generate loud sonic booms.

4.2.2 Alternative A

Under Alternative A, Nellis AFB would receive additional F-35, F-22A, and COCO ADAIR aircraft, and support an additional 5,476 annual training sorties for the 65th AGRS, 422nd TES, and other flying units at Nellis AFB. This increase in sorties would be flown in the NTTR and R-2508 Complex. Impacts to the noise environment from these additional military aircraft operations are expected to range from negligible to minor and would be long term. Impacts from construction noise are expected to range from negligible to minor and would be short term and localized.

4.2.2.1 Nellis AFB Noise Environment

Implementation of Alternative A would increase F-35 annual training sorties by 1,976 and establish COCO ADAIR capabilities (up to an estimated 30 aircraft), providing up to 3,500 annual training sorties at Nellis AFB. The aircraft proposed for use by COCO ADAIR and the surrogate aircraft modeled for these ADAIR aircraft are summarized in **Table 4-1**.

**Table 4-1.
COCO ADAIR Aircraft**

COCO ADAIR Aircraft	Surrogate Aircraft
Douglas A-4N Skyhawk	A-4C
Dassault F-1 Mirage	F-16C
Aero Vodochody L-159 Alca	T-45

To model changes in noise relative to the baseline conditions, COCO ADAIR flight and engine run-up operations are set to the COCO ADAIR aircraft listed in **Table 4-1**. However, the NOISEMAP database does not contain noise data for any of the COCO ADAIR aircraft types listed; therefore, appropriate noise modeling surrogates were selected (e.g., the F-16C noise modeling surrogate was used to represent the Dassault F-1 Mirage). The Air Force Civil Engineer Center CZN (NEPA division) and CPPR (Noise and Air Installation Compatible Use Zone division) have approved these noise modeling surrogates for the aircraft presented in **Table 4-1**. The Air Force reviewed and approved flight profiles for COCO ADAIR (i.e., schedules of altitude, power setting, and airspeed along each flight track). The representative flight profiles for the various COCO ADAIR scenarios are provided in **Appendix C**. All COCO ADAIR departure profiles were modeled using afterburner or the maximum possible power on all take-offs. Runway utilization, flight tracks, and flight-track utilization for COCO ADAIR aircraft would be identical to existing 65th AGRS operations.

Table 4-2 summarizes the based aircraft annual departure, arrival, and closed pattern aircraft operations at Nellis AFB with the addition of the proposed F-35 and COCO ADAIR operations. These proposed aircraft would also perform static run-up operations, such as pre- and post-flight run-ups. Note that **Table 4-2** presents operations instead of sorties; one sortie equals one departure operation, one arrival operation, and any associated pattern operations that occur in between departing and arriving at the airfield. Under Alternative A, there would be an approximately 20-percent increase in the number of operations by based aircraft at Nellis AFB. COCO ADAIR would fly approximately 66 percent of the proposed additional 12,057 operations, while the additional F-35s would fly 34 percent of these operations.

**Table 4-2.
Existing and Proposed (Based Aircraft) Annual Operations Summary at
Nellis Air Force Base**

Aircraft Type	Departures	Arrivals	Closed Patterns	Total
Based Military	16,069	16,069	5,480	37,618
Transient	10,768	10,768	0	21,536
F-35 (Proposed)	1,976	1,976	160	4,112
COCO ADAIR (Proposed)	3,500	3,500	945	7,945
Grand Total	**26,837**	**26,837**	**5,480**	**71,211**

Note:
Operations are presented instead of sorties. One sortie equals one departure operation, one arrival operation, and any associated pattern operations that occur in between departing and arriving at the airfield.

As described in **Section 3.2.1.2**, NOISESMAP was used to model military aircraft noise. **Figure 4-1** shows the resultant 65 dB to 85 dB DNL contours in 5-dB increments for the daily flight events at Nellis AFB under Alternative A. 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 used in planning tools that depict the general noise environment around the installation based on typical aviation activities. Areas beyond 65 dBA DNL (i.e., outside the contour line associated with 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 from unit deployments, funding levels, and other factors.

Figure 4-2 shows a comparison of the DNL noise contours for Alternative A and the existing conditions. The primary changes in noise contour features between the Alternative A and the existing conditions are the slight elongation of the DNL contours along the flight paths with a heading to/from the northwest. North of the airfield, the elongated 65 dBA DNL contour associated with Alternative A does not impact residential areas. West of the airfield, the 65 dBA DNL contour associated with Alternative A is elongated slightly over a small residential area west of the airfield and represents a 1 dB or less increase in DNL over existing conditions. This overall increase in DNL is a result of COCO ADAIR following the 65^{th} AGRS departure and arrival operations along the noted flight paths to and from the northwest.

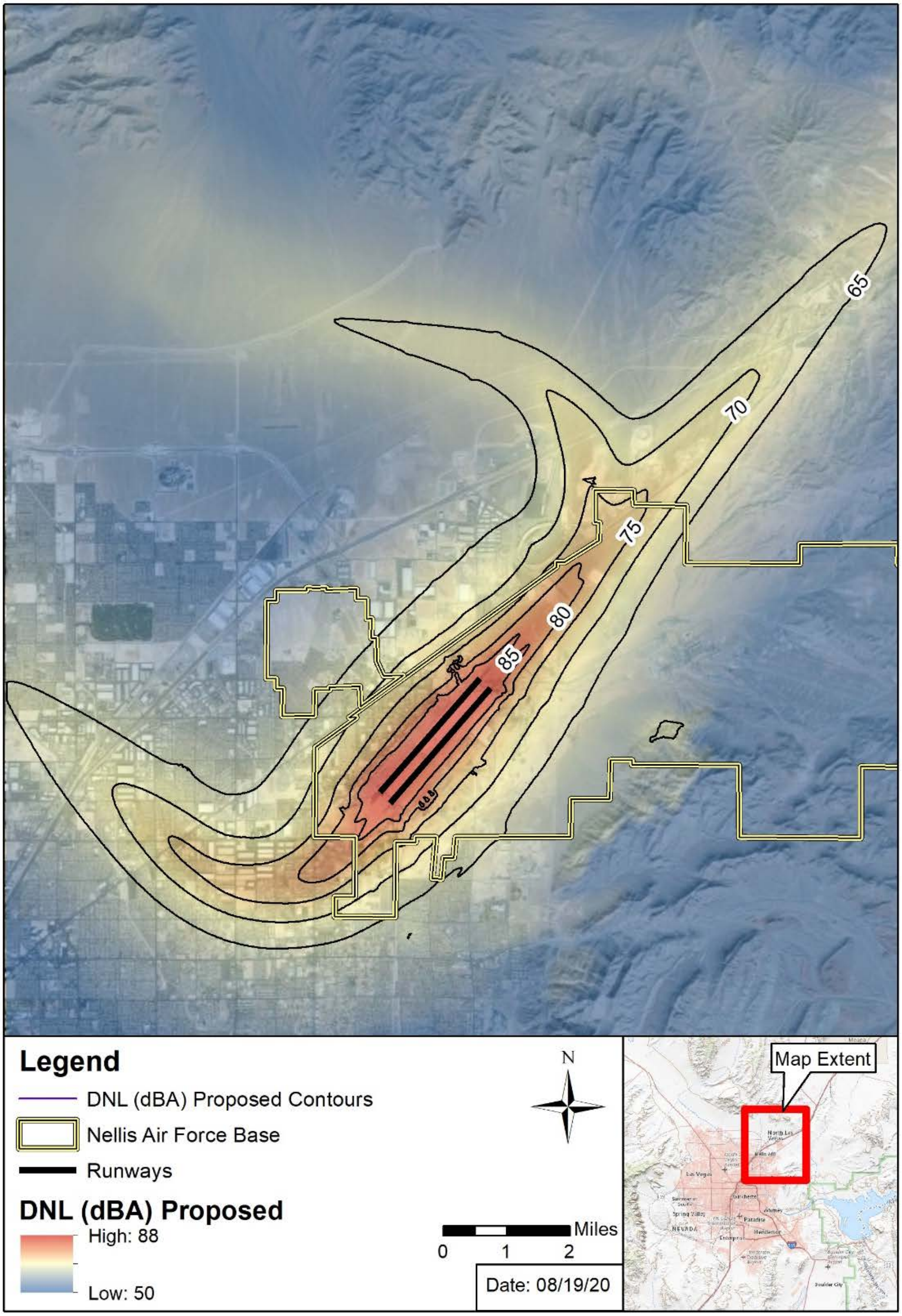

Figure 4-1. Day-Night Average Sound Level Contours under Alternative A at Nellis AFB

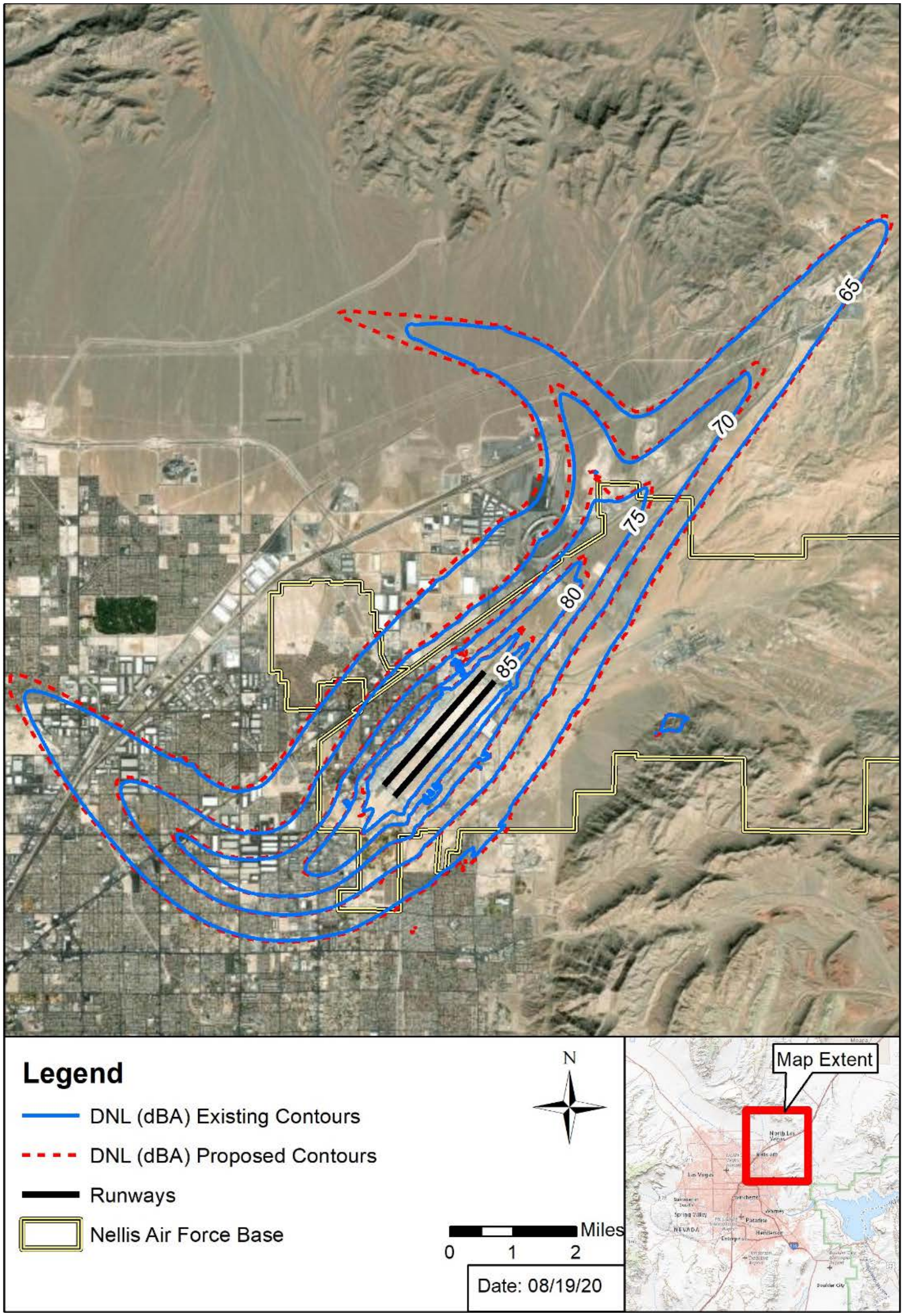

Figure 4-2. Comparison of Alternative A and Existing Day-Night Average Sound Level Contours at Nellis AFB

Under Alternative A, the amount of area within the DNL contours would increase (**Table 4-3**) compared with existing conditions (see **Table 3-3** above). As mentioned above, noise increases associated with Alternative A represent negligible to minor impacts in these areas.

Table 4-3.
Alternative A Day-Night Average Sound Level Acreage Affected at Nellis Air Force Base

Noise Level (dBA DNL)	Total Area Within DNL Contour (acres) Proposed Action	Total Area Within DNL Contour (acres) Existing	Off Base Area Within DNL Contour (acres) Proposed Action	Off Base Area Within DNL Contour (acres) Existing
>65	17,875	16,782	10,731	10,007
>70	8,675	8,134	3,801	3,400
>75	4,201	3,918	917	812
>80	2,004	1,880	172	160
>85	960	895	0	0

Notes:
Area (total and off Base) was based off NOISEMAP modeled noise contours used to calculate the amount of land within each noise contour; off-Base areas exclude Nellis AFB and Creech AFB land areas. 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

Under Alternative A, noise levels at the representative POIs identified in **Section 3.2.2** would remain the same. Modeled POIs include noise-sensitive locations, such as hospitals, residences, schools, and places of worship, located in the vicinity of Nellis AFB (see **Table 3-4**). At the representative noise-sensitive locations modeled, the DNL would experience negligible changes. All POIs examined would experience negligible changes to DNL.

4.2.2.2 Airspace Noise Environment

Implementation of Alternative A is not expected to impact the operational capacity or necessitate changes to airspace locations or dimensions of the airspace around Nellis AFB. Potential impacts to the airspace around the airfield are expected to be minor and long term.

The primary SUAs used by aircraft based at Nellis AFB are the NTTR and R-2508 Complex (see **Figure 1-4**). Subsonic aircraft operations, supersonic aircraft operations, and blast noise from munitions are the primary contributors to the airspace noise environments. Under Alternative A, the additional F-35s and COCO ADAIR would conduct an estimated 5,476 annual airspace sorties. COCO ADAIR would operate in these same airspaces concurrently with the 65th AGRS, 422nd TES, and other supported Air Force units based at Nellis AFB. Time spent within these airspaces would depend upon the specific training mission performed but would typically last from 45 to 60 minutes. The NTTR airspaces would receive approximately 80 percent of the sorties originating from Nellis AFB, while the R-2508 Complex airspace would receive approximately 20 percent of the sorties. No airspace modifications would be required for the additional F-35, F-22A, and COCO ADAIR aircraft.

NTTR

The NTTR received more than 31,000 aircraft sorties over a 12-month period in 2017 and 2018. Per recent NEPA analysis, this level of subsonic sorties generates noise levels between 45 and 70 dBA L_{dnmr} throughout the NTTR airspace (USAF, 2018a). Under Alternative A, the addition of 5,476 sorties by F-35, F-22A, and COCO ADAIR aircraft to the NTTR, flying approximately the same training missions as aircraft based at Nellis AFB, would result in long-term, negligible to minor (0 to 2 dB) noise increases.

The NTTR experiences up to 20 sonic booms per day from supersonic aircraft operation. These supersonic operations correlate to a cumulative annual CDNL of 52 to 62 dBC throughout the NTTR airspace. Individual sonic booms generate overpressures between 3.8 and 4.8 psf (corresponding to noise levels of 113 to 115 dBC CSEL) when aircraft are operating at Mach 1.2 and altitudes of 15,000 feet AGL (see **Appendix C** for more details). Under Alternative A, the addition of approximately 4,380 sorties (i.e., 80 percent of the total sorties proposed under Alternative A) by F-35, F-22A, and COCO ADAIR aircraft to the NTTR is expected to increase the number of sonic booms per day by about 14 percent, resulting in long-term, negligible to minor noise increases.

NTTR regularly experiences noise exposure from large-caliber weapons and munitions firing, such that the 57 dBC CDNL noise contours from blast noise exposure extends approximately from 2 to 3 nm from each target area. The 57 dBC CDNL level is the threshold for an LUPZ Noise Zone I, which is where noise-sensitive land uses, such as schools, residences, hospitals, and places of worship, need to be carefully managed. The increase in large-caliber weapons and munitions firing associated with Alternative A is not expected to significantly change the 57 dBC CDNL noise contours, and would result in long-term, negligible to minor noise increases.

R-2508

Over a 12-year period (1990-2002), the R-2508 Complex received an average of 46,525 aircraft sorties (USAF, 2006a). Approximately 759 sorties per year are from F-16, F-22, and F-35 aircraft based at Nellis AFB. The noise contribution from these Nellis AFB aircraft operating in the R-2508 Complex is less than 45 dBA L_{dnmr}. R-2508 is authorized for supersonic flight and experiences overpressure levels and CSEL from individual sonic booms similar to those at NTTR. The addition of 1,095 sorties (i.e., 20 percent of the total sorties proposed under Alternative A) for F-35, F-22A, and COCO ADAIR aircraft to the R-2508 Complex represents a substantial increase compared with the existing annual sorties from aircraft based at Nellis AFB. However, when all sorties using R-2508 are considered, including an undisclosed additional number of sorties, the increase in sorties under Alternative A is expected to result in a long-term, negligible to minor noise increase for both subsonic and supersonic operations.

4.2.3 Alternative B

Alternative B differs from Alternative A only in the demolition/renovation/construction activities at Nellis AFB, as described in **Sections 2.1.4.1** and **2.7**. All other proposed activities would be the same as under Alternative A, including the airspace training activities. As such, impacts under Alternative B would be the same as those described for Alternative A.

4.2.4 No Action Alternative

Under the No Action Alternative, no aircraft would be added to Nellis AFB, COCO ADAIR would not operate at Nellis AFB, and no associated construction/demolition/renovation activities would occur. There would be no change to the noise environment under the No Action Alternative.

4.3 SAFETY

4.3.1 Evaluation Criteria

Impacts from a proposed action are assessed according to the potential to increase or decrease safety risks to personnel, the public, property, or the environment. For the purposes of this EA, an impact is considered significant if the Air Force Office of Safety and Health or OSHA criteria are exceeded or if established or proposed safety measures are not properly implemented, resulting in unacceptable safety risk to personnel.

This section assesses safety issues associated with ground, explosives, and flight activities. 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.

CZs and APZs around the airfield restrict the public's exposure to areas of higher accident potential. While this section addresses ground and flight safety 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.

4.3.2 Alternative A

4.3.2.1 Ground Safety

Under Alternative A, the addition of F-35 Joint Strike Fighter and F-22A Raptor aircraft would not create any new conditions to ground safety at Nellis AFB since these aircraft are currently in operation at the Base. The addition of COCO ADAIR aircraft would comply with all AFI and other specific safety directives at Nellis AFB.

4.3.2.2 Emergency Response

Emergency response procedures for additional F-35 Joint Strike Fighter and F-22A Raptor aircraft would not change from current procedures at Nellis AFB. Existing facilities for fire response and crash recovery for Air Force aircraft would continue to be sufficient to handle the increased capacity from Alternative A.

For initial emergency response involving a COCO ADAIR aircraft, the Air Force would provide emergency responders (i.e., airport firefighters) trained on the applicable mission design series. For crash response, the Air Force would provide on-field aircraft crash damaged or disabled aircraft recovery (CDDAR). For events occurring off Base, civilian authorities (city, county, or state) would be the first on scene. After the initial response, the COCO ADAIR would be required to facilitate crash site security and clean-up. The COCO ADAIR is responsible to cooperate with the Air Force or the National Transportation Safety Board investigation, depending upon circumstances of the incident.

COCO ADAIR’s emergency response would include the following:

- The Contractor would 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 COCO ADAIR aircraft, consistent with the following considerations: 1) urgency to open the runway for operational use; 2) prevention of secondary damage to the aircraft; and 3) preservation of evidence for mishap or accident investigations in accordance with AFI 91-202 and AFI 91-204, National Transportation Safety Board guidelines, and any local operating location guidance, as applicable. The Contractor would ensure the host operating location’s CDDAR personnel receive familiarization training on Contractor aircraft and procedures prior to commencing local flying operations, at permanent and temporary duty operating locations.
- The Contractor would develop an egress/cockpit familiarization training program to ensure that all host operating location’s non-egress 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.

4.3.2.3 Safety Zones

Under Alternative A, there would be no change in the existing Safety Zones at Nellis AFB.

4.3.2.4 Explosives Safety

Under Alternative A, the Munitions Flight would support additional F-35 Joint Strike Fighter and F-22A Raptor aircraft training operations with the maintenance and delivery of defensive countermeasure flares. Trained and certified personnel would provide this support, following Air Force safety guidance and technical orders. COCO ADAIR would not use defensive countermeasures.

In addition to flares, there may be rare occasions in which egress cartridge activated devices (CADs) and propellant activated devices (PADs) may need to be removed from the aircraft for maintenance.

CADs/PADs are explosive items used in aircraft ejection, life support, weapons release, and fire suppression systems. In accordance with AFMAN 91-201, Paragraph 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. For Air Force aircraft, this would occur during routine aircraft maintenance that takes place at Nellis AFB, and no changes to those procedures would occur. COCO ADAIR would work with the Wing Safety Office to obtain a license, if needed, to store egress CADs and PADs. 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 of 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 COCO ADAIR CAD/PAD items within the Wing munitions storage area is needed, the aircraft 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 flares would occur on the aircraft parking ramp for F-35 aircraft. In accordance with AFMAN 91-201, Paragraphs 12.47.2 and 12.47.3 the F-35 ramp does not need to be sited for Hazard Class 1.3 for counter measure flares. COCO ADAIR would not use defensive countermeasures; therefore, there are no changes to ramp procedures.

No significant impacts to explosive safety are anticipated to occur under Alternative A, for proposed increase in Air Force aircraft or COCO ADAIR aircraft operations. Q-D arcs would not change.

4.3.2.5 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 man-made structures or terrain, mechanical failure, weather-related accidents, pilot error, BASH, or strikes from defensive countermeasures used during training. Under Alternative A, aircraft would continue to follow standard flight safety procedures at Nellis AFB. The additional F-35 Joint Strike Fighter and F-22A Raptor aircraft would be required to follow BASH procedures that already exist. Adherence to the existing procedures reduces the risk for a BASH-related incident at the airfield or within the training airspace.

COCO ADAIR operations would follow the Flight Operations Procedures and Quality Management System that would include the contractor's BASH plan. The contractor's BASH plan must, at a minimum, meet the same requirements as the Wing's BASH plan and it is expected their plan would mirror or be an exact copy of the Wing's plan. In addition, COCO ADAIR would adhere to the following requirements:

- Contractor Flight Operations would respond to and follow Air Traffic Control vectors from approved facilities per FAA and AFI guidelines.
- COCO ADAIR would be conducted under positive tactical control. Pilots would be responsible to respond to tactical vectors and instructions by the applicable controlling authority (e.g., Ground Controller Intercept, Baron Controllers, Range Control Officer, Joint Terminal Attack Controller). If positive control is unavailable, mission flights would remain autonomous and adhere to the briefed presentations and Special Instructions.
- COCO ADAIR aircraft would
    - be equipped with applicable communication and navigation capability to operate in the National Airspace Structure under FAA IFR and aircraft operating limitations (if applicable) and International Civil Aviation Organization equipment prerequisites;
    - have at least one type of FAA-approved navigation system such as a Tactical Air Navigation, Automatic Direction Finder (ADF) Receiver System, with ADF indicator; Very High Frequency Omni Directional Range; Global Positioning System/Long Range Navigation;

- o 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
- o have at least two functional voice radios operating in either the very high frequency or ultra-high frequency bands.

Use of flares would occur by the additional F-35. Flares would be dispensed in the NTTR airspace during training operations. Once flares are deployed, the end cap and piston of the flare fall to the ground. The end cap weighs approximately 0.16 ounce, creating the potential to generate an impact momentum of 0.010 pound-second (USAF, 1997). If an end cap struck a person on the ground, the momentum generated would be far below that required to cause serious injury. The wide distribution of the residual materials would make the probability of these materials impacting a person on the ground extremely unlikely. Therefore, safety risks related to residual flare material would be negligible.

Flares consist of magnesium and Teflon pellets that burn rapidly and completely after being dispensed. The flares have a greater than 99-percent reliability rate for discharging and burning. On extremely rare occasions, however, a flare may not ignite and fall to the earth as a dud flare. A dud flare could seriously injure a person if he or she is either struck by the falling dud or if a dud flare is discovered and mishandled. There is no documentation of a dud flare or any flare striking an individual on the ground, and the likelihood of such occurring would be extremely rare (USAF, 2011b). Previous analysis has determined the probability of a dud flare striking a person on the ground is correlated with population density (USAF, 2011b). To reduce the risk of dud flares striking a person on the ground, flares would not be released over established communities beneath the airspace. Dud flares may be mishandled if discovered on non-DoD lands by the uninformed public; however, since the reliability rate is so high and the geographic distribution of flare usage would be so large, the probability of such an occurrence would be extremely low. Any dud flare found should be treated as Unexploded Ordnance. A dud flare would probably not ignite even in a campfire unless it was on a very hot bed of coals. If a dud flare were shot with a bullet or cut with a power saw, the friction could cause it to ignite.

The analysis in this EA used the results from a flare fire risk assessment reported in *Environmental Effects of Chaff and Flares* (Air Force, 1997, 2011). According to that assessment, the probability of a single flare starting a fire cannot be predicted to any level of statistical significance, particularly since it would depend on so many variables as to be totally situationally dependent. If a burning flare reaches the ground or the canopy of a tree or shrub, it may or may not start a fire. The following conditions must be satisfied in order for a fire to start and spread: 1) the source must be very near to or in contact with a fuel element, 2) the source must have sufficient residual energy to ignite the fuel element, and 3) fuel conditions must support the spread of fire. With regard to fires starting from a flare landing in the crown of a tree or shrub, a burning flare alighting in the crown layer of shrub cover may start a fire, but the crown layer must contain a sufficient density of dead foliage with low enough moisture content to support the spread of fire, or no fire would result. If hot material comes in contact with rotten wood, smoldering combustion can be sustained at temperatures as low as 200 degrees Celsius (392°F). However, the fraction of surface area covered by rotten wood is small in even a decadent forest stand.

Any fires of a natural or nonnatural source may adversely affect vegetation, injure wildlife or livestock, and destroy property such as fences or buildings. If a wildland fire were to occur as a result of flare activity, a loss of canopy and/or understory vegetation would likely occur depending on the severity of the fire, land condition at the time, and how quickly fire control could respond. Recovery of the vegetation would depend on the species burned, season, and severity. Grasslands naturally have frequent fire regime, and therefore are composed of species that can quickly recover from fires. Woodland and shrubland communities recover over longer periods depending on severity of the fire and climatic conditions available following the fire.

Fires result in a loss of plant cover that could increase erosion and sedimentation downslope in some areas. Bare ground resulting from fires can allow the spread of invasive and nonnative plant species, such as annual grasses, depending on the nature of the vegetation burned and the presence of invasive species in surrounding areas.

The probability of ignition given a hot inert item reaching the surface can be assessed based on the moisture content of "fuel" (vegetation and other combustible materials on the ground), which can be derived from local meteorological history and current conditions. The National Fire Danger Rating System uses these variables to calculate the fire hazards on a daily basis for the entire country. The system uses a selection of wildland fuel types that together can be used to characterize most forest and rangeland vegetation cover found in the continental US. The National Fire Danger Rating System is used primarily for pre-suppression planning over large geographic areas. The system's indices are sensitive to the phenology of vegetation communities; historical precipitation, temperature, and humidity; and current temperature, humidity, and windspeed. Nellis AFB uses these daily ratings to determine if flares should be used on any given training day as a way to balance the risk of an unwanted fire start, possible consequences of an unwanted fire, and disruption of training operations. Flares are not permitted below 5,000 feet AGL on Very High or Extreme fire danger days. Suspending use of flares during high fire-risk periods is an effective procedure at reducing fire risk (Air Force, 1997).

In the fire risk assessment (Air Force, 1997, 2011), operating parameters (e.g., release altitude, area, environmental conditions) were too diverse to isolate level of use as the only or primary factor affecting the frequency of fires. For this reason, and because flare-caused fires were rare in any case, no statistical correlations could be made between utilization and fire occurrence. Therefore, there is no statistical basis for assuming increased flare usage in an area increases the risk of fire.

Flares are only used in approved airspace at designated altitudes. Flares are designed to completely burn out within 3 to 5 seconds of release, which results in a travel distance of 145 to 400 feet. The fire risk is directly associated with the release altitude; therefore, the risk of fire can be greatly reduced through establishing minimum altitudes for deployment of flares (Air Force, 2011). Minimum flare release altitudes are defined in the NTTR Wildland Fire Plan to ensure complete burnout prior to reaching 100 feet AGL A minimum release altitude of 5,000 feet AGL is observed in the MOAs, over manned sites, or within 3 nm of forested areas.

AFI 11-214 (22 December 2005) prescribes a minimum flare release altitude of 2,000 feet AGL over non-government-owned or -controlled property, minimizing the risk of flare-caused fires. In addition, the Air Force would inform local fire departments about proper dud flare handling procedures and would cooperate with local agencies for response to flare-related fires. Implementation of these management practices would greatly reduce the risk of fire from flares; therefore, no significant fire-related impacts would be expected from implementation of Alternative A.

Bird/Wildlife-Aircraft Strike Hazards

The addition of F-35 Joint Strike Fighter and F-22A Raptor aircraft would pose no new threat to safety from BASH. The additional aircraft would continue to follow those procedures outlined by the BASH plan maintained by Nellis AFB.

COCO ADAIR operations would not follow government BASH procedures; they would follow the Flight Operations Procedures and Quality Management System. 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 that the COCO ADAIR BASH plan would very closely mirror, if not be an exact copy of, the Wing's BASH plan. While not required, the COCO ADAIR BASH plan would comply with the FAA Wildlife Hazard Mitigation Program.

No significant impacts to safety are anticipated to occur under Alternative A.

4.3.3 Alternative B

Alternative B differs from Alternative A only in the demolition/renovation/construction activities at Nellis AFB, as described in **Sections 2.1.4.1** and **2.7**. All other proposed activities would be the same as under Alternative A, including the airspace training activities. As such, impacts under Alternative B would be the same as those described for Alternative A. There would be no significant safety-related impacts from implementation of Alternative B.

4.3.4 No Action Alternative

Under the No Action Alternative, no aircraft would be added to Nellis AFB, COCO ADAIR would not operate at Nellis AFB, and no associated demolition/renovation/construction activities would occur. There would be no change to Base safety under the No Action Alternative.

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.

Potential impacts to air quality are evaluated with respect to the extent, context, and intensity of the impact in relation to relevant regulations, guidelines, and scientific documentation. The CEQ defines significance in terms of context and intensity in 40 CFR § 1508.27. This requires that the significance of the action must be analyzed with respect to the setting of the proposed and alternative actions and based relative to the severity of the impact. The CEQ NEPA Regulations (40 CFR § 1508.27[b]) provide 10 key factors to consider in determining an impact’s intensity.

The environmental impact methodology for both noise and air quality impacts presented in this EA was derived by utilizing the same operational data as directed by AFMAN 32-7002, *Environmental Compliance and Pollution Prevention* (4 February 2020). The air analysis for aircraft operations factors in the engine types used in the aircraft, the time spent at or below 3,000 feet AGL at specific engine power settings, the emission factors associated with those flight modes, engine maintenance run-ups, and other relevant details. These data are included in the USAF Air Conformity Applicability Model (ACAM) used for analysis. Construction operations similarly evaluate the operation of construction equipment and other fuel-burning sources as the primary emission sources of that activity. These data, along with information on the affected environment and the proposed and alternative actions, are used to produce a consistent determination of environmental consequences. The air quality impacts analysis at the locations evaluated in this EA has factored in each mode of flight operations that occur at or below the mixing layer, which is defined as the default value of 3,000 feet AGL.

ACAM (version 5.0.16b) was used to provide emissions estimates for the F-35, F-22A, and COCO ADAIR airfield operations, maintenance activities, worker commutes, and flight operations in the airspaces. ACAM provides estimated air emissions from proposed federal actions for each specific criteria and precursor pollutant as defined in the NAAQS. For aircraft, operational modes (including taxi/idle [in and out], take off, climb out, approach, and pattern flight that includes touch and go operations) are used as the basis of the emission estimates. Emissions were calculated separately for the Nellis AFB airfield operations and the NTTR and R-2508 training airspaces. While both chaff and flares are used in the training airspaces, only flares have been carried forward for analysis because the use of chaff is not a component of the proposed or alternative actions.

Potential impacts to air quality are evaluated with respect to the extent, context, and intensity of the impact in relation to relevant regulations, guidelines, and scientific documentation. The CEQ defines significance in terms of context and intensity in 40 CFR § 1508.27. This requires that the significance of an action be analyzed with respect to the setting of the action and be based relative to the severity of the impact. For attainment area criteria pollutants, the project air quality analysis used the USEPA’s PSD permitting threshold of 250 tons per year as an initial indicator of the local significance of potential impacts to air quality. It is important to note that these indicators only provide a clue to the potential impacts to air quality. In the context of criteria pollutants for which the ROI is in attainment of a NAAQS, the analysis compared the annual net increase in emissions estimated for each project alternative to the 250 tons per year PSD permitting threshold. The PSD permitting threshold represents the level of potential new emissions below which a new or existing minor, non-listed stationary source may acceptably emit without triggering the requirement to obtain a permit. Thus, if the intensity of any net emissions increase for a project alternative is below 250 tons per year in the context of an attainment criteria pollutant, the indication is the air quality impacts would not be significant for that pollutant. In the case of criteria pollutants for which the ROI does not attain a NAAQS or has been designated a maintenance area for the NAAQS, the analysis compared the net increase in annual direct and indirect emissions to the applicable pollutant *de minimis* threshold(s). If the net direct and indirect emissions from the project alternative equal or exceed an applicable *de minimis* threshold, then a general conformity determination is required before any emissions from the actions may occur.

For CO, PM_{10}, and $PM_{2.5}$, and the ozone precursors VOC and NOx, the estimated direct and indirect air emissions associated with implementing an alternative were compared to the General Conformity Rule *de minimis* thresholds to assess significance in areas that have been designated as nonattainment or maintenance for those pollutants (see **Table 3-6**).

According to **Tables 2-1** and **2-2**, the increase in aircraft is scheduled to occur over a 3-year period beginning in the fourth quarter of FY21 and completing by the fourth quarter of FY23. Relocation of the F-22A Raptor aircraft would not result in any changes to baseline F-22 operations. The analysis in this EA assumed 30 COCO ADAIR aircraft. COCO ADAIR would have multiple aircraft available to support training requirements. The following types of aircraft would be proposed by multiple vendors under a competitive solicitation for the Nellis ADAIR II program: the Douglas A-4 Skyhawk, the Aero Vodochody L-159 Alca, the Dassault F1 Mirage, and the Atlas Cheetah. For purposes of analysis, the F-16C Fighting Falcon is a surrogate for the F-1 Mirage, and the T-45 Goshawk is a surrogate for the L-159. The third aircraft used in the ADAIR analysis is the A-4K Skyhawk.

Construction to support the F-35 expansion would occur from Calendar Year (CY)21 through CY25. During this time, demolition, construction, and renovation activities would take place, involving additions to several existing buildings, additional parking, and a new six-bay hanger. Construction emissions were estimated using ACAM.

4.4.2 Alternative A

Under Alternative A, construction of associated infrastructure would generate temporary emissions. Once aircraft are re-located, the additional flight operations of the F-35 and COCO ADAIR aircraft would be implemented. Construction is not anticipated to be completed prior to the relocation of the aircraft. As a result, the analysis assumed construction activities occurred simultaneously with aircraft operations and total emissions for CY21 through CY25 include both construction and airfield flight operations at Nellis AFB. Airspace operations at the NTTR and R-2508 Complex would increase with the additional COCO ADAIR and F-35 aircraft. The airspace analyses conservatively assumed that all of the low-altitude training operations presented in **Table 2-8** would occur beginning in CY 2021. There are no known stationary sources associated with Alternative A.

Table 4-4 provides estimated air emissions of criteria pollutants SO_2 and $PM_{2.5}$, for which the Nellis AFB and NTTR areas are in attainment and have no maintenance area designations. These estimates represent emissions from the proposed F-35 and COCO ADAIR aircraft operations, commuters, and the proposed building construction under Alternative A (see **Section 2.1.4**). The net change between the existing environment and proposed operations is solely additive, as implementation of Alternative A would not otherwise change operations at Nellis AFB. NTTR airspace operations include low-altitude sortie flights below 3,000 feet AGL and proposed flare use. Estimated emissions are evaluated against the initial indicator of significance for the pollutants.

Table 4-4.
SO_2 and $PM_{2.5}$ Emission Estimates under Alternative A, including Proposed Demolition/Renovation/Construction Activities and Aircraft Operations at Nellis AFB and the NTTR

Activity	Total Annual Emissions in Tons	
	SO_2	$PM_{2.5}$
2021		
Proposed Nellis AFB Operations	1.53	2.36
Proposed NTTR Airspace Operations	0.59	0.69
Total Proposed Emissions/Net Change	**2.12**	**3.05**
Initial Indicator of Significance	250	250
Exceed Initial Indicator of Significance?	**No**	**No**
2022		
Proposed Nellis AFB Operations	4.88	7.523
Proposed NTTR Airspace Operations	0.59	0.69
Total Proposed Emissions/Net Change	**5.47**	**8.21**
Initial Indicator of Significance	250	250
Exceed Initial Indicator of Significance?	**No**	**No**
2023		
Proposed Nellis AFB Operations	6.47	9.79
Proposed NTTR Airspace Operations	0.59	0.69
Total Proposed Emissions/Net Change	**7.06**	**10.48**
Initial Indicator of Significance	250	250
Exceed Initial Indicator of Significance?	**No**	**No**
2024		
Proposed Nellis AFB Operations	6.84	10.29
Proposed NTTR Airspace Operations	0.59	0.69
Total Proposed Emissions/Net Change	**7.43**	**10.98**
Initial Indicator of Significance	250	250
Exceed Initial Indicator of Significance?	**No**	**No**
2025 (Steady State)		
Proposed Nellis AFB Operations	6.84	10.28
Proposed NTTR Airspace Operations	0.59	0.69
Total Proposed Emissions/Net Change	**7.43**	**10.97**
Initial Indicator of Significance	250	250
Exceed Initial Indicator of Significance?	**No**	**No**

Note:
$PM_{2.5}$ = particulate matter less than or equal to 2.5 microns; SO_2 = sulfur dioxide

SO_2 and $PM_{2.5}$ emissions would increase with implementation of Alternative A, but the proposed net changes would be less than the initial indicator of significance. Therefore, increases in these pollutant emissions would not be significant.

Clark County is nonattainment for ozone and a maintenance area for CO and PM_{10}. For the General Conformity Applicability Analysis of CO, PM_{10}, and the ozone precursors VOC and NO_x, the estimated direct and indirect air emissions associated with implementing Alternative A were compared to the General Conformity Rule *de minimis* thresholds in **Table 4-5**. These estimates represent emissions from the proposed F-35 and COCO ADAIR aircraft operations, commuters, and the proposed building construction under Alternative A (see **Section 2.1.4**). The net change between the existing environment and proposed operations is solely additive, as implementation of Alternative A would not otherwise change operations at Nellis AFB. NTTR airspace operations include low-altitude sortie flights below 3,000 feet AGL performed by COCO ADAIR and F-35 aircraft and proposed flare use.

Table 4-5.
General Conformity Applicability Emissions Estimates under Alternative A including Proposed Demolition/Renovation/Construction Activities and Aircraft Operations at Nellis AFB and the NTTR

Activity	Total Annual Emissions in Tons			
	VOCs	**CO**	**NO_x**	**PM_{10}**
2021				
Proposed Nellis AFB Operations	7.99	22.72	16.12	2.55
Proposed NTTR Airspace Operations	0.24	1.54	10.55	0.74
Total Proposed Operations/ Net Change	**8.23**	**24.26**	**26.67**	**3.29**
De minimis Threshold	100	100	100	100
Exceed *de minimis* Threshold?	**No**	**No**	**No**	**No**
2022				
Proposed Nellis AFB Operations	25.23	72.99	52.31	10.12
Proposed NTTR Airspace Operations	0.24	1.54	10.55	0.74
Total Proposed Operations/ Net Change	**25.47**	**74.53**	**62.85**	**10.86**
De minimis Threshold	100	100	100	100
Exceed *de minimis* Threshold?	**No**	**No**	**No**	**No**
2023				
Proposed Nellis AFB Operations	26.91	92.38	68.49	10.62
Proposed NTTR Airspace Operations	0.24	1.54	10.55	0.74
Total Proposed Operations/ Net Change	**27.15**	**93.92**	**79.04**	**11.36**
De minimis Threshold	100	100	100	100
Exceed *de minimis* Threshold?	**No**	**No**	**No**	**No**
2024 (Steady State)				
Proposed Nellis AFB Operations	26.88	94.87	71.28	11.16
Proposed NTTR Airspace Operations	0.24	1.54	10.55	0.74
Total Proposed Operations/ Net Change	**27.12**	**96.41**	**81.83**	**11.9**
De minimis Threshold	100	100	100	100
Exceed *de minimis* Threshold?	**No**	**No**	**No**	**No**
2025 (Steady State)				
Proposed Nellis AFB Operations	26.84	94.64	71.10	11.15
Proposed NTTR Airspace Operations	0.24	1.54	10.55	0.74
Total Proposed Operations/ Net Change	**27.08**	**96.18**	**81.65**	**11.89**
De minimis Threshold	100	100	100	100
Exceed *de minimis* Threshold?	**No**	**No**	**No**	**No**

Note:
CO = carbon monoxide; NO_x = nitrogen oxides; PM_{10} = particulate matter less than or equal to 10 microns in diameter; VOC = volatile organic compound

While emissions for all of the pollutants would increase with implementation of Alternative A, the proposed net changes would be less than the *de minimis* thresholds. Because the VOC, NOx, CO, and PM_{10} emissions associated with Alternative A are below the *de minimis* thresholds, the requirements of the General Conformity Rule are not applicable, as documented in the Detail Air Conformity Applicability Model Report and ROCA.

The R-2508 Complex airspace primarily overlies portions of the state of California and Esmerelda County, Nevada. Esmerelda County is in attainment/unclassifiable for all criteria pollutants. The areas within California maintain several nonattainment and/or maintenance designations for criteria pollutants, as delineated in **Table 3-6**. SO_2 and CO were evaluated using the indicator of significance, as there is no area underlying the R-2508 Complex airspace that is classified as nonattainment or maintenance for these pollutants. The airspace operations analyzed include low-altitude sorties below 3,000 feet AGL performed by COCO ADAIR and F-35 aircraft. No flares are proposed for use in the R-2508 Complex.

As indicated in **Table 4-6**, SO_2 and CO emissions would increase with implementation of Alternative A, but the proposed net changes would be less than the initial indicator of significance. As such, the increases in these pollutant emissions would not be significant.

Table 4-6.
SO_2 and CO Emission Estimates under Alternative A Airspace Operations at the R-2508 Complex

Activity	Total Annual Emissions in Tons	
	SO_2	CO
2021 (Steady State)		
Proposed R-2508 Airspace Operations	0.08	0.20
Initial Indicator of Significance	250	250
Exceed Initial Indicator of Significance?	**No**	**No**

Note:
CO = carbon monoxide; SO_2 = sulfur dioxide

For the General Conformity Applicability Analysis of PM_{10}, $PM_{2.5}$, and the ozone precursors VOC and NO_x, the estimated direct and indirect air emissions associated with implementing Alternative A were compared to the General Conformity Rule *de minimis* thresholds in **Table 4-7**. The net change between the existing Affected Environment and proposed operations is solely additive as implementation of Alternative A does not otherwise change operations in the R-2508 airspace.

Table 4-7.
General Conformity Applicability Emission Estimates under Alternative A Airspace Operations at the R-2508 Complex

Activity	Total Annual Emissions in Tons			
	VOCs	NO_x	PM_{10}	$PM_{2.5}$
2021 (Steady State)				
Proposed R-2508 Airspace Operations	0.01	1.52	0.09	0.08
De minimis Threshold[a]	25	25	70	100
Exceed *de minimis* Threshold?	**No**	**No**	**No**	**No**

Note:
a. If more than one threshold applies for a given pollutant due to the inclusion of several air quality districts under the airspace, then the *de minimis* thresholds presented here are based on the lowest thresholds that could apply.
CO = carbon monoxide; NO_x = nitrogen oxides; PM_{10} = particulate matter less than or equal to 10 microns in diameter; VOC = volatile organic compound

While emissions for all of the pollutants would increase with implementation of Alternative A, the proposed net changes would be less than the *de minimis* thresholds. Because the VOC, NOx, PM_{10}, and $PM_{2.5}$ emissions associated with implementation of Alternative A would be below the *de minimis* thresholds, the requirements of the General Conformity Rule are not applicable, as documented in the Detail Air Conformity Applicability Model Report and ROCA.

4.4.3 Alternative B

Under Alternative B, other than implementation of a different demolition/renovation/construction scenario at Nellis AFB as described in **Sections 2.1.4.1** and **2.7**, all other proposed activities would remain the same as under Alternative A, including the airspace training activities. As with Alternative A, the analysis of Alternative B addressed demolition/renovation/construction activities and total emissions from additional aircraft operations for CY21 and CY22 at Nellis AFB.

Emissions of SO_2 and $PM_{2.5}$ would be nearly identical to the emissions under Alternative A. Those emissions are presented in **Tables 4-4** and **4-6** above and demonstrate that SO_2 and $PM_{2.5}$ emissions would be well below the indicators of significance.

For the General Conformity Applicability Analysis of CO, PM_{10}, and the ozone precursors VOC and NO_x, the estimated direct and indirect air emissions under Alternative B were compared to the General Conformity Rule *de minimis* thresholds in **Table 4-8**. These estimates represent emissions from the proposed F-35 and COCO ADAIR aircraft operations, commuters, and the proposed building demolition/renovation/construction under Alternative B (see **Section 2.1.4**). The net change between the existing environment and proposed operations is solely additive, as implementation of Alternative B would not otherwise change operations at Nellis AFB.

Table 4-8.
General Conformity Applicability Emissions Estimates for Alternative B Including Proposed Demolition/Renovation/Construction Activities and Aircraft Operations

Activity	Total Annual Emissions in Tons			
	VOCs	CO	NO_x	PM_{10}
2021				
Proposed Nellis AFB Operations	7.99	22.72	16.12	2.55
Proposed NTTR Airspace Operations	0.24	1.54	10.55	0.74
Total Proposed Operations/ Net Change	**8.23**	**24.26**	**26.67**	**3.29**
De minimis Threshold	100	100	100	100
Exceed *de minimis* Threshold?	**No**	**No**	**No**	**No**
2022				
Proposed Nellis AFB Operations	25.25	73.10	52.45	10.26
Proposed NTTR Airspace Operations	0.24	1.54	10.55	0.74
Total Proposed Operations/ Net Change	**25.49**	**74.64**	**63.00**	**11.00**
De minimis Threshold	100	100	100	100
Exceed *de minimis* Threshold?	**No**	**No**	**No**	**No**
2023				
Proposed Nellis AFB Operations	26.92	92.40	68.55	10.62
Proposed NTTR Airspace Operations	0.24	1.54	10.55	0.74
Total Proposed Operations/ Net Change	**27.16**	**93.94**	**79.10**	**12.59**
De minimis Threshold	100	100	100	100
Exceed *de minimis* Threshold?	**No**	**No**	**No**	**No**
2024				
Proposed Nellis AFB Operations	26.88	94.88	71.29	11.16
Proposed NTTR Airspace Operations	0.24	1.54	10.55	0.74
Total Proposed Operations/ Net Change	**27.17**	**98.54**	**90.98**	**11.36**
De minimis Threshold	100	100	100	100
Exceed *de minimis* Threshold?	**No**	**No**	**No**	**No**
2025 (Steady State)				
Proposed Nellis AFB Operations	26.84	94.64	71.10	11.15
Proposed NTTR Airspace Operations	0.24	1.54	10.55	0.74
Total Proposed Operations/ Net Change	**27.08**	**96.18**	**81.65**	**11.89**
De minimis Threshold	100	100	100	100
Exceed *de minimis* Threshold?	**No**	**No**	**No**	**No**

CO = carbon monoxide; NO_x = nitrogen oxides; PM_{10} = particulate matter less than or equal to 10 microns in diameter; VOC = volatile organic compound

While emissions for all of the pollutants would increase with implementation of Alternative B, the proposed net changes would be less than the *de minimis* thresholds. Because the VOC, NOx, CO, and PM_{10} emissions associated with implementation of Alternative B would be below the *de minimis* thresholds, the requirements of the General Conformity Rule are not applicable, as documented in the Detail Air Conformity Applicability Model Report and ROCA.

4.4.4 No Action Alternative

Under the No Action Alternative, no aircraft would be added to Nellis AFB, COCO ADAIR would not operate at Nellis AFB, and no associated demolition/renovation/construction activities would occur. There would be no change to Base air quality under the No Action Alternative.

4.4.5 Climate Change Considerations

The state of Nevada has warmed about 2°F since the beginning of the 20th century. Throughout the southwestern United States, heat waves are becoming more common, and snow is melting earlier in spring.

Soils are likely to be drier, and periods without rain are likely to become longer, making droughts more severe. Higher temperatures and drought will increase the severity, frequency, and extent of wildfires in Nevada, which could harm property, livelihoods, and human health (USEPA, 2016b). Rising temperatures will also increase the formation of ground-level ozone, which can exacerbate the existing issues with attainment of the ozone NAAQS standard for areas that are currently classified as maintenance or nonattainment.

Table 4-9 presents GHG annual emissions under both Alternatives A and B, as there is virtually no difference in GHG emissions between the two alternatives. The projected steady-state annual emissions represent airfield operations at Nellis AFB, commuters, and demolition/renovation/construction activities during CY21 through CY25, and low-altitude airspace flight and flare use at the NTTR and R-2508 MOAs. The GHG emissions calculated for aircraft operations only include activities below the mixing height of 3,000 feet AGL. Unlike criteria pollutants, GHG emissions impacts are not restricted to the mixing height; however, it is not possible to ascertain the flight movements for the thousands of training operations that occur annually; as a result, GHGs were modeled only for the airfield and airspace areas where low-altitude flight is below the mixing height.

Table 4-9.
Greenhouse Gas Emissions under Alternatives A and B

Year	Total Annual Emissions in Tons
	CO_2e
Alternative A (including construction and airfield activities at Nellis AFB and airspace activities at NTTR and R-2508)	
2021	5,266.5
2022	13,788.1
2023	17,990.6
2024	18,652.4
2025	18,608.8

CO_2e = carbon dioxide equivalent

Implementing Alternative A or Alternative B at Nellis AFB would increase GHG emissions below 3,000 ft AGL by 18,608.8 tons per year. Under the No Action Alternative, the operations would not occur and the associated annual GHG emissions would not be generated.

Climate change presents a global problem caused by increasing concentrations of GHG emissions. While climate change results from the incremental addition of GHG emissions from millions of individual sources, the significance of an individual source alone is impossible to assess on a global scale beyond the overall need for global GHG emissions reductions to avoid catastrophic global outcomes. Therefore, the quantitative analysis of CO_2e emissions in this EA is for purposes of disclosing the net increase of alternative actions.

4.5 Biological Resources

4.5.1 Evaluation Criteria

The level of impact on biological resources is based on the following:

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

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

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

Because the number and type of aircraft as well as flight profiles and airspace would be the same for both Alternatives A and B, potential impacts to biological resources would be the same for Alternatives A and B. Alternatives A and B would involve relocation of the same number of aircraft and the same aircraft operations, but would vary in the demolition/renovation/construction measures conducted to support the relocation.

4.5.2 Alternative A

Under Alternative A, the Air Force would add 17 F-35 Joint Strike Fighter aircraft, three F-22A Raptor aircraft, and operate COCO ADAIR at Nellis AFB. To support the assignment of these aircraft, an additional 751 personnel would be added to Nellis AFB. In association, facility demolition/renovation/construction activities would be necessary to support the new aircraft. Under Alternative A, the annual number of sorties by aircraft based at Nellis AFB would increase by approximately 20 percent. These increased flights, along with the use of large-caliber weapons on the ranges during training, would result in negligible to minor noise increases (0 to 2 dB) at the airfield and training areas. Potential impacts to biological resources would be associated with operation of the aircraft at Nellis AFB, the NTTR, and R-2508 Complex, as well as the demolition/renovation/construction activities on the ground at Nellis AFB. The aircraft operations under Alternative A could have impacts on biological resources from aircraft movement, noise impacts, or BASH.

Sortie training operations would include the use of flare. Potential direct impacts from such activities include the deposition of residual materials, such as plastic, from flare use, its accumulation in sensitive and protected areas, and the ultimate breakdown of these materials into substrate mediums. Indirect impacts include fire risk, transport of these materials to other areas by environmental elements, and the potential for ingestion by sensitive species within the ROI and beyond.

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 flares. Some flares use impulse cartridges and initiates, which contain chromium and sometimes lead. Even though these are hazardous air pollutants, a screening health risk assessment concluded that these materials do not present a significant health risk (USAF, 1997). More significantly, flares have a potential to start fires that can spread, adversely and indirectly affecting many resources. Flare-induced fires depend on the probabilities of flare materials reaching the ground, igniting vegetation, and spreading to cause significant damage (USAF, 1997); however, all use of flares in the MOAs would occur above 2,000 ft, reducing the risk of wildland fires.

4.5.2.1 Vegetation

The areas designated for demolition/renovation/construction under Alternative A are generally adjacent to existing facilities and are either paved or graveled areas maintained to be generally free of vegetation. Due to the lack of intact native vegetation in the areas designated for development under Alternative A, the demolition/renovation/construction portion of Alternative A has no potential to disturb vegetation or habitats at Nellis AFB.

The use of flares during aircraft operations has the potential to impact vegetation and habitats due to the possibility of starting fires. Potential impacts to vegetation from flare constituents may include toxicity or accumulation of chemical compounds. Studies have determined that residual deposition of materials onto soils does not lead to significant increase of concentrations of flare chemical constituents in soil and have not been found to be toxic to plants or soil fauna (USAF, 1997). Aircraft operations are not expected to impact vegetative habitat beyond the use of flares.

4.5.2.2 Wildlife

There is limited suitable habitat for wildlife in the areas on Nellis AFB where demolition/renovation/ construction activities would occur under Alternative A. Wildlife are more abundant on the undeveloped portions of Nellis AFB and in the training areas (NTTR/R-2508). The developed portion of Nellis AFB supports relatively common wildlife species such as small mammals and migratory birds, while the undeveloped portions of Nellis AFB, NTTR, and the R-2508 Complex support a wider variety of species, including ESA-listed species. Wildlife, and especially avian species, utilizing these undeveloped areas for foraging and breeding would normally be sensitive to increased noise impacts from military aircraft. Anthropogenic noise increases can alter wildlife behavior and negatively impact habitat quality across a variety of taxa (Shannon et al. 2016). Although research into noise impacts on wildlife is increasing, much of the research focuses on birds and marine mammals, with reptiles, amphibians, and invertebrates being underrepresented in published literature (Shannon et al. 2016, Jerem and Matthews 2000). There is variability in responses across species, but many birds and other wildlife have the ability to habituate to noise and movement from military aircraft (Grubb et al., 2010), and military aircraft operations have been ongoing at Nellis AFB for decades. As such, the noise and movement from increased aircraft operations under Alternative A is anticipated to have negligible short-term and long-term impacts on wildlife, including birds breeding and foraging in nearby relatively undisturbed 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 Alternative A, there is an increased risk of BASH. However, Nellis AFB maintains a Wildlife Aircraft Strike Hazard Plan specifically to manage BASH risk and implement measures to greatly reduce the likelihood for BASH incidents (Nellis AFB, 2019a). The outcome of the BASH program is both increased safety for pilots and military aircraft as well as fewer 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 discussed in **Section 4.3.2.3**, the impacts on birds and other wildlife from the addition of the aircraft associated with Alternative A would be minor.

Most aircraft training operations at NTTR and the R-2508 Complex would occur at altitudes above where most bird species would be migrating or foraging. As such, it is highly unlikely that aircraft movement would adversely impact foraging birds or have a risk of BASH. Migrating birds could have a greater potential of encountering aircraft during training operations, especially those that migrate at altitudes above 2,000 ft; however, given the large area and high altitude where training would occur, that aircraft training would occur and that most migratory song birds migrate at altitudes less than 2,000 ft (Kerlinger, 2008), the likelihood for birds to encounter aircraft during training operations is low. Research has also shown that raptors (e.g., peregrine falcons, prairie falcons, golden eagles) showed very little response to low-level, mid-level, and high-level fly overs or sonic booms, resulting in no change in productivity (Ellis et al., 1991). Additionally, a study of low-level (150m) jet aircraft passes throughout the nesting season showed no differences detected in the nestling provisioning rates, subtle behavioral differences, and noted that the results provided “little support for the hypothesis that low-altitude jet aircraft overflights affect parental behavior of peregrine falcons” (Palmer et al. 2003). An evaluation of military jet noise effects on captive desert ungulates (e.g., mule deer and mountain sheep) showed heart rate and behavioral responses to be limited in time (from 1 to 4 minutes) and also indicated that animals habituated to sound levels of even low-altitude aircraft (Weisenberger et al., 1996). For these reasons, the increased aircraft movement under Alternative A would have negligible impacts on avian species. Further, given the altitudes that training occurs, the increased aircraft movement in the training areas would have no significant impacts on terrestrial animals.

Noise modeling for the aircraft training operations indicates that there would be no substantial increase in noise impacts within the Nellis AFB or the training areas (NTTR and R-2508), and that subsonic and/or supersonic noise levels in the airspace would not change significantly from the baseline conditions. The noise impacts from aircraft training over the ambient noise levels are not expected to significantly impact breeding, foraging, or nesting birds (including bald and golden eagles) or terrestrial animals at Nellis AFB or the training areas under Alternative A.

Sonic booms from supersonic flights within the training areas could cause startle effects to avian and mammal species on or near the ground; however, the sonic boom and post-boom rumbling sounds that would be experienced by wildlife do not differ substantially from thunder, which is a naturally caused sonic boom. Further, the sonic boom events would be highly isolated and rare occurrences in the training areas and would occur in areas where supersonic flights currently occur with military training activities. Implementation of Alternative A would increase the number of sonic booms in the NTTR by approximately 12 percent. As such, sonic booms from supersonic flights would not significantly impact wildlife and breeding birds in the training areas under Alternative A.

Under Alternative A, the use of flares would increase within the NTTR and R-2508 Complex. Impacts on terrestrial wildlife from the use of flares would be limited to a startle effect from flare deployment and inhalation of flare combustion products. The potential of being struck by debris, given the small amount, or a dud flare is remote. Startle effects from the release of flares would be minimal relative to the noise of the aircraft. The potential for wildlife to be startled from flare deployment at night when flares would be most visible would be minimal due to the short burn time of the flare. Further, flares are so small in size that it is highly unlikely that the small amount of light-weight material ejected during their deployment would have an adverse impact on birds or that the material would reach the ground level and have an impact on mammals. Therefore, the use of flares during aircraft training would have minimal impact on terrestrial wildlife under Alternative A.

4.5.2.3 Fish

Increased aircraft operations in the training areas under Alternative A would have no impact on freshwater fish. The increased use of flares would not increase the potential for plastics associated with flares to end up in aquatic ecosystems; however, the amount of plastic material expended in the use of flares is small, the size of the plastic material is also very small, and most of the material would remain in terrestrial environments. The additional sorties in the training area airspace, including the use of defensive countermeasures, would have no impact on EFH.

4.5.2.4 Invasive Species

The increase in sorties associated with Alternative A would have the potential to impact invasive species by increasing the potential for starting wildland fires. These fires could increase the spread of invasive plants due to the disturbance and competition removal associated with fires. Specifically, fires can increase the prevalence of invasive grass species, which can outcompete native species and prevent natural restoration after fire disturbance (Brooks and Pyke, 2001).

4.5.2.5 Threatened and Endangered Species

Under Alternative A, no impacts to listed species are expected associated with the demolition/ renovation/construction activities in previously disturbed and developed areas on Nellis AFB. All potential impacts on biological resources would be associated with the increased aircraft operations at Nellis AFB, NTTR, and the R-2508 Complex. Although five species listed under the ESA potentially occur according to the USFWS, only the desert tortoise has been documented. Because tortoises have not been documented to occur in the heavily disturbed areas where construction activities associated with Alternative A would occur, the potential source of impacts would be from aircraft overflights (Nellis AFB, 2019a). Bowles et al. (1999) evaluated the effects of simulated jet aircraft fly overs and sonic booms on desert tortoises and recorded defensive responses (short-duration freezing), followed by defensive postures; tortoises habituated to the noise disturbances quickly. More extreme defensive reactions (e.g., urinating) were not observed (Bowles et al., 1999). These data indicate that exposure to aircraft flyovers, including sonic booms, are not expected to adversely impact desert tortoises.

Effects on other listed species could occur from the increased flight operations under Alternative A. 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, considering the large area and high altitude where training would occur, and that most training would occur during daytime hours, the likelihood for birds to encounter aircraft during training operations under Alternative A is low.

The primary impact likely to occur for the listed species in the project area is startle responses associated with aircraft flyovers. Evaluation of available literature for avian and mammalian species does not indicate that these species are likely to be significantly impacted by the additional flights under Alternative A (Bowles et al., 1999; Ellis et al., 1999; Weisenberger et al., 1996). Individuals occurring in these areas are already subjected to frequent flyovers associated with the baseline conditions at Nellis AFB, NTTR, and the R-2508 Complex and likely demonstrate some habituation to the aircraft activity, thus, the addition of the aircraft activity associated with Alternative A is not expected to significantly alter behavior of the listed species in the project areas. California condors are documented to exhibit potentially deleterious responses to low-level military aircraft flyovers and sonic booms (Manci et al., 1988). However, due to the existing levels of aircraft usage, including sonic booms, in these areas, the minor increase in flyovers, sonic booms, and associated minimal changes in noise levels under Alternative A is not expected to adversely affect condors.

There is the potential for components of flares that remain after use to be ingested. Flare end caps and pistons are released into the environment, where they persist for long periods and could be ingested. However, these materials are distributed over very large training areas, and the density of any remaining debris is very low, lessening the chances of being encountered and ingested. There is also a potential that wildland fires could occur as a result of training activities, such as from the accidental low-altitude deployment of flares. Although the potential for this to occur is low, wildlife fires could impact listed species present in the training areas. For safety purposes, flares are deployed in a manner to avoid wildland fires, reducing the risk of impacts to wildlife. Such safety practices would continue under Alternative A.

Due to the potential for short-term disturbances to listed species resulting from an increase in flyovers, the potential for ingesting flare materials, and the possibility of wildland fires associated with training activities, implementation of Alternative A may affect but is not likely to adversely affect listed species in the project areas.

4.5.2.6 Wetlands

Under Alternative A, demolition/renovation/construction activities would not impact any wetlands (see **Section 3.5.2**). No fill or alteration of wetlands would occur at Nellis AFB. Thus, no impacts to wetlands are expected.

4.5.2.7 Wilderness Areas

As stated in Section 4.5.2.2, noise modeling for the aircraft training operations indicates that there would be no substantial increase in noise impacts within the Nellis AFB or the training areas (NTTR and R-2508), and that subsonic and/or supersonic noise levels in the airspace would not change significantly from the baseline conditions. The noise impacts from aircraft training over the ambient noise levels are not expected to significantly impact Wilderness Areas.

4.5.3 Alternative B

Alternative B differs from Alternative A only in the demolition/renovation/construction activities at Nellis AFB, as described in **Sections 2.1.4.1** and **2.7**. All other proposed activities would be the same as under Alternative A, including the airspace training activities. As such, impacts under Alternative B would be the same as those described for Alternative A.

4.5.4 No Action Alternative

Under the No Action Alternative, no aircraft would be added to Nellis AFB, COCO ADAIR would not operate at Nellis AFB, and no associated demolition/renovation/construction activities would occur. There would be no change to biological resources under the No Action Alternative.

4.6 WATER RESOURCES

4.6.1 Evaluation Criteria

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

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

4.6.2 Alternative A

Under Alternative A, construction activities would not take place in a floodplain and would not impact surface or groundwater. The increase of 751 new personnel to the Nellis AFB workforce (a 2-percent increase over the current number of military and civilian personnel who live and work on Base) would not impact water availability at Nellis. A Stormwater Pollution Prevention Permit would be required before any construction activities would occur at Nellis AFB.

Under Alternative A, activities that could result in potential impacts to water resources include the use of flares and emergency fuel dumps within the NTTR and R-2508. Chemical components and emergency fuel dumps could potentially occur during rare in-flight emergency circumstances involving increased loss-of-life potential for the pilot; however, such actions are not included on any established training syllabus and would only occur under extreme circumstances where human or aircraft survival is a concern (FAA Order JO 7110.65U Section 4, *Fuel Dumping*). Air Force regulations require that fuel be dumped at an altitude of at least 10,000 ft AGL (see AFI 11-2F-15V3, *F-15--Operations Procedures*). This allows the fuel to evaporate and atomize before it reaches the ground or surface water (American Petroleum Institute [API], 2010). Due to the infrequent nature of fuel dumps as well as in-place safety precautions, these emergency procedures are not likely to adversely affect water resources.

The primary material in flares is magnesium, which in not highly toxic. However, plastic caps are released with the deployment of flares. Plastic accumulation is a problem in aquatic environments. Microplastic pollution (small particles of plastic <5 mm in size) impacts have been well documented in oceans, and more recently in lakes and rivers, but more research is needed on the fate and effects of microplastics in these diverse freshwater ecosystems themselves.

For these reasons, the activities associated with the implementation of Alternative A are not anticipated to impact water resources.

4.6.3 Alternative B

Alternative B differs from Alternative A only in the demolition/renovation/construction activities at Nellis AFB, as described in **Sections 2.1.4.1** and **2.7**. All other proposed activities would be the same as under Alternative A, including the airspace training activities. As such, impacts under Alternative B would be the same as those described for Alternative A.

4.6.4 No Action Alternative

Under the No Action Alternative, no aircraft would be added to Nellis AFB, COCO ADAIR would not operate at Nellis AFB, and no associated demolition/renovation/construction activities would occur. There would be no change to water resources under the No Action Alternative.

4.7 SOILS

4.7.1 Evaluation Criteria

Protection of soils is considered when evaluating potential impacts of a proposed action. Effects on soils would be adverse if they alter the soil composition, structure, or function within the environment or accumulate in the soil. The degree of adverse effects depends on the quantity of material deposited locally, stability of the residual components, the soil chemical conditions, and the sensitivity of the environment to chemicals of concern.

Because the number and type of aircraft as well as flight profiles and airspace would be the same for both Alternatives A and B, potential impacts to soils would be the same for Alternatives A and B. Alternatives A and B would involve relocation of the same number of aircraft and the same aircraft operations, but would vary in the demolition/renovation/construction measures conducted to support the relocation.

4.7.2 Alternative A

Construction activities associated with Alternative A would occur entirely on existing Nellis AFB military lands. All areas that would be affected by construction activities are within the current perimeter fence boundaries of Nellis AFB. The proposed facilities would be located on previously disturbed land adjacent to existing buildings and infrastructure on Nellis AFB grounds in Area I. Buildings 278, 423, 451, and 878 are all located on previously disturbed land. Impacts to remediation sites at Nellis AFB are discussed in **Section 4.12.2.1**.

Activities under Alternative A that could affect soils are the use of flares, fire risk due to flares, and emergency fuel dumps.

Potential impacts to soils from and flare constituents may include toxicity or accumulation of chemical compounds and fire risk. The projected total flare use would be widely dispersed over time and space. The fire risk from potential flare landing could reduce soil productivity, but with the low probability of occurrence and BMPs in place, no indirect, adverse impacts would be expected under Alternative A.

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

Alternative A would not result in significant changes to existing land use or land use compatibility. No direct impacts to soil are anticipated under Alternative A, and any adverse, indirect impacts would be negligible for all MOAs.

4.7.3 Alternative B

Alternative B differs from Alternative A only in the demolition/renovation/construction activities at Nellis AFB, as described in **Sections 2.1.4.1** and **2.7**. All other proposed activities would be the same as under Alternative A.

Under Alternative B, construction activities at Nellis AFB would be located on previously disturbed land adjacent to existing buildings and infrastructure on Nellis AFB grounds in Area I. Buildings 250, 245, 246, and 248 would be located on previously disturbed land with land use designation of Airfield Ops. Impacts to remediation sites at Nellis AFB are discussed in **Section 4.12.3**.

Impacts under Alternative B would be the same as those described for Alternative A.

4.7.4 No Action Alternative

Under the No Action Alternative, no aircraft would be added to Nellis AFB, COCO ADAIR would not operate at Nellis AFB, and no associated demolition/renovation/construction activities would occur. There would be no change to soils under the No Action Alternative.

4.8 LAND USE

4.8.1 Evaluation Criteria

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

- inconsistent or noncompliant with existing land use plans or policies,
- precluded the viability of existing land use,
- precluded continued use or occupation of an area,
- incompatible with adjacent land use to the extent that public health or safety is threatened, or
- conflicted with planning criteria established to ensure the safety and protection of human life and property.

4.8.2 Alternative A

Land use on Nellis AFB would not be negatively impacted by implementation of Alternative A. Based on the analysis of proposed aircraft operations, Area I and portions of Areas II and III would continue to be exposed to DNL noise levels of 65 dB or greater; however, these proposed noise levels are consistent with existing on-Base conditions, and facilities and land uses within the noise contours would remain compatible.

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**, the area within the noise contours (DNL noise levels of 65 dB or greater) would potentially increase by 724 acres, mostly in unincorporated Clark county land north of Nellis AFB. However, noise levels would not increase for the POIs. At the representative noise sensitive locations modeled, the DNL would not change. All POIs examined would experience negligible changes to DNL which would be long term, barely noticeable or unnoticeable, and not significant. Changes to the noise contours would not result in a change to the safety zones.

Construction activities would occur entirely on existing Nellis AFB military lands. All areas that would be affected by construction activities are within the current perimeter fence boundaries of Nellis AFB. Nellis AFB has a mix of land use categories. The proposed facilities would be located on previously disturbed land adjacent to existing buildings and infrastructure on Nellis AFB grounds in Area I. Buildings 278, 423, 451, and 878 are all located on previously disturbed land, with land use designation of Airfield Ops (Nellis AFB, 2017). The existing land use for Buildings 1770A and 10301 is Administrative, as shown in **Figure 3-9**. Buildings 257, 262, and 283 are located on previously disturbed land with land use designation of Airfield Ops.

Alternative A would not result in changes to existing land use or land use compatibility.

4.8.3 Alternative B

Alternative B differs from Alternative A only in the demolition/renovation/construction activities at Nellis AFB, as described in **Sections 2.1.4.1** and **2.7**. Under Alternative B, the proposed facilities would be located on previously disturbed land adjacent to existing buildings and infrastructure on Nellis AFB grounds in Area I.

Buildings 250, 245, 246, and 248 would be located on previously disturbed land with land use designation of Airfield Ops.

All other proposed activities would be the same as under Alternative A. As such, impacts under Alternative B would be the same as those described for Alternative A.

4.8.4 No Action Alternative

Under the No Action Alternative, no aircraft would be added to Nellis AFB, COCO ADAIR would not operate at Nellis AFB, and no associated demolition/renovation/construction activities would occur. There would be no change to existing land use under the No Action Alternative.

4.9 SOCIOECONOMICS

4.9.1 Evaluation Criteria

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

4.9.2 Alternative A

The requirements for an estimated additional 751 military, contract, and civilian personnel and their families under Alternative A in the Clark County region would have no impact on the region's population. Assuming all personnel relocated with family members to Clark County or North Las Vegas, this would be a negligible increase in the County's population of over 2,000,000 people and the city's population of over 600,000 people; therefore, there would be no impacts from Alternative A on the local or regional population.

Under Alternative A, construction of new hangars and additions/demolition/renovation of existing buildings would result in a temporary increase of 20 to 50 construction personnel, which would have no impact on the socioeconomic condition on the region. No new in-migration regionally is anticipated because there are existing construction personnel in the greater Las Vegas area to support the new construction. The 751 additional military, contract, and civilian personnel would represent a small increase in the total persons permanently assigned to and working at Nellis AFB, where currently over 40,000 military and civilian personnel are employed. Adequate housing and educational resources are available in the ROI to accommodate the small increase in personnel; therefore, no adverse impacts on employment, housing, or educational resources would occur under Alternative A.

Under Alternative A, Nellis AFB would operate an additional 5,476 sorties each year, along with over 5,000 additional training sorties flown at the NTTR and R-2508 Complex. At the representative noise sensitive locations modeled, the DNL would not change. All POIs examined would experience negligible changes to DNL, which would be long term, barely noticeable or unnoticeable, and not significant (see **Section 4.2.2.1**).

4.9.3 Alternative B

Alternative B differs from Alternative A only in the demolition/renovation/construction activities at Nellis AFB, as described in **Sections 2.1.4.1** and **2.7**. All other proposed activities would be the same as under Alternative A, including the airspace training activities. As such, impacts under Alternative B would be the same as those described for Alternative A.

4.9.4 No Action Alternative

Under the No Action Alternative, no aircraft would be added to Nellis AFB, COCO ADAIR would not operate at Nellis AFB, and no associated demolition/renovation/construction activities would occur. No expenditures would occur locally or regionally to support the alternative actions. There would be no change to socioeconomic conditions under the No Action Alternative.

4.10 ENVIRONMENTAL JUSTICE

4.10.1 Evaluation Criteria

Environmental justice analysis applies to potential disproportionately and adverse effects on minority, low-income, elderly, 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, elderly or youth populations. In **Section 3.10**, ethnicity and poverty status were compared to state and national data to determine if these populations could be disproportionately affected by Alternatives A or B.

4.10.2 Alternative A

Under Alternative A, the increase in the number of personnel at Nellis AFB supporting the additional F-35, F-22A, and COCO ADAIR sorties would not result in a disproportionate impact on minorities, low-income, elderly, and youth populations because there is adequate housing, community resources, and community services in the ROI to support the increase in personnel. The 751 additional personnel and their families supporting Alternative A would not disproportionately affect the availability of these resources to minorities, low-income populations, the elderly, or children.

The impact assessment for each of the resource topics considered in the preceding sections identified only [negligible-to-low] impacts on the physical, natural, and human environment (see **Table 2-1**). Implementation of Alternative A would not result in the disproportionally high and adverse impacts on minority, low-income, or youth populations. Under Alternative A, noise levels at representative POIs identified in **Section 3.2.2** would remain the same. Modeled POIs include noise-sensitive locations such as hospitals, residences, schools, and places of worship located in the vicinity of Nellis AFB (see **Table 3-4**). At the representative noise-sensitive locations modeled, the DNL would not change. All POIs examined would experience negligible changes to DNL, which would be long term, barely noticeable or unnoticeable, and not significant (**Section 4.2.2.1**).

Under Alternative A, the annual number of sorties at Nellis AFB will increase by 20 percent for aircraft based at Nellis AFB. The NTTR airspaces would receive approximately 80% of the sorties originating from Nellis AFB, and the R-2508 Complex would receive around 20% of the sorties. The NTTR regularly experiences noise exposure from large-caliber weapons and munitions firing, such that the 57 dBC CDNL noise contours from blast noise exposure extends approximately 2 to 3 nm from each target area. The increase in large-caliber weapons and munitions firing associated with implementation of Alternative A is not expected to significantly change the 57-dBC-CDNL noise contours, resulting in long-term, negligible to minor noise increases. For the R-2508 Complex, the increase in sorties due to implementation of Alternative A is expected to result in a long-term, negligible to minor noise increase for both subsonic and supersonic operations. **Section 4.2.2.1** contains the full description of impacts to the noise environment under Alternative A.

4.10.3 Alternative B

Alternative B differs from Alternative A only in the demolition/renovation/construction activities at Nellis AFB, as described in **Sections 2.1.4.1** and **2.7**. All other proposed activities would be the same as under Alternative A, including the airspace training activities. As such, impacts under Alternative B would be the same as those described for Alternative A.

4.10.4 No Action Alternative

Under the No Action Alternative, no aircraft would be added to Nellis AFB, COCO ADAIR would not operate at Nellis AFB, and no associated demolition/renovation/construction activities would occur. There would be no change to minority, low-income, or youth populations.

4.11 CULTURAL RESOURCES

4.11.1 Evaluation Criteria

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

4.11.2 Alternative A

Alternative A includes elements affecting Nellis AFB and military training airspace. As described in **Chapter 2**, the elements affecting the Base include aircraft, facilities, personnel, and sorties. The elements affecting the airspace include airspace use and defensive countermeasures. Impact results from Alternative A related to cultural resources are described below.

The required O&M and/or MILCON facility projects on Nellis AFB to successfully operate additional F-35 aircraft would potentially impact several existing buildings, none of which would impact cultural resources. As outlined in **Section 3.11.2.3**, Building 278, constructed in 1971, was determined not eligible for the NRHP, as were Building 423, built in 1981, and Building 451, built in 1970. Building 878 and Building 10301 were determined to be not eligible for the NRHP with SHPO concurrence in 2020. Building 1170 was constructed in 2009 and is therefore not eligible for the NRHP.

Additional structures would be impacted under Alternative A, including Building 262, built in 1954, and Building 283, built in 1977, both determined to be ineligible for the NRHP, and Building 257, built in 2018 and therefore not pertinent to the NRHP. No impacts would occur to NRHP-eligible buildings within the direct or indirect APE.

There are 30 identified historic resources associated with the airspace APE listed in the NRHP. Of these, one each is associated with the Reveille North MOA, R-4808N site, and X-Ray/Nellis AFB site in Nevada and seven are associated with the Desert MOA in Nevada. In California, there is one historic site associated with each of Barstow, Bishop, Porterville, and Saline MOAs, two each with Bakersfield and Panamint MOAs, four each with Isabella and Owens MOAs, and one that is associated with both the Saline and Owens MOAs. In California, there are also two sites associated with the R-2502N area and one with the R-2515 area. Resource types include 3 structures (e.g., bridges, light houses, infrastructure features), 5 sites (e.g., townsites cemeteries, mining-related sites), 9 districts (e.g., townsites, historical districts), and 13 buildings (e.g., homes, government buildings, churches, theaters) (**Table 3-14**).

The NTTR experiences up to 20 sonic booms per day from supersonic aircraft operation. Under Alternative A, the addition of approximately 4,380 sorties (i.e., 80 percent of the total sorties proposed under Alternative A) by F-35, F-22A, and COCO ADAIR aircraft to the NTTR is expected to increase the number of sonic booms per day by less than 14 percent, resulting in long-term, negligible to minor noise increases.

Potential effects from sonic booms include audible intrusions to traditional resources and vibration effects to historic structures and rock art sites. There is very low potential for structural damage to architectural resources due to sonic booms. Therefore, no adverse effects to architectural resources are expected due to an increase in supersonic noise levels or frequency of sonic booms.

The airspace APE is directly associated with several federally recognized Native American Tribes in Nevada and California, as well as several non-federally recognized Native American Tribes that are seeking recognition in California. As discussed in **Section 4.2.2.2**, Alternative A is expected to result in a long-term, negligible to minor noise increase for both subsonic and supersonic operations within the airspace APE.

Potential effects to cultural resources from the use of flares are usually associated with the secondary effects of fire. The probability of flares causing fires is usually related to the chances of unexpended flares reaching the ground, the chances of flames igniting vegetation, and the chances of the fire spreading. This continued use would have a negligible, if any, effect on cultural resources because continued implementation of operational procedures during high fire risk periods would limit impacts to cultural resources.

4.11.3 Alternative B

Alternative B differs from Alternative A only in the demolition/renovation/construction activities on Nellis AFB, as described in **Sections 2.1.4.1** and **2.7**. Additional structures would be impacted by the selection of Alternative B at Nellis AFB, including Buildings 246 and 248, both built in 1969, which were determined not eligible for the NRHP, and Building 250, built in 1971, and Building 245, built in 1954, both determined not eligible for the NRHP with SHPO concurrence in 2006 and 2015, respectively.

Like Alternative A, no impacts to NRHP-eligible buildings or archeological sites are expected as result of construction activities at Nellis AFB.

4.11.4 No Action Alternative

Under the No Action Alternative, no aircraft would be added to Nellis AFB, COCO ADAIR would not operate at Nellis AFB, and no associated demolition/renovation/construction activities would occur. There would be no change to cultural resources under the No Action Alternative.

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

4.12.1 Evaluation Criteria

Impacts on HAZMAT management would be considered adverse if the federal action resulted in noncompliance with applicable federal and state regulations, or increased the amounts generated or procured beyond current Nellis AFB waste management procedures and capacities. Impacts on the ERP would be considered adverse if the federal action disturbed (or created) contaminated sites resulting in negative effects on human health or the environment.

4.12.2 Alternative A

The HAZMAT and hazardous waste associated with the F-35, F22A, and COCO ADAIR operations would not significantly impact installation management programs. The most commonly used HAZMAT related to flight operations would include jet and motor fuels, other types of petroleum products, paints, thinners, adhesives, cleaners, lead-acid batteries, hydraulic fluids, and halogenated and non-halogenated solvents. Under Alternative A, the quantity of oil, jet fuel, hydrazine, hydraulic fluid, solvents, sealants, and antifreeze would slightly increase. All hazardous waste generated as a result of aircraft operations and maintenance would be properly handled, stored, and disposed of following the installation's Hazardous Waste Management Plan (Nellis AFB, 2015b). 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 A.

The use of HAZMAT and petroleum products would be required during demolition/renovation/construction activities under Alternative A. Potential impacts from the accidental release of such products (i.e., fuel and lubricants) would be minimized by implementing specified spill prevention, control, and countermeasures specified in the *Nellis, Creech, and NTTR Facility Response Plan* (Nellis AFB, 2016b).Compliance with the Nellis AFB Hazardous Material Pharmacy requirements and disposal of hazardous wastes in accordance with the Hazardous Waste Management Plan would minimize impacts from handling and disposal of hazardous substances.

4.12.2.1 Environmental Restoration Program

There are currently nine active ERP sites on Nellis AFB (USAF, 2004). Construction for four buildings would occur on two of these sites (SS-28 and ST-44) (see **Figure 3-11**). Site SS-28 is a historic fuel spill located near Building 941, and remedial action operations are underway for extraction of product/ groundwater and long-term monitoring to ensure CERCLA compliance. Under Alternative A, Building 878 would have a 4,000-ft^2 addition constructed above the groundwater plume of Site SS-28.

Site ST-44 is a fuel leak from two USTs at the AGE service island. Buildings 257, 262, and 283 are located above the contaminated groundwater plume associated with ST-44. Under Alternative A, Building 283 would undergo interior renovations, while Buildings 257 and 262 each would receive a 4,000-ft^2 addition.

The groundwater plumes associated with Sites ST-28 and ST-44 would not be disturbed by surface-level construction efforts since the plumes are more than 40 ft below ground level. While no impact is expected, an ERP waiver would be required if proposed construction would occur above ERP groundwater plumes.

4.12.2.2 Asbestos-Containing Materials and Lead-Based Paint

Asbestos and LBP may be encountered as structures are renovated or demolished under Alternative A. Construction contractors would be responsible for monitoring exposure to asbestos and lead, and current Air Force practice is to remove exposed friable asbestos and manage other ACMs in place, depending on the potential threat to human health. If encountered, friable asbestos would be removed by licensed contractors and disposed of in a local asbestos-permitted landfill. Additionally, policies and procedures documented in the Nellis AFB *Asbestos Operations and Management Plan* to manage, identify, and assess ACMs would be followed (Nellis AFB, 2016a).

LBP may be present in buildings proposed for demolition and renovation under Alternative A. LBP removal and disposal would be conducted in accordance with the Nellis AFB *Lead-Based Paint Management Plan* (Nellis AFB, 2003) and federal, state, and local regulations. All paint waste generated from paint removal operations under Alternative A would be containerized, sampled, and analyzed to determine if the waste meets the definition of hazardous waste.

Clark County Department of Air Quality (CCDAQ) requires buildings undergoing renovation or demolition to be surveyed for asbestos regardless of their age. The same regulation requires a notification to CCDAQ for the buildings undergoing renovation or demolition at least 10 work days before the work begins.

4.12.2.3 Radon

There is a low potential for radon to pose a health hazard at Nellis AFB. As such, no impact from radon is anticipated under Alternative A.

4.12.2.4 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 A.

4.12.3 Alternative B

Alternative B differs from Alternative A only in the demolition/renovation/construction activities on Nellis AFB, as described in **Sections 2.1.4.1** and **2.7**. Impacts for this alternative, except for potential impacts on ERP sites, would be the same as those described for Alternative A. Under Alternative B, no construction activities would occur above the ST-44 plume. Buildings 257, 262, and 283 would not have any additions or undergo renovation.

4.12.4 No Action Alternative

Under the No Action Alternative, no aircraft would be added to Nellis AFB, COCO ADAIR would not operate at Nellis AFB, and no demolition/renovation/construction activities would occur. There would be change in management or use of HAZMAT or hazardous or special wastes under the No Action Alternative.

4.13 Infrastructure, Transportation, and Utilities

4.13.1 Evaluation Criteria

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

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

Adverse impacts related to utilities/services would occur if a proposed action required more than the existing infrastructure could provide or required services in conflict with adopted plans and policies for the area.

4.13.2 Alternative A

Under Alternative A, 751 new personnel would be added to the Nellis AFB workforce, a 2-percent increase over the current number of military and civilian personnel who live and work on Base. As such, there would be no appreciable change in demand for utilities (i.e., electricity, sewer, natural gas). New facility construction would likely employ new energy-efficient hot water boilers and cooling systems to reduce the impact on the existing electrical infrastructure.

Overall, the addition of 751 personnel and their dependents under Alternative A would increase water usage. However, any effect on the availability of groundwater at Nellis AFB or in the surrounding areas would be minimal from increased usage associated with a 2-percent increase in military and civilian personnel, would be well below the Base's allotment, and would not require Nellis AFB to seek additional water rights. Cumulative impacts to drinking water are discussed in Section 5.3.13.

The addition of 751 personnel under Alternative A would increase traffic on Base and increase congestion at the various gates/access points at Nellis AFB. Nearby Las Vegas and Nellis Boulevards, Craig Road, and I-15 would be able to accommodate the anticipated increase in off-base traffic resulting from the increase in personnel. The increase in off-Base traffic would be negligible.

The Nellis AFB roadways would experience increased traffic levels associated with demolition/renovation/construction equipment; the increased levels may create congestion during peak traffic periods (i.e., morning and evening rush hours). Traffic levels on the Base would be moderate to high during these activities. Although implementation of Alternative A would impact existing transportation resources, such impacts would be temporary and localized. Nearby Las Vegas and Nellis Boulevards, Craig Road, and I-15 would be able to accommodate the anticipated temporary increase in traffic from demolition/renovation/construction activities.

4.13.3 Alternative B

Alternative B differs from Alternative A only in the demolition/renovation/construction activities at Nellis AFB, as described in **Sections 2.1.4.1** and **2.7**. All other proposed activities would be the same as under

Alternative A, including the number of personnel. As such, impacts under Alternative B would be the same as those described for Alternative A.

4.13.4 No Action Alternative

Under the No Action Alternative, no aircraft would be added to Nellis AFB, COCO ADAIR would not operate at Nellis AFB, and no demolition/renovation/construction activities would occur. There would be no changes to on-Base infrastructure, including utilities, water service, sewer systems, solid waste management, and transportation under the No Action Alternative.

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CHAPTER 5 CUMULATIVE IMPACTS AND OTHER ENVIRONMENTAL CONSIDERATIONS

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

5.1 Cumulative Effects

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

The baseline conditions at Nellis AFB and the SUA were discussed in **Chapter 3**. The potential for environmental consequences related to the proposed and alternative actions was addressed in **Chapter 4**. This section identifies and evaluates past, present, and reasonably foreseeable other projects that could cumulatively affect environmental resources in conjunction with these actions. The ROI for cumulative impacts analysis is the same as defined for each resource in **Chapter 4**. **Tables 5-1** and **5-2** identify past and future actions that have and could interact with resources analyzed in this EA, as noted in the tables.

Assessing cumulative effects begins with defining the scope of other actions and their potential interrelationship with the proposed and alternative actions. Other activities or projects that coincide with the location and timetable of the proposed actions 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 Nellis AFB and the SUA.

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 and alternative actions, these actions are included in this cumulative impacts analysis. This approach provides decision-makers with the most current information available so that they can evaluate the potential environmental consequences of the proposed and alternative actions.

5.2 Past, Present, and Reasonably Foreseeable Future Actions

The following past, present, and reasonably foreseeable actions by the Air Force on Nellis AFB as well as in the region and airspace were considered.

5.2.1 Air Force Actions

Recent past and ongoing military actions at Nellis AFB were considered as part of the baseline or existing condition in the ROI. Each project summarized in this section was reviewed to consider the implication of each action with the proposed and alternative actions. The analysis considered potential overlap in the affected area and project timing.

Nellis AFB is an active military installation that experiences continuous evolution of mission and operational requirements. Nellis AFB, like other major military installations, requires new construction, infrastructure improvements, and general maintenance. Routine projects are environmentally cleared using the Air Force’s Categorical Exclusion process (32 CFR § 989, Appendix B) and would continue to occur during operation of the proposed and alternative actions. In addition to these routine projects, the past, present, and reasonably foreseeable future major Air Force projects anticipated to occur on the Base are listed in **Table 5-1**.

Table 5-1.
Past, Present, Reasonably Foreseeable Future Projects

Scheduled Project	Project Summary	Location	Relevance to Proposed Action	Interaction with Resources
Past and Present Actions				
Construction in and around the airfield[a]	Construction of F-22 simulation facilities, a third LOLA and parking lot, UAV weapons school, information transfer node, shop addition, and maintenance facility; and expansion of the east side apron	Nellis AFB in and around the airfield	Existing conditions/activity would be in proximity to proposed actions	Air Quality, Socioeconomics – Income and Employment
Area Development Plans[a]	Implement Unaccompanied Housing Area Development Plan, Hospital Campus Plan, repair Dorm 782, construct active vehicle barrier at Beale avenue, upgrade entry control points and Security Forces operations facility	Nellis AFB in and around the housing community north of the airfield	Existing conditions/activity would be in proximity to proposed actions	Air Quality, Socioeconomics – Income and Employment
SCIF Addition[a]	Construction of SCIF addition and repair of interior of Building 1114	Nellis AFB north of the airfield and housing community	Existing conditions/activity would be in proximity to proposed actions	Air Quality, Socioeconomics – Income and Employment
F-35 Force Development Evaluation and Weapons School Beddown[b]	Basing 36 F-35 aircraft at Nellis AFB in a phased approach through 2020. Construction, demolition, and or modification of various Base facilities, particularly along the flight line	Nells AFB in and around the airfield NTTR and R-2508 for flight activities	Existing conditions/activity would be in proximity to proposed actions Increase in the baseline for the number of F-35s and sorties flown	Noise, Airspace, and Air Quality
Tactical Air Support Squadron Standup[b]	Transfer/assign up to 16 F-16C aircraft to Nellis AFB. Expand the east side ramp space, construct support facility, and relocate O'Bannon Road	Nellis AFB in and around the airfield NTTR and R-2508 for flight activities	Existing conditions/ activity would be in proximity to proposed actions Increase in the baseline for the number of F-16s and sorties flown	Noise, Airspace, and Air Quality
NTTR Withdrawal[b]	Withdraw and reserve public lands for military use to support utilization and modernization of the NTTR	NTTR	Action in proximity NTTR and the sorties flown there	Noise, Airspace, and Air Quality
Fire Management on NTTR[b]	Fire management, suppression, fuel treatment	NTTR	Chaff and flare potential impacts	Safety and Biological Resources

Scheduled Project	Project Summary	Location	Relevance to Proposed Action	Interaction with Resources
Future Actions				
Roadway construction and relocation in and around the airfield[a]	Realign Tyndall Avenue, Hollywood Boulevard, and perimeter and reroute traffic off taxiway; relocate petting zoo and Thunderbird Heritage Center; realign fence for public access; construct multipurpose maintenance facility, additional Red Flag Facility, and new Thunderbirds hangar	Nellis AFB in and around the airfield	Construction would overlap with proposed action implementation Impacts related to a change in traffic patterns	Traffic, Socioeconomics – Income and Employment
Construction, renovation, and demolition in housing community areas[a]	Repurpose BX and Commissary for Force Weapons School; construct new elementary school and Communications Support Center; reconfigure Main Gate; demolish Dunning Circle housing; relocate Family Camp; and make road improvements between Ellsworth Avenue and Beale Avenue	Nellis AFB in and around the housing community north of the airfield	Construction would overlap with Proposed Action implementation. Additional construction and impacts to Base housing	Socioeconomics
Construction in industrial area[a]	Construction of new Urban Assault Training Facility and 58 RQS HQ facility,	Nellis AFB industrial area north east of the airfield	Additional construction at Nellis AFB potentially impacting noise and personnel	Noise, Socioeconomics, and Air Quality.
Nellis Development of East side of the Runway	Expansion of the developed area of Nellis AFB to the eastern portion of the Base.	Nellis AFB in and around the airfield	Additional construction and impacts to Nellis AFB. Increase in the baseline for the number of F-35s.	Noise, Airspace, Air Quality, Land Use, Socioeconomics

Notes:
a. Source: Nellis AFB, 2018a
b. Source: Nellis AFB, 2017c
AFB= Air Force Base BX = Base Exchange; HQ = Headquarters; LOLA = Live Ordnance Loading Area; NTTR = Nevada Test and Training Range; RQS = ; SCIF = Sensitive Compartment Information Facility

Several sources were used to identify past, present, and reasonably foreseeable future actions. Sources include the July 2018 IDP (Nellis AFB, 2018a) the *Nevada Test and Training Range Land Withdrawal Legislative Environmental Impact Statement* (Nellis AFB, 2017c). The IDP is the primary source for cumulative effects information, as it describes Nellis AFB's past, present, and future physical state (Nellis AFB, 2018a). For the purposes of this EA, projects planned in the IDP for years 2015–2020 are considered present actions, and actions planned for 2021–2025 are considered future actions. IDP districts noted in the location column in **Table 5-1** are shown on **Figure 5-1**.

Future off-Base projects that may overlap in the potentially affected area or during project timing were also considered and are discussed in **Section 5.2.2**. Projects of limited scope (e.g., construction of individual buildings, minor roadway improvements) are not considered cumulatively significant and, therefore, were not included in this cumulative effects analysis. Similarly, due to the limited number of flights in the R-2508 Complex (1,095 total annual sorties), projects in that geographic area also are not considered cumulatively significant and were not included in this cumulative effects analysis.

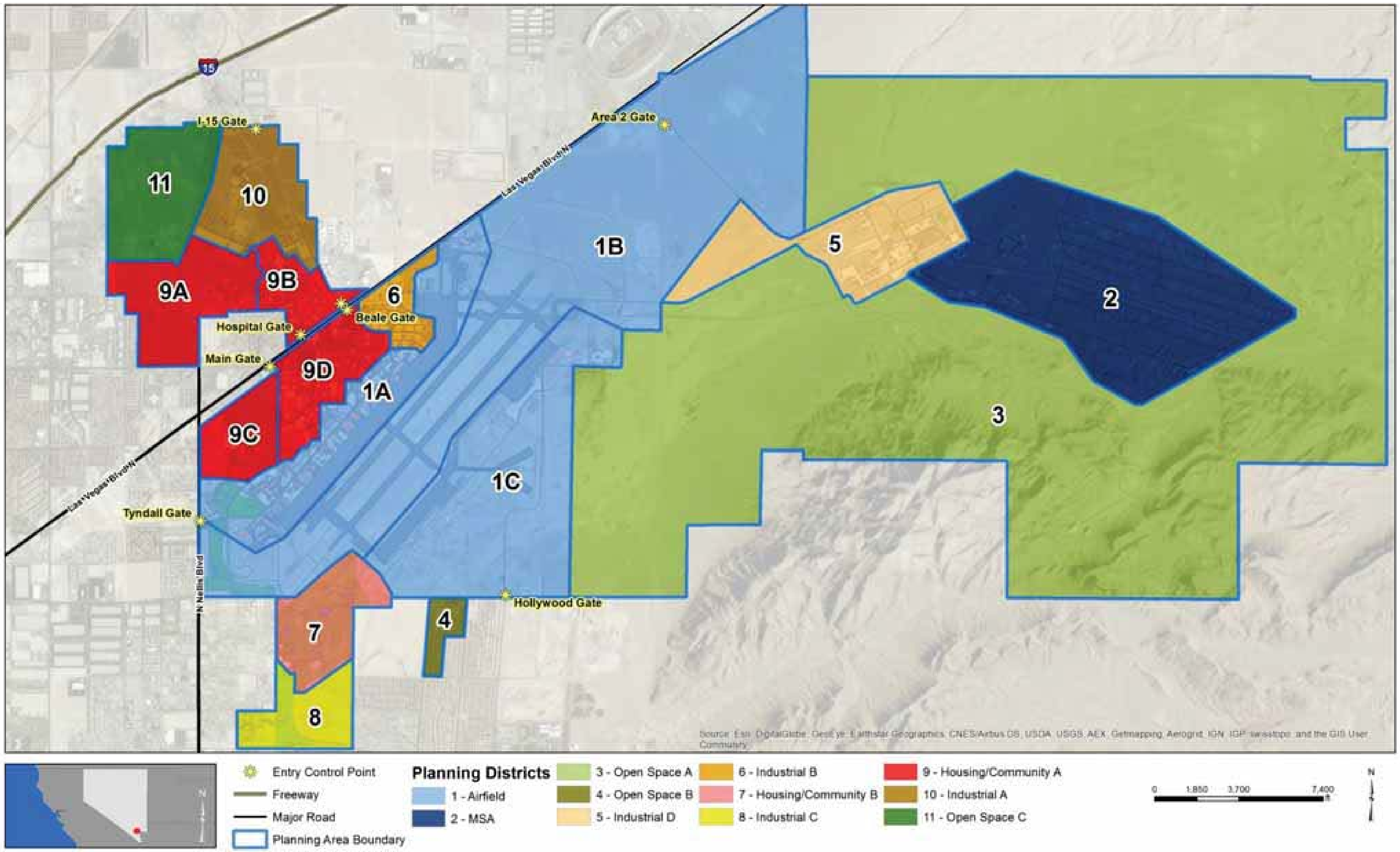

Figure 5-1. Nellis Air Force Base Planning Districts and Future Planning Areas (Source: Nellis AFB, 2018a)

5.2.2 Non-Federal Actions

Non-federal actions, such as new development or construction projects, occurring in the area surrounding Nellis AFB and the NTTR were considered for potential cumulative impacts and are listed in **Table 5-2**.

Table 5-2.
Non-Federal Past, Present, Reasonably Foreseeable Future Projects

Scheduled Project	Project Summary	Location	Relevance to Proposed Action	Interaction with Resources
Past/Present Actions				
Wastewater Recycling Facility	City of North Las Vegas construction of wastewater recycling facility	Nellis AFB	Existing conditions/activity would be in proximity to proposed actions Onsite development of utilities	Infrastructure
Roadway and drainage improvement projects	Roadway and drainage improvement projects are ongoing in and around the city of Las Vegas	Greater Las Vegas Area	Existing conditions/ activity would be in proximity to proposed actions	Infrastructure, Transportation, Utilities
Coyote Springs Nevada, LLC, Lincoln County[a]	Planned housing development of 42,000 acres in Lincoln County with 5 units per acre	East of NTTR and the Desert NWR	Existing conditions/ activity would be in proximity to proposed actions Population increase in the vicinity of the NTTR	Noise and Visual Resources
Lincoln County Industrial Park[a]	Industrial park on 217 acres along U.S. Highway 93	East of NTTR and south of Alamo, Nevada	Existing conditions/ activity would be in proximity to proposed actions	Noise and Visual Resources
Future Actions				
Roadway and drainage improvement projects	Roadway and drainage improvement projects are ongoing in and around the city of Las Vegas	Greater Las Vegas Area	Construction would overlap with proposed actions implementation	Infrastructure, Transportation, Utilities
Gemini solar and battery storage	Project is expected to produce 690 megawatts of electricity and is 11 square miles in size	Approximately 30 miles northeast of Las Vegas	Existing conditions/ activity would be in proximity to proposed actions	Land Use, Infrastructure

Notes:
a. Source: Nellis AFB, 2017c
NTTR = Nevada Test and Training Range; NWR = Nevada Wildlife Refuge

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 and alternative actions.

5.3.1 Airspace Management and Use

Cumulative impacts on airspace from the proposed and alternative actions, in addition to past, present, and reasonably foreseeable future actions is expected to be minor. The airspace proposed for use has the capacity and is in locations with the dimensions necessary to support the additional sorties for the proposed action and actions identified above.

5.3.2 Noise

The proposed and alternative actions, in addition to past, present, and reasonably foreseeable future actions on and off Nellis AFB would potentially result in negligible cumulative impacts related to airfield noise and negligible to minor cumulative impacts related to airspace noise. The additional F-35, F-22A, and COCO ADAIR aircraft operating at supersonic speeds means that the number of sonic booms in the SUA used by Nellis would increase; this increase is expected to be negligible in the proposed airspace compared to existing levels. Future actions have the potential to increase the number of F-35 sorties at Nellis AFB and subsequently increase the noise at Nellis AFB. Any increase in sorties beyond the scope of this EA would be reviewed and analyzed using this EA as the baseline. Since construction noise is localized to the construction sites and would be short term, no cumulative noise impacts are anticipated.

5.3.3 Safety

The proposed and alternative actions, in addition to past, present, and reasonably foreseeable future actions, is not expected to adversely impact ground safety, safety zones, explosive safety, and emergency response. If future actions increase the number of planes and sorties, flight safety could be impacted proportionally to the increase in operations. Future actions will need to be evaluated for impacts.

Fire management activities within NTTR would have long-term beneficial impacts with regard to safety. While the chance for wildfire from flare use is relatively small, given standard operating procedures for fire abatement within NTTR, the management of NTTR to reduce fuels would further lower the chances of wildland fire within the range. Fuel reduction would also reduce the chances of a severe wildland fire in the event of an aircraft crash or a malfunctioning flare. When added to past, present, and reasonably foreseeable future actions, the proposed and alternative actions would result in minimal increases of wildfire risk, Therefore, there would be no adverse cumulative impacts to safety.

5.3.4 Air Quality

Current and reasonably foreseeable projects that may be ongoing in the same timeframe as proposed and alternative actions include the construction in and around the airfield, the remaining beddown of 35 F-35 aircraft unrelated to the proposed and alternative actions, the assignment of F-16C aircraft to Nellis AFB not included in the proposed and alternative actions in this EA, and ongoing construction occurring throughout the Clark County and Las Vegas area. Any contribution of the proposed and alternative actions that could, in combination with past, present, and future activities, contribute to significant cumulative effects to air quality would be due to increases in annual CO, VOC, and NOx emissions from airfield operations and related activities and flight below the mixing height in the Clark County region.

To assess these emissions, this analysis used the Clark County criteria pollutant inventory (USEPA, 2020a). Under the Proposed Action, CO emissions were estimated to increase the Clark County region emissions by 0.04 percent; NOx emissions by approximately 0.25 percent; and VOC emissions by 0.03 percent. Based on these data, it is reasonable to conclude that implementation of the proposed and alternative actions is not likely to result in significant impacts when combined with past, present, and future activities in the region. While CO emissions are below *de minimus* thresholds, they are within 1.5 tons of the threshold. Future actions will need to be evaluated with ACAM to ensure that they are under *de minimus* thresholds.

5.3.5 Biological Resources

The proposed and alternative action, in addition to past, present, and reasonably foreseeable future actions on and off Nellis AFB, would result in negligible impacts to biological resources. Construction activities would occur west of the runway in previously disturbed areas with minimal natural resources present. Future actions could impact undeveloped land east of the runways, potentially impacting desert tortoises. Activities related to the Nellis Development of East side of the Runway will need to be evaluated in the future. The additional sorties and training actions under the Proposed Action would be an insignificant addition to the activities already occurring at Nellis AFB, NTTR, and the R-2508 Complex. When added to past, present, and foreseeable future actions, the proposed and alternative actions would result in minimal increases in BASH risk, wildfire risk, and noise disturbance to wildlife. These actions are not expected to result in any adverse effects on threatened and endangered species. As such, no significant cumulative effects on biological resources is expected.

5.3.6 Water Resources

The proposed and alternative action, in addition to past, present, and reasonably foreseeable future actions, is not expected to adversely impact water resources at Nellis AFB, NTTR, or the R-2508 Complex. Construction activities would only occur at Nellis AFB in previously disturbed areas lacking surface water resources. The proposed and alternative actions would result in minimal amounts of flare materials being deposited in wetland areas in NTTR/R-2508, but these are expected to be widely spread across the landscape and would not result in any significant accumulations or effects. Future actions involving an increase in sorties in NTTR/R-2508 will be evaluated but are expected to be similar in terms of the impacts described in this EA for the proposed and alternative action. As such, cumulative impacts to water resources from the proposed and alternative actions would not be significant.

5.3.7 Soils

The proposed and alternative action, in addition to the past, present, and reasonably foreseeable future actions, would have negligible cumulative effects to soils during new construction and demolition activities, which would occur in previously disturbed areas. BMPs and compliance with permits would minimize the cumulative effect on soils. Expansion of Nellis AFB on the eastern side of the base could have the potential to impact soils and will need to be evaluated.

The proposed and alternative actions, in addition to past, present, and reasonably foreseeable future actions, would result in the release of additional flares from current conditions; however, due to the wide dispersal over time and space of the flare constituents, no direct effects to soils are expected. The potential for impacts on soil productivity from wildfire, or any potential impacts associated with emergency fuel dumps, are minimal. Therefore, cumulative effects to soils from the proposed and alternative actions when added to the past, present, and reasonably foreseeable future projects are not anticipated.

5.3.8 Land Use

The proposed and alternative action, in addition to past, present, and reasonably foreseeable future actions, is not expected to have significant land use impacts. Other ongoing and planned construction projects, such as the beddown of the F-35 aircraft or the various capital improvement projects, would be adjacent to the proposed TASS MILCON and O&M projects. These projects would likely change specific land uses on Nellis AFB; however, the overall land use as a military installation would remain unchanged. Construction at each of the proposed TASS project sites would result in minor impacts due to compliance with the current Area Development Plan. Therefore, cumulative land use impacts on Nellis AFB would not be significant.

5.3.9 Socioeconomics

The proposed and alternative action, in addition to past, present, and reasonably foreseeable future actions on and off Nellis AFB, would not result in an adverse cumulative impact to the region's population, employment, housing, or educational opportunities. Construction and demolition projects would result in a cumulative beneficial impact, as local sales and payroll taxes would increase. Expenditures associated with the purchase of additional fighter aircraft, annual maintenance costs, and additional expenditures to support the program would result in a major beneficial cumulative socioeconomic impact to the local economy.

5.3.10 Environmental Justice and Protection of Children

The proposed and alternative action, in addition to past, present, and reasonably foreseeable future actions on and off Nellis AFB, are not expected to have a disproportionate cumulative impact on minority and low-income populations or children. The addition of COCO ADAIR aircraft and future proposed activities would increase the number of annual sorties and subsequently cause a long-term, minor noise increase for both subsonic and supersonic operations; however, this increase is expected to be negligible compared to current conditions. Therefore, no cumulative effect to minority and low-income populations or children are anticipated.

5.3.11 Cultural Resources

The proposed and alternative action would result in impacts to several existing buildings, none of which have been determined to impact cultural resources. For the Nellis Development of East side of the Runway, a cultural survey was conducted on previously undisturbed land and no cultural resources were identified. Impacts to existing cultural resources from development on the east side have not been determined because development plans are not yet in place. Therefore, the proposed and alternative action, in addition to past, present, and reasonably foreseeable future actions on and off Nellis AFB, are not anticipated to result in incremental cumulative impacts to cultural resources, archaeological resources, historic resources, or Native American TCPs.

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

The proposed and alternative action would result in negligible impacts related to hazardous materials and wastes; therefore, there would be no cumulative impacts. Additional facility construction in the future, specifically buildings in the eastern portion of Nellis AFB, will need to be evaluated for impacts to hazardous materials and wastes.

5.3.13 Infrastructure, Transportation, and Utilities

The proposed and alternative action would result in negligible impacts related to utilities and infrastructure; therefore, there would be no cumulative impacts.

Increased growth within the Las Vegas area under the proposed and alternative action is expected to result in a similar increase in regional population resulting in potential impacts to utility usage and traffic. Future actions with the potential to increase water usage at Nellis AFB will be evaluated in context of the growing regional population. The Colorado River Basin is experiencing the worst drought in recorded history. Since 2000, snowfall and runoff into the basin have been well below normal. These conditions have resulted in significant water level declines at major system reservoirs, including Lake Mead and Lake Powell. Drought conditions are expected to continue in the future.

Based on the increase of personnel planned for Nellis AFB, there would be minimal impacts to traffic off Base, while there would be increased traffic and congestion at the entry gates and within Nellis AFB.

5.4 RELATIONSHIP BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

CEQ regulations (40 CFR § 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 Action compared to the long-term productivity derived from not pursuing the Proposed Action.

Short-term effects to the environment are generally defined as a direct consequence of a project in its immediate vicinity. For example, short-term effects could include localized disruptions from construction. Environmental commitments and BMPs in place for each project should reduce potential impacts or disruptions. Under the Proposed Action, these short-term uses would have a negligible cumulative effect.

The Proposed Action involves the conduct of training sorties in the SUA. There would be no short-term effects to the airspace used by the additional aircraft and, therefore, would not adversely affect the long-term productivity and future us of the airspace. The Proposed Action also includes elements affecting the Base, such as the demolition, renovation, and construction of facilities and the personnel to undertake such activities. 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 timeframe. 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 aircraft activities and would not result in an irreversible and irretrievable commitment of airspace resources; however, the Proposed Action calls for an additional 5,476 sorties, which represent an increase of 20 percent in the number of operations. As such, flight operations and training would result in the consumption of additional fuel, which increases the irreversible and irretrievable commitment of fuels. The addition of 751 personnel to support the Proposed Action also would create additional fuel consumption from daily commute travel to and from Nellis AFB. Consumption of fuel associated with the Proposed Action, in addition to the total use of available fuels, is expected to result in a negligible decrease to the overall supply of regional petroleum resources. No significant irreversible or irretrievable commitment of resources is anticipated from implementing the Proposed Action.

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APPENDIX A.
INTERAGENCY AND INTERGOVERNMENTAL AGENCY COORDINATION AND CONSULTATION

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Appendix A-1
Interagency and Intergovernmental Coordination for Environmental Planning – Description of Proposed Action and Alternatives

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Sample Coordination Letters

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DEPARTMENT OF THE AIR FORCE
99TH CIVIL ENGINEER SQUADRON (ACC)
NELLIS AIR FORCE BASE, NEVADA

Douglas C. Fitzpatrick
Deputy Base Civil Engineer, 99 CES
6020 Beale Ave.
Nellis AFB, NV 89191

Rebecca Palmer
State Historic Preservation Officer
Nevada State Historic Preservation Office
901 S. Stewart St., Suite 5004
Carson City, NV 89701

Subject: Introduction of the Proposed Addition of Seventeen (17) F-35A Joint Strike Fighters, Three (3) F-22As, and Contractor-Owned Contractor-Operated Adversary Air (COCO ADAIR) at Nellis Air Force Base (AFB)

Dear Ms. Palmer,

The purpose of this letter is twofold: to give you an opportunity to review and comment on a proposed action in which the State Historic Preservation Office (SHPO) may have an interest, and to initiate consultation pursuant to Section 106 of the National Historic Preservation Act (NHPA) and 36 Code of Federal Regulations (CFR) Section 800.3.

The United States Air Force (USAF) is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) to evaluate the potential impacts associated with the addition of seventeen (17) F-35A Joint Strike Fighters, three (3) F-22As, and contractor-owned contractor-operated Adversary Air (COCO ADAIR) at Nellis AFB. Facility construction, demolition, renovation, addition, as well as an increase in personnel would be necessary to support the proposed actions. Pursuant to 36 CFR Sections 800.4(a) and (b), we request your assistance defining the Area of Potential Effects (APE) and information on any historic properties located therein that may be affected by our undertaking. Location maps are attached for your review.

The overall purpose of the proposed actions is to improve test, training and tactics development capabilities at Nellis AFB to keep pace with USAF mission requirements, evolving technology and enemy capabilities. This purpose would be achieved through implementation of several supporting actions. These supporting actions include the addition of F-35A Joint Strike Fighter aircraft, the addition of F-22A aircraft, and operation of COCO ADAIR.

Construction, demolition, renovation, and addition would be necessary to support the additional F-35A aircraft. There would be two facility options for the additional F-35A aircraft depending upon the availability of military construction (MILCON) funding. Preliminary investigation indicates that none of the structures planned for demolition, renovation, or addition are eligible for or listed on the National Register of Historic Places (NRHP). No construction or renovation is needed to support the F-22A aircraft or COCO ADAIR. Together, the components of the action would add 751 personnel at Nellis AFB (479 personnel for the addition of 17 F-35As, 32 personnel for the reassignment of three F-22As and 240 personnel to support COCO ADAIR). Details of the preliminary proposed and alternative action are included in the attached Summary of the Description of the Proposed Action and Alternatives.

The EA will assess the potential environmental consequences associated with the proposed action and no action alternative. Potential impacts identified during the initial planning stages include effects on noise, air quality, infrastructure/utilities, biological and cultural resources, and socioeconomic resources. The EA will also examine the cumulative effects when combined with past, present, and any reasonably foreseeable future actions. In support of this process, we request your input in identifying general or specific issues or areas of concern you believe should be addressed in the EA.

We intend to provide your agency with a copy of the Draft EA when the document is completed. Please inform us if additional copies are needed or if someone else within your agency other than you should receive the Draft EA. We will also provide you with a 36 CFR 800.4 effects determination after we have completed the historic property identification process.

Please reach out to my point of contact, provided below on any issues or concerns you have in the development of this EA. We ask your assistance in identifying any issues or concerns of which we may be unaware, particularly those that may be affected by this proposal.

The USAF Point of Contact for Environmental Planning is Mr. Tod Oppenborn. Please send him your comments and concerns to 6020 Beale Ave., Nellis AFB, NV, 89191, or by email or phone at tod.oppenborn@us.af.mil or (702) 652-9366. I look forward to receiving any input you may have regarding this endeavor. Thank you in advance for your assistance in this effort.

Sincerely

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DOUGLAS C. FITZPATRICK, Architect, DAF
Deputy Base Civil Engineer

Attachment:
Summary of the Description of the Proposed Action and Alternatives

DEPARTMENT OF THE AIR FORCE
99TH CIVIL ENGINEER SQUADRON (ACC)
NELLIS AIR FORCE BASE, NEVADA

August 24, 2020

99 CES/CENP
6020 Beale Avenue
Nellis AFB, NV 89191-6520

U.S. Department of the Interior Fish and Wildlife Service - Ventura Field Office
2493 Portola Road, Suite B
Ventura,CA 93003-7726

Subject: Introduction of the Proposed Addition of Seventeen (17) F-35A Joint Strike Fighters, Three (3) F-22As, and Contractor-Owned Contractor-Operated Adversary Air (COCO ADAIR) at Nellis Air Force Base (AFB)

Dear Sir/Madam,

The purpose of this letter is twofold: to give you an opportunity to review and comment on a proposed action in which the United States Fish and Wildlife Services (USFWS) may have an interest, and, pursuant to 50 Code of Federal Regulations (CFR) § 402.12(c), request a list of Federally-listed species that may be present in the action area.

The United States Air Force (USAF) is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) to evaluate the potential impacts associated with the addition of seventeen (17) F-35A Joint Strike Fighters, three (3) F-22As, and contractor-owned contractor-operated Adversary Air (COCO ADAIR) at Nellis AFB. Facility construction, demolition, renovation, addition, as well as an increase in personnel would be necessary to support the proposed actions. Taking into account various environmental concerns, the USAF is engaging early with the appropriate resource and regulatory agencies as it formulates the undertaking. Therefore, we request additional information on what listed, proposed, and candidate species or designated or proposed critical habitats may be in the proposed action area. Location maps are attached for your review. This information and your comments on the proposed action will help us develop the scope of our environmental review.

The overall purpose of the proposed actions is to improve test, training and tactics development capabilities at Nellis AFB to keep pace with USAF mission requirements, evolving technology and enemy capabilities. This purpose would be achieved through implementation of several supporting actions. These supporting actions include the addition of F-35A Joint Strike Fighter aircraft, the addition of F-22A aircraft, and operation of COCO ADAIR.

Construction, demolition, renovation, and addition would be necessary to support the additional F-35A aircraft. There would be two facility options for the additional F-35A aircraft depending upon the availability of military construction (MILCON) funding. No construction or renovation is needed to support the F-22A aircraft or COCO ADAIR. Together, the components of the action would add 751 personnel at Nellis AFB (479 personnel for the addition of 17 F-35As, 32 personnel for the reassignment of three F-22As and 240 personnel to support COCO ADAIR). Details of the preliminary proposed and alternative action are included in the attached Summary of the Description of the Proposed Action and Alternatives.

The EA will assess the potential environmental consequences associated with the proposed action and no action alternative. Potential impacts identified during the initial planning stages include effects on noise, air quality, infrastructure/utilities, biological and cultural resources, and socioeconomic resources. The EA will also examine the cumulative effects when combined with past, present, and any reasonably foreseeable future actions. In support of this process, we request your input in identifying general or specific issues or areas of concern you believe should be addressed in the EA.

We intend to provide your agency with a copy of the Draft EA when the document is completed. Please inform us if additional copies are needed or if someone else within your agency other than you should receive the Draft EA.

Please provide the species list to my point of contact identified below and advise him of any issues or concerns that you believe we should address in the development of this EA.

The USAF Point of Contact for Environmental Planning is Mr. Tod Oppenborn. Please send him your comments and concerns to 6020 Beale Ave., Nellis AFB, NV, 89191, or by email or phone at tod.oppenborn@us.af.mil or (702) 652-9366. I look forward to receiving any input you may have regarding this endeavor. Thank you in advance for your assistance in this effort.

Sincerely,

CHARLES W. ROWLAND JR.
Chief, Portfolio Optimization

Attachment:
Summary of the Description of the Proposed Action and Alternatives

DEPARTMENT OF THE AIR FORCE
99TH CIVIL ENGINEER SQUADRON (ACC)
NELLIS AIR FORCE BASE, NEVADA

99 CES/CENP
6020 Beale Avenue
Nellis AFB, NV 89191-6520

August 24, 2020

Field Station Manager
US Geological Survey - Las Vegas Field Station
160 N. Stephanie Street
Henderson, NV 89074

Dear Sir/Madam,

The United States Air Force (USAF) is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) to evaluate the potential impacts associated with the addition of seventeen (17) F-35A Joint Strike Fighters, three (3) F-22As, and operation of contractor-owned contractor-operated Adversary Air (COCO ADAIR) at Nellis Air Force Base (AFB). Facility construction, demolition, renovation, addition, as well as an increase in personnel would be necessary to support the actions. Taking into account various environmental concerns, the USAF is engaging early with the appropriate resource and regulatory agencies as it formulates the undertaking. Accordingly, the USAF seeks consultation with your office.

The overall purpose of the proposed actions is to improve test, training and tactics development capabilities at Nellis AFB to keep pace with USAF mission requirements, evolving technology and enemy capabilities. This purpose would be achieved through implementation of several supporting actions. These supporting actions include the addition of F-35A Joint Strike Fighter aircraft, the addition of F-22A aircraft, and operation of COCO ADAIR.

Construction, demolition, renovation, and addition would be necessary to support the additional F-35A aircraft. There would be two facility options for the additional F-35A aircraft depending upon the availably of military construction (MILCON) funding. No construction or renovation is needed to support the F-22A aircraft or COCO ADAIR. Together, the components of the action would add 751 personnel at Nellis AFB (479 personnel for the addition of 17 F-35As, 32 personnel for the reassignment of three F-22As and 240 personnel to support COCO ADAIR). Details of the preliminary proposed and alternative action are included in the attached Summary of the Description of the Proposed Action and Alternatives.

The EA will assess the potential environmental consequences associated with the proposed action and no action alternative. Potential impacts identified during the initial planning stages include effects on noise, air quality, infrastructure/utilities, biological and cultural resources, and socioeconomic resources. The EA will also examine the cumulative effects when combined with past, present, and any reasonably foreseeable future actions. In support of this process, we request your input in identifying general or specific issues or areas of concern you believe should be addressed in the EA.

We intend to provide your agency with a copy of the Draft EA when the document is completed. Please inform us if additional copies are needed or if someone else within your agency other than you should receive the Draft EA.

Please reach out to my point of contact, provided below on any issues or concerns you have in the development of this EA. We ask your assistance in identifying any issues or concerns of which we may be unaware, particularly those that may be affected by this proposal.

The USAF Point of Contact for Environmental Planning is Mr. Tod Oppenborn. Please send him your comments and concerns to 6020 Beale Ave., Nellis AFB, NV, 89191, or by email or phone at tod.oppenborn@us.af.mil or (702) 652-9366. I look forward to receiving any input you may have regarding this endeavor. Thank you in advance for your assistance in this effort.

Sincerely,

CHARLES W. ROWLAND JR.
Chief, Portfolio Optimization

Attachment:
Summary of the Description of the Proposed Action and Alternatives

Government to Government Coordination Letters

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DEPARTMENT OF THE AIR FORCE
99TH CIVIL ENGINEER SQUADRON (ACC)
NELLIS AIR FORCE BASE, NEVADA

Douglas C. Fitzpatrick
Deputy Base Civil Engineer, 99 CES
6020 Beale Ave.
Nellis AFB, NV 89191

Allen Summers
Chairperson
Bishop Paiute Tribe
50 Tusu Lane
Bishop, CA 93514

Subject: Introduction of the Proposed Addition of Seventeen (17) F-35A Joint Strike Fighters, Three (3) F-22As, and Contractor-Owned Contractor-Operated Adversary Air (COCO ADAIR); and Section 106 Consultation Invitation for Nellis Air Force Base (AFB)

Dear Chairperson Summers

The purpose of this letter is twofold: to give you an opportunity to review and comment on a proposed action in which the Bishop Paiute Tribe may have an interest, and to invite the Bishop Paiute Tribe to participate in government-to-government consultation with the United States Air Force (USAF) pursuant to Section 106 of the National Historic Preservation Act (NHPA).

The USAF is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) to evaluate the potential impacts associated with the addition of seventeen (17) F-35A Joint Strike Fighters, three (3) F-22As, and contractor-owned contractor-operated Adversary AIR (COCO ADAIR) at Nellis AFB. Facility construction, demolition, renovation, addition, as well as an increase in personnel would be necessary to support the proposed actions.

Pursuant to Section 106 of the NHPA, implementing regulations at 36 Code of Federal Regulations (CFR) Part 800, and Department of Defense (DoD) Instruction 4710.02 Section 6, *DoD Interactions with Federally-Recognized Tribes*, we request government-to-government consultation on this proposed action. In particular, we invite you, pursuant to 36 CFR Section 800.4(a)(4), to provide information on any properties of historic, religious, or cultural significance that may be affected by our proposed undertaking. Regardless of whether the Bishop Paiute Tribe chooses to consult on this project, the USAF will comply with the Native American Graves Protection and Repatriation Act by informing you of any inadvertent discovery of archaeological or human remains and consulting on their disposition. Being defined as a federal undertaking, we will be seeking input and inviting other potential consulting parties, such as the Nevada State Historic Preservation Office (SHPO).

The overall purpose of the proposed actions is to improve test, training and tactics development capabilities at Nellis AFB to keep pace with USAF mission requirements, evolving technology and enemy capabilities. This purpose would be achieved through implementation of several supporting actions. These supporting actions include the addition of F-35A Joint Strike Fighter aircraft, the addition of F-22A aircraft, and operation of COCO ADAIR.

Construction, demolition, renovation, and addition would be necessary to support the additional F-35A aircraft. There would be two facility options for the additional F-35A aircraft depending upon the availability of military construction (MILCON) funding. No construction or renovation is needed to support the F-22A aircraft or COCO ADAIR. Together, the components of the action would add 751 personnel at Nellis AFB (479 personnel for the addition of 17 F-35As, 32 personnel for the reassignment of three F-22As and 240 personnel to support COCO ADAIR). Details of the preliminary proposed and alternative action are included in the attached Summary of the Description of the Proposed Action and Alternatives.

The EA will assess the potential environmental consequences associated with the proposed action and no action alternative. Potential impacts identified during the initial planning stages include effects on noise, air quality, infrastructure/utilities, biological and cultural resources, and socioeconomic resources. The EA will also examine the cumulative effects when combined with past, present, and any reasonably foreseeable future actions. In support of this process, we request your input in identifying general or specific issues or areas of concern you believe should be addressed in the EA.

We intend to provide your government with a copy of the Draft EA when the document is completed. Please inform us if additional copies are needed or if someone else within your government other than you should receive the Draft EA.

Please reach out to my point of contact, provided below on any issues or concerns you have in the development of this EA. We ask your assistance in identifying any issues or concerns of which we may be unaware, particularly those that may be affected by this proposal.

The USAF Point of Contact is Ms. Kish LaPierre. Please send her your comments and concerns to 6020 Beale Ave., Nellis AFB, NV, 89191, or by email or phone at kish.lapierre@us.af.mil or (702) 652-5813. I look forward to receiving any input you may have regarding this endeavor. Thank you in advance for your assistance in this effort.

Sincerely

FITZPATRICK.DOUGLAS.C.1159071177 Digitally signed by FITZPATRICK.DOUGLAS.C.1159071177 Date: 2020.07.20 08:47:32 -07'00'

DOUGLAS C. FITZPATRICK, Architect, DAF
Deputy Base Civil Engineer

Attachment:
Summary of the Description of the Proposed Action and Alternatives

DEPARTMENT OF THE AIR FORCE
99TH CIVIL ENGINEER SQUADRON (ACC)
NELLIS AIR FORCE BASE, NEVADA

Douglas C. Fitzpatrick
Deputy Base Civil Engineer, 99 CES
6020 Beale Ave.
Nellis AFB, NV 89191

Charles Wood
Chairperson
Chemehuevi Indian Tribe
P.O. Box 1976
Havasu Lake, CA 92363

Subject: Introduction of the Proposed Addition of Seventeen (17) F-35A Joint Strike Fighters, Three (3) F-22As, and Contractor-Owned Contractor-Operated Adversary Air (COCO ADAIR); and Section 106 Consultation Invitation for Nellis Air Force Base (AFB)

Dear Chairperson Wood

The purpose of this letter is twofold: to give you an opportunity to review and comment on a proposed action in which the Chemehuevi Indian Tribe may have an interest, and to invite the Chemehuevi Indian Tribe to participate in government-to-government consultation with the United States Air Force (USAF) pursuant to Section 106 of the National Historic Preservation Act (NHPA).

The USAF is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) to evaluate the potential impacts associated with the addition of seventeen (17) F-35A Joint Strike Fighters, three (3) F-22As, and contractor-owned contractor-operated Adversary AIR (COCO ADAIR) at Nellis AFB. Facility construction, demolition, renovation, addition, as well as an increase in personnel would be necessary to support the proposed actions.

Pursuant to Section 106 of the NHPA, implementing regulations at 36 Code of Federal Regulations (CFR) Part 800, and Department of Defense (DoD) Instruction 4710.02 Section 6, *DoD Interactions with Federally-Recognized Tribes*, we request government-to-government consultation on this proposed action. In particular, we invite you, pursuant to 36 CFR Section 800.4(a)(4), to provide information on any properties of historic, religious, or cultural significance that may be affected by our proposed undertaking. Regardless of whether the Chemehuevi Indian Tribe chooses to consult on this project, the USAF will comply with the Native American Graves Protection and Repatriation Act by informing you of any inadvertent discovery of archaeological or human remains and consulting on their disposition. Being defined as a federal undertaking, we will be seeking input and inviting other potential consulting parties, such as the Nevada State Historic Preservation Office (SHPO).

The overall purpose of the proposed actions is to improve test, training and tactics development capabilities at Nellis AFB to keep pace with USAF mission requirements, evolving technology and enemy capabilities. This purpose would be achieved through implementation of several supporting actions. These supporting actions include the addition of F-35A Joint Strike Fighter aircraft, the addition of F-22A aircraft, and operation of COCO ADAIR.

Construction, demolition, renovation, and addition would be necessary to support the additional F-35A aircraft. There would be two facility options for the additional F-35A aircraft depending upon the availability of military construction (MILCON) funding. No construction or renovation is needed to support the F-22A aircraft or COCO ADAIR. Together, the components of the action would add 751 personnel at Nellis AFB (479 personnel for the addition of 17 F-35As, 32 personnel for the reassignment of three F-22As and 240 personnel to support COCO ADAIR). Details of the preliminary proposed and alternative action are included in the attached Summary of the Description of the Proposed Action and Alternatives.

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Please reach out to my point of contact, provided below on any issues or concerns you have in the development of this EA. We ask your assistance in identifying any issues or concerns of which we may be unaware, particularly those that may be affected by this proposal.

The USAF Point of Contact is Ms. Kish LaPierre. Please send her your comments and concerns to 6020 Beale Ave., Nellis AFB, NV, 89191, or by email or phone at kish.lapierre@us.af.mil or (702) 652-5813. I look forward to receiving any input you may have regarding this endeavor. Thank you in advance for your assistance in this effort.

Sincerely

FITZPATRICK.DOUGLAS.C.1159071177 Digitally signed by FITZPATRICK.DOUGLAS.C.1159071177 Date: 2020.07.20 08:47:32 -07'00'

DOUGLAS C. FITZPATRICK, Architect, DAF
Deputy Base Civil Engineer

Attachment:
Summary of the Description of the Proposed Action and Alternatives

DEPARTMENT OF THE AIR FORCE
99TH CIVIL ENGINEER SQUADRON (ACC)
NELLIS AIR FORCE BASE, NEVADA

Douglas C. Fitzpatrick
Deputy Base Civil Engineer, 99 CES
6020 Beale Ave.
Nellis AFB, NV 89191

Dennis Patch
Chairperson
Colorado River Indian Tribes
26600 Mohave Road
Parker, AZ 85344

Subject: Introduction of the Proposed Addition of Seventeen (17) F-35A Joint Strike Fighters, Three (3) F-22As, and Contractor-Owned Contractor-Operated Adversary Air (COCO ADAIR); and Section 106 Consultation Invitation for Nellis Air Force Base (AFB)

Dear Chairperson Patch

The purpose of this letter is twofold: to give you an opportunity to review and comment on a proposed action in which the Colorado River Indian Tribes may have an interest, and to invite the Colorado River Indian Tribes to participate in government-to-government consultation with the United States Air Force (USAF) pursuant to Section 106 of the National Historic Preservation Act (NHPA).

The USAF is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) to evaluate the potential impacts associated with the addition of seventeen (17) F-35A Joint Strike Fighters, three (3) F-22As, and contractor-owned contractor-operated Adversary AIR (COCO ADAIR) at Nellis AFB. Facility construction, demolition, renovation, addition, as well as an increase in personnel would be necessary to support the proposed actions.

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NELLIS AIR FORCE BASE, NEVADA

Douglas C. Fitzpatrick
Deputy Base Civil Engineer, 99 CES
6020 Beale Ave.
Nellis AFB, NV 89191

Rodney Mike
Chairperson
Duckwater Shoshone Tribe
P.O. Box 140068
Duckwater, NV 89314

Subject: Introduction of the Proposed Addition of Seventeen (17) F-35A Joint Strike Fighters, Three (3) F-22As, and Contractor-Owned Contractor-Operated Adversary Air (COCO ADAIR); and Section 106 Consultation Invitation for Nellis Air Force Base (AFB)

Dear Chairperson Mike

The purpose of this letter is twofold: to give you an opportunity to review and comment on a proposed action in which the Duckwater Shoshone Tribe may have an interest, and to invite the Duckwater Shoshone Tribe to participate in government-to-government consultation with the United States Air Force (USAF) pursuant to Section 106 of the National Historic Preservation Act (NHPA).

The USAF is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) to evaluate the potential impacts associated with the addition of seventeen (17) F-35A Joint Strike Fighters, three (3) F-22As, and contractor-owned contractor-operated Adversary AIR (COCO ADAIR) at Nellis AFB. Facility construction, demolition, renovation, addition, as well as an increase in personnel would be necessary to support the proposed actions.

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The overall purpose of the proposed actions is to improve test, training and tactics development capabilities at Nellis AFB to keep pace with USAF mission requirements, evolving technology and enemy capabilities. This purpose would be achieved through implementation of several supporting actions. These supporting actions include the addition of F-35A Joint Strike Fighter aircraft, the addition of F-22A aircraft, and operation of COCO ADAIR.

Construction, demolition, renovation, and addition would be necessary to support the additional F-35A aircraft. There would be two facility options for the additional F-35A aircraft depending upon the availability of military construction (MILCON) funding. No construction or renovation is needed to support the F-22A aircraft or COCO ADAIR. Together, the components of the action would add 751 personnel at Nellis AFB (479 personnel for the addition of 17 F-35As, 32 personnel for the reassignment of three F-22As and 240 personnel to support COCO ADAIR). Details of the preliminary proposed and alternative action are included in the attached Summary of the Description of the Proposed Action and Alternatives.

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Deputy Base Civil Engineer

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99TH CIVIL ENGINEER SQUADRON (ACC)
NELLIS AIR FORCE BASE, NEVADA

Douglas C. Fitzpatrick
Deputy Base Civil Engineer, 99 CES
6020 Beale Ave.
Nellis AFB, NV 89191

Diana Buckner
Chairwoman
Ely Shoshone Tribe
250 Heritage Drive #B
Ely, NV 89301

Subject: Introduction of the Proposed Addition of Seventeen (17) F-35A Joint Strike Fighters, Three (3) F-22As, and Contractor-Owned Contractor-Operated Adversary Air (COCO ADAIR); and Section 106 Consultation Invitation for Nellis Air Force Base (AFB)

Dear Chairwoman Buckner

The purpose of this letter is twofold: to give you an opportunity to review and comment on a proposed action in which the Ely Shoshone Tribe may have an interest, and to invite the Ely Shoshone Tribe to participate in government-to-government consultation with the United States Air Force (USAF) pursuant to Section 106 of the National Historic Preservation Act (NHPA).

The USAF is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) to evaluate the potential impacts associated with the addition of seventeen (17) F-35A Joint Strike Fighters, three (3) F-22As, and contractor-owned contractor-operated Adversary AIR (COCO ADAIR) at Nellis AFB. Facility construction, demolition, renovation, addition, as well as an increase in personnel would be necessary to support the proposed actions.

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The overall purpose of the proposed actions is to improve test, training and tactics development capabilities at Nellis AFB to keep pace with USAF mission requirements, evolving technology and enemy capabilities. This purpose would be achieved through implementation of several supporting actions. These supporting actions include the addition of F-35A Joint Strike Fighter aircraft, the addition of F-22A aircraft, and operation of COCO ADAIR.

Construction, demolition, renovation, and addition would be necessary to support the additional F-35A aircraft. There would be two facility options for the additional F-35A aircraft depending upon the availability of military construction (MILCON) funding. No construction or renovation is needed to support the F-22A aircraft or COCO ADAIR. Together, the components of the action would add 751 personnel at Nellis AFB (479 personnel for the addition of 17 F-35As, 32 personnel for the reassignment of three F-22As and 240 personnel to support COCO ADAIR). Details of the preliminary proposed and alternative action are included in the attached Summary of the Description of the Proposed Action and Alternatives.

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Please reach out to my point of contact, provided below on any issues or concerns you have in the development of this EA. We ask your assistance in identifying any issues or concerns of which we may be unaware, particularly those that may be affected by this proposal.

The USAF Point of Contact is Ms. Kish LaPierre. Please send her your comments and concerns to 6020 Beale Ave., Nellis AFB, NV, 89191, or by email or phone at kish.lapierre@us.af.mil or (702) 652-5813. I look forward to receiving any input you may have regarding this endeavor. Thank you in advance for your assistance in this effort.

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99TH CIVIL ENGINEER SQUADRON (ACC)
NELLIS AIR FORCE BASE, NEVADA

Douglas C. Fitzpatrick
Deputy Base Civil Engineer, 99 CES
6020 Beale Ave.
Nellis AFB, NV 89191

Carl Dahlberg
Chairperson
Fort Independence Indian Tribe
P.O. Box 67
Independence, CA 93526

Subject: Introduction of the Proposed Addition of Seventeen (17) F-35A Joint Strike Fighters, Three (3) F-22As, and Contractor-Owned Contractor-Operated Adversary Air (COCO ADAIR); and Section 106 Consultation Invitation for Nellis Air Force Base (AFB)

Dear Chairperson Dahlberg

The purpose of this letter is twofold: to give you an opportunity to review and comment on a proposed action in which the Fort Independence Indian Tribe may have an interest, and to invite the Fort Independence Indian Tribe to participate in government-to-government consultation with the United States Air Force (USAF) pursuant to Section 106 of the National Historic Preservation Act (NHPA).

The USAF is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) to evaluate the potential impacts associated with the addition of seventeen (17) F-35A Joint Strike Fighters, three (3) F-22As, and contractor-owned contractor-operated Adversary AIR (COCO ADAIR) at Nellis AFB. Facility construction, demolition, renovation, addition, as well as an increase in personnel would be necessary to support the proposed actions.

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The overall purpose of the proposed actions is to improve test, training and tactics development capabilities at Nellis AFB to keep pace with USAF mission requirements, evolving technology and enemy capabilities. This purpose would be achieved through implementation of several supporting actions. These supporting actions include the addition of F-35A Joint Strike Fighter aircraft, the addition of F-22A aircraft, and operation of COCO ADAIR.

Construction, demolition, renovation, and addition would be necessary to support the additional F-35A aircraft. There would be two facility options for the additional F-35A aircraft depending upon the availability of military construction (MILCON) funding. No construction or renovation is needed to support the F-22A aircraft or COCO ADAIR. Together, the components of the action would add 751 personnel at Nellis AFB (479 personnel for the addition of 17 F-35As, 32 personnel for the reassignment of three F-22As and 240 personnel to support COCO ADAIR). Details of the preliminary proposed and alternative action are included in the attached Summary of the Description of the Proposed Action and Alternatives.

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99TH CIVIL ENGINEER SQUADRON (ACC)
NELLIS AIR FORCE BASE, NEVADA

Douglas C. Fitzpatrick
Deputy Base Civil Engineer, 99 CES
6020 Beale Ave.
Nellis AFB, NV 89191

Ona Segundo
Chairwoman
Kaibab Band of Southern Paiutes
HC 65 Box 2
Fredonia, AZ 86022

Subject: Introduction of the Proposed Addition of Seventeen (17) F-35A Joint Strike Fighters, Three (3) F-22As, and Contractor-Owned Contractor-Operated Adversary Air (COCO ADAIR); and Section 106 Consultation Invitation for Nellis Air Force Base (AFB)

Dear Chairwoman Segundo

The purpose of this letter is twofold: to give you an opportunity to review and comment on a proposed action in which the Kaibab Band of Southern Paiutes may have an interest, and to invite the Kaibab Band of Southern Paiutes to participate in government-to-government consultation with the United States Air Force (USAF) pursuant to Section 106 of the National Historic Preservation Act (NHPA).

The USAF is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) to evaluate the potential impacts associated with the addition of seventeen (17) F-35A Joint Strike Fighters, three (3) F-22As, and contractor-owned contractor-operated Adversary AIR (COCO ADAIR) at Nellis AFB. Facility construction, demolition, renovation, addition, as well as an increase in personnel would be necessary to support the proposed actions.

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99TH CIVIL ENGINEER SQUADRON (ACC)
NELLIS AIR FORCE BASE, NEVADA

Douglas C. Fitzpatrick
Deputy Base Civil Engineer, 99 CES
6020 Beale Ave.
Nellis AFB, NV 89191

Curtis Anderson
Chairperson
Las Vegas Paiute Tribe
#1 Paiute Drive
Las Vegas, NV 89106

Subject: Introduction of the Proposed Addition of Seventeen (17) F-35A Joint Strike Fighters, Three (3) F-22As, and Contractor-Owned Contractor-Operated Adversary Air (COCO ADAIR); and Section 106 Consultation Invitation for Nellis Air Force Base (AFB)

Dear Chairperson Anderson

The purpose of this letter is twofold: to give you an opportunity to review and comment on a proposed action in which the Las Vegas Paiute Tribe may have an interest, and to invite the Las Vegas Paiute Tribe to participate in government-to-government consultation with the United States Air Force (USAF) pursuant to Section 106 of the National Historic Preservation Act (NHPA).

The USAF is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) to evaluate the potential impacts associated with the addition of seventeen (17) F-35A Joint Strike Fighters, three (3) F-22As, and contractor-owned contractor-operated Adversary AIR (COCO ADAIR) at Nellis AFB. Facility construction, demolition, renovation, addition, as well as an increase in personnel would be necessary to support the proposed actions.

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The USAF Point of Contact is Ms. Kish LaPierre. Please send her your comments and concerns to 6020 Beale Ave., Nellis AFB, NV, 89191, or by email or phone at kish.lapierre@us.af.mil or (702) 652-5813. I look forward to receiving any input you may have regarding this endeavor. Thank you in advance for your assistance in this effort.

Sincerely

FITZPATRICK.DOUGLAS.C.1159071177 Digitally signed by FITZPATRICK.DOUGLAS.C.1159071177 Date: 2020.07.20 08:47:32 -07'00'

DOUGLAS C. FITZPATRICK, Architect, DAF
Deputy Base Civil Engineer

Attachment:
Summary of the Description of the Proposed Action and Alternatives

DEPARTMENT OF THE AIR FORCE
99TH CIVIL ENGINEER SQUADRON (ACC)
NELLIS AIR FORCE BASE, NEVADA

Douglas C. Fitzpatrick
Deputy Base Civil Engineer, 99 CES
6020 Beale Ave.
Nellis AFB, NV 89191

Richard Button
Chairperson
Lone Pine Paiute-Shoshone Tribe
P.O. Box 747
Lone Pine, CA 93545

Subject: Introduction of the Proposed Addition of Seventeen (17) F-35A Joint Strike Fighters, Three (3) F-22As, and Contractor-Owned Contractor-Operated Adversary Air (COCO ADAIR); and Section 106 Consultation Invitation for Nellis Air Force Base (AFB)

Dear Chairperson Button

The purpose of this letter is twofold: to give you an opportunity to review and comment on a proposed action in which the Lone Pine Paiute-Shoshone Tribe may have an interest, and to invite the Lone Pine Paiute-Shoshone Tribe to participate in government-to-government consultation with the United States Air Force (USAF) pursuant to Section 106 of the National Historic Preservation Act (NHPA).

The USAF is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) to evaluate the potential impacts associated with the addition of seventeen (17) F-35A Joint Strike Fighters, three (3) F-22As, and contractor-owned contractor-operated Adversary AIR (COCO ADAIR) at Nellis AFB. Facility construction, demolition, renovation, addition, as well as an increase in personnel would be necessary to support the proposed actions.

Pursuant to Section 106 of the NHPA, implementing regulations at 36 Code of Federal Regulations (CFR) Part 800, and Department of Defense (DoD) Instruction 4710.02 Section 6, *DoD Interactions with Federally-Recognized Tribes*, we request government-to-government consultation on this proposed action. In particular, we invite you, pursuant to 36 CFR Section 800.4(a)(4), to provide information on any properties of historic, religious, or cultural significance that may be affected by our proposed undertaking. Regardless of whether the Lone Pine Paiute-Shoshone Tribe chooses to consult on this project, the USAF will comply with the Native American Graves Protection and Repatriation Act by informing you of any inadvertent discovery of archaeological or human remains and consulting on their disposition. Being defined as a federal undertaking, we will be seeking input and inviting other potential consulting parties, such as the Nevada State Historic Preservation Office (SHPO).

The overall purpose of the proposed actions is to improve test, training and tactics development capabilities at Nellis AFB to keep pace with USAF mission requirements, evolving technology and enemy capabilities. This purpose would be achieved through implementation of several supporting actions. These supporting actions include the addition of F-35A Joint Strike Fighter aircraft, the addition of F-22A aircraft, and operation of COCO ADAIR.

Construction, demolition, renovation, and addition would be necessary to support the additional F-35A aircraft. There would be two facility options for the additional F-35A aircraft depending upon the availability of military construction (MILCON) funding. No construction or renovation is needed to support the F-22A aircraft or COCO ADAIR. Together, the components of the action would add 751 personnel at Nellis AFB (479 personnel for the addition of 17 F-35As, 32 personnel for the reassignment of three F-22As and 240 personnel to support COCO ADAIR). Details of the preliminary proposed and alternative action are included in the attached Summary of the Description of the Proposed Action and Alternatives.

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99TH CIVIL ENGINEER SQUADRON (ACC)
NELLIS AIR FORCE BASE, NEVADA

Douglas C. Fitzpatrick
Deputy Base Civil Engineer, 99 CES
6020 Beale Ave.
Nellis AFB, NV 89191

Laura Watters
Chairperson
Moapa Band of Paiutes
P.O. Box 340
Moapa, NV 89025

Subject: Introduction of the Proposed Addition of Seventeen (17) F-35A Joint Strike Fighters, Three (3) F-22As, and Contractor-Owned Contractor-Operated Adversary Air (COCO ADAIR); and Section 106 Consultation Invitation for Nellis Air Force Base (AFB)

Dear Chairperson Watters

The purpose of this letter is twofold: to give you an opportunity to review and comment on a proposed action in which the Moapa Band of Paiutes may have an interest, and to invite the Moapa Band of Paiutes to participate in government-to-government consultation with the United States Air Force (USAF) pursuant to Section 106 of the National Historic Preservation Act (NHPA).

The USAF is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) to evaluate the potential impacts associated with the addition of seventeen (17) F-35A Joint Strike Fighters, three (3) F-22As, and contractor-owned contractor-operated Adversary AIR (COCO ADAIR) at Nellis AFB. Facility construction, demolition, renovation, addition, as well as an increase in personnel would be necessary to support the proposed actions.

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The overall purpose of the proposed actions is to improve test, training and tactics development capabilities at Nellis AFB to keep pace with USAF mission requirements, evolving technology and enemy capabilities. This purpose would be achieved through implementation of several supporting actions. These supporting actions include the addition of F-35A Joint Strike Fighter aircraft, the addition of F-22A aircraft, and operation of COCO ADAIR.

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99TH CIVIL ENGINEER SQUADRON (ACC)
NELLIS AIR FORCE BASE, NEVADA

Douglas C. Fitzpatrick
Deputy Base Civil Engineer, 99 CES
6020 Beale Ave.
Nellis AFB, NV 89191

Richard Arnold
Native American Coordinator
Pahrump Paiute Tribe
P.O. Box 3411
Pahrump, NV 89041

Subject: Introduction of the Proposed Addition of Seventeen (17) F-35A Joint Strike Fighters, Three (3) F-22As, and Contractor-Owned Contractor-Operated Adversary Air (COCO ADAIR); and Section 106 Consultation Invitation for Nellis Air Force Base (AFB)

Dear Chairperson Arnold

The purpose of this letter is twofold: to give you an opportunity to review and comment on a proposed action in which the Pahrump Paiute Tribe may have an interest, and to invite the Pahrump Paiute Tribe to participate in government-to-government consultation with the United States Air Force (USAF) pursuant to Section 106 of the National Historic Preservation Act (NHPA).

The USAF is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) to evaluate the potential impacts associated with the addition of seventeen (17) F-35A Joint Strike Fighters, three (3) F-22As, and contractor-owned contractor-operated Adversary AIR (COCO ADAIR) at Nellis AFB. Facility construction, demolition, renovation, addition, as well as an increase in personnel would be necessary to support the proposed actions.

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DOUGLAS C. FITZPATRICK, Architect, DAF
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99TH CIVIL ENGINEER SQUADRON (ACC)
NELLIS AIR FORCE BASE, NEVADA

Douglas C. Fitzpatrick
Deputy Base Civil Engineer, 99 CES
6020 Beale Ave.
Nellis AFB, NV 89191

Tamra Borchardt-Slayton
Chairperson
Paiute Indian Tribe of Utah
440 North Paiute Drive
Cedar City, UT 84721

Subject: Introduction of the Proposed Addition of Seventeen (17) F-35A Joint Strike Fighters, Three (3) F-22As, and Contractor-Owned Contractor-Operated Adversary Air (COCO ADAIR); and Section 106 Consultation Invitation for Nellis Air Force Base (AFB)

Dear Chairperson Borchardt-Slayton

The purpose of this letter is twofold: to give you an opportunity to review and comment on a proposed action in which the Paiute Indian Tribe of Utah may have an interest, and to invite the Paiute Indian Tribe of Utah to participate in government-to-government consultation with the United States Air Force (USAF) pursuant to Section 106 of the National Historic Preservation Act (NHPA).

The USAF is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) to evaluate the potential impacts associated with the addition of seventeen (17) F-35A Joint Strike Fighters, three (3) F-22As, and contractor-owned contractor-operated Adversary AIR (COCO ADAIR) at Nellis AFB. Facility construction, demolition, renovation, addition, as well as an increase in personnel would be necessary to support the proposed actions.

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Construction, demolition, renovation, and addition would be necessary to support the additional F-35A aircraft. There would be two facility options for the additional F-35A aircraft depending upon the availability of military construction (MILCON) funding. No construction or renovation is needed to support the F-22A aircraft or COCO ADAIR. Together, the components of the action would add 751 personnel at Nellis AFB (479 personnel for the addition of 17 F-35As, 32 personnel for the reassignment of three F-22As and 240 personnel to support COCO ADAIR). Details of the preliminary proposed and alternative action are included in the attached Summary of the Description of the Proposed Action and Alternatives.

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99TH CIVIL ENGINEER SQUADRON (ACC)
NELLIS AIR FORCE BASE, NEVADA

Douglas C. Fitzpatrick
Deputy Base Civil Engineer, 99 CES
6020 Beale Ave.
Nellis AFB, NV 89191

White Dove Kennedy
Chairperson
Timbisha Shoshone Tribe
621 West Line St. Suite 109
Bishop, CA 93514

Subject: Introduction of the Proposed Addition of Seventeen (17) F-35A Joint Strike Fighters, Three (3) F-22As, and Contractor-Owned Contractor-Operated Adversary Air (COCO ADAIR); and Section 106 Consultation Invitation for Nellis Air Force Base (AFB)

Dear Chairperson Kennedy

The purpose of this letter is twofold: to give you an opportunity to review and comment on a proposed action in which the Timbisha Shoshone Tribe may have an interest, and to invite the Timbisha Shoshone Tribe to participate in government-to-government consultation with the United States Air Force (USAF) pursuant to Section 106 of the National Historic Preservation Act (NHPA).

The USAF is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) to evaluate the potential impacts associated with the addition of seventeen (17) F-35A Joint Strike Fighters, three (3) F-22As, and contractor-owned contractor-operated Adversary AIR (COCO ADAIR) at Nellis AFB. Facility construction, demolition, renovation, addition, as well as an increase in personnel would be necessary to support the proposed actions.

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The overall purpose of the proposed actions is to improve test, training and tactics development capabilities at Nellis AFB to keep pace with USAF mission requirements, evolving technology and enemy capabilities. This purpose would be achieved through implementation of several supporting actions. These supporting actions include the addition of F-35A Joint Strike Fighter aircraft, the addition of F-22A aircraft, and operation of COCO ADAIR.

Construction, demolition, renovation, and addition would be necessary to support the additional F-35A aircraft. There would be two facility options for the additional F-35A aircraft depending upon the availability of military construction (MILCON) funding. No construction or renovation is needed to support the F-22A aircraft or COCO ADAIR. Together, the components of the action would add 751 personnel at Nellis AFB (479 personnel for the addition of 17 F-35As, 32 personnel for the reassignment of three F-22As and 240 personnel to support COCO ADAIR). Details of the preliminary proposed and alternative action are included in the attached Summary of the Description of the Proposed Action and Alternatives.

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99TH CIVIL ENGINEER SQUADRON (ACC)
NELLIS AIR FORCE BASE, NEVADA

Douglas C. Fitzpatrick
Deputy Base Civil Engineer, 99 CES
6020 Beale Ave.
Nellis AFB, NV 89191

Daryl Brady
Vice-Chairperson
Yomba Shoshone Tribe
HC 61, Box 6275
Austin, NV 89310

Subject: Introduction of the Proposed Addition of Seventeen (17) F-35A Joint Strike Fighters, Three (3) F-22As, and Contractor-Owned Contractor-Operated Adversary Air (COCO ADAIR); and Section 106 Consultation Invitation for Nellis Air Force Base (AFB)

Dear Vice-Chairperson Brady

The purpose of this letter is twofold: to give you an opportunity to review and comment on a proposed action in which the Yomba Shoshone Tribe may have an interest, and to invite the Yomba Shoshone Tribe to participate in government-to-government consultation with the United States Air Force (USAF) pursuant to Section 106 of the National Historic Preservation Act (NHPA).

The USAF is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) to evaluate the potential impacts associated with the addition of seventeen (17) F-35A Joint Strike Fighters, three (3) F-22As, and contractor-owned contractor-operated Adversary AIR (COCO ADAIR) at Nellis AFB. Facility construction, demolition, renovation, addition, as well as an increase in personnel would be necessary to support the proposed actions.

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99TH CIVIL ENGINEER SQUADRON (ACC)
NELLIS AIR FORCE BASE, NEVADA

Douglas C. Fitzpatrick
Deputy Base Civil Engineer, 99 CES
6020 Beale Ave.
Nellis AFB, NV 89191

Ronnie Snooks
Chairperson
Yomba Shoshone Tribe
HC 61, Box 6275
Austin, NV 89310

Subject: Introduction of the Proposed Addition of Seventeen (17) F-35A Joint Strike Fighters, Three (3) F-22As, and Contractor-Owned Contractor-Operated Adversary Air (COCO ADAIR); and Section 106 Consultation Invitation for Nellis Air Force Base (AFB)

Dear Chairperson Snooks

The purpose of this letter is twofold: to give you an opportunity to review and comment on a proposed action in which the Yomba Shoshone Tribe may have an interest, and to invite the Yomba Shoshone Tribe to participate in government-to-government consultation with the United States Air Force (USAF) pursuant to Section 106 of the National Historic Preservation Act (NHPA).

The USAF is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) to evaluate the potential impacts associated with the addition of seventeen (17) F-35A Joint Strike Fighters, three (3) F-22As, and contractor-owned contractor-operated Adversary AIR (COCO ADAIR) at Nellis AFB. Facility construction, demolition, renovation, addition, as well as an increase in personnel would be necessary to support the proposed actions.

Pursuant to Section 106 of the NHPA, implementing regulations at 36 Code of Federal Regulations (CFR) Part 800, and Department of Defense (DoD) Instruction 4710.02 Section 6, *DoD Interactions with Federally-Recognized Tribes*, we request government-to-government consultation on this proposed action. In particular, we invite you, pursuant to 36 CFR Section 800.4(a)(4), to provide information on any properties of historic, religious, or cultural significance that may be affected by our proposed undertaking. Regardless of whether the Yomba Shoshone Tribe chooses to consult on this project, the USAF will comply with the Native American Graves Protection and Repatriation Act by informing you of any inadvertent discovery of archaeological or human remains and consulting on their disposition. Being defined as a federal undertaking, we will be seeking input and inviting other potential consulting parties, such as the Nevada State Historic Preservation Office (SHPO).

The overall purpose of the proposed actions is to improve test, training and tactics development capabilities at Nellis AFB to keep pace with USAF mission requirements, evolving technology and enemy capabilities. This purpose would be achieved through implementation of several supporting actions. These supporting actions include the addition of F-35A Joint Strike Fighter aircraft, the addition of F-22A aircraft, and operation of COCO ADAIR.

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The USAF Point of Contact is Ms. Kish LaPierre. Please send her your comments and concerns to 6020 Beale Ave., Nellis AFB, NV, 89191, or by email or phone at kish.lapierre@us.af.mil or (702) 652-5813. I look forward to receiving any input you may have regarding this endeavor. Thank you in advance for your assistance in this effort.

Sincerely

FITZPATRICK.DOUGLAS.C.1159071177 Digitally signed by FITZPATRICK.DOUGLAS.C.1159071177 Date: 2020.07.20 08:47:32 -07'00'

DOUGLAS C. FITZPATRICK, Architect, DAF
Deputy Base Civil Engineer

Attachment:
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DEPARTMENT OF THE AIR FORCE
99TH CIVIL ENGINEER SQUADRON (ACC)
NELLIS AIR FORCE BASE, NEVADA

Douglas C. Fitzpatrick
Deputy Base Civil Engineer, 99 CES
6020 Beale Ave.
Nellis AFB, NV 89191

Shane Saulque
Chairperson
Benton Paiute Indian Tribe
25669 Highway 6, PMB I
Benton, CA 93512

Subject: Introduction of the Proposed Addition of Seventeen (17) F-35A Joint Strike Fighters, Three (3) F-22As, and Contractor-Owned Contractor-Operated Adversary Air (COCO ADAIR); and Section 106 Consultation Invitation for Nellis Air Force Base (AFB)

Dear Chairperson Saulque

The purpose of this letter is twofold: to give you an opportunity to review and comment on a proposed action in which the Benton Paiute Indian Tribe may have an interest, and to invite the Benton Paiute Indian Tribe to participate in government-to-government consultation with the United States Air Force (USAF) pursuant to Section 106 of the National Historic Preservation Act (NHPA).

The USAF is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) to evaluate the potential impacts associated with the addition of seventeen (17) F-35A Joint Strike Fighters, three (3) F-22As, and contractor-owned contractor-operated Adversary AIR (COCO ADAIR) at Nellis AFB. Facility construction, demolition, renovation, addition, as well as an increase in personnel would be necessary to support the proposed actions.

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Sincerely

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DOUGLAS C. FITZPATRICK, Architect, DAF
Deputy Base Civil Engineer

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DEPARTMENT OF THE AIR FORCE
99TH CIVIL ENGINEER SQUADRON (ACC)
NELLIS AIR FORCE BASE, NEVADA

Douglas C. Fitzpatrick
Deputy Base Civil Engineer, 99 CES
6020 Beale Ave.
Nellis AFB, NV 89191

James Rambeau, Sr.
Chairperson
Big Pine Paiute Tribe
P.O. Box 700
Big Pine, CA 93513

Subject: Introduction of the Proposed Addition of Seventeen (17) F-35A Joint Strike Fighters, Three (3) F-22As, and Contractor-Owned Contractor-Operated Adversary Air (COCO ADAIR); and Section 106 Consultation Invitation for Nellis Air Force Base (AFB)

Dear Chairperson Rambeau, Sr.

The purpose of this letter is twofold: to give you an opportunity to review and comment on a proposed action in which the Big Pine Paiute Tribe may have an interest, and to invite the Big Pine Paiute Tribe to participate in government-to-government consultation with the United States Air Force (USAF) pursuant to Section 106 of the National Historic Preservation Act (NHPA).

The USAF is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) to evaluate the potential impacts associated with the addition of seventeen (17) F-35A Joint Strike Fighters, three (3) F-22As, and contractor-owned contractor-operated Adversary AIR (COCO ADAIR) at Nellis AFB. Facility construction, demolition, renovation, addition, as well as an increase in personnel would be necessary to support the proposed actions.

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99TH CIVIL ENGINEER SQUADRON (ACC)
NELLIS AIR FORCE BASE, NEVADA

Douglas C. Fitzpatrick
Deputy Base Civil Engineer, 99 CES
6020 Beale Ave.
Nellis AFB, NV 89191

Ross Stone
Elder
Big Pine Paiute Tribe
P.O. Box 700
Big Pine, CA 93513

Subject: Introduction of the Proposed Addition of Seventeen (17) F-35A Joint Strike Fighters, Three (3) F-22As, and Contractor-Owned Contractor-Operated Adversary Air (COCO ADAIR); and Section 106 Consultation Invitation for Nellis Air Force Base (AFB)

Dear Elder Stone

The purpose of this letter is twofold: to give you an opportunity to review and comment on a proposed action in which the Big Pine Paiute Tribe may have an interest, and to invite the Big Pine Paiute Tribe to participate in government-to-government consultation with the United States Air Force (USAF) pursuant to Section 106 of the National Historic Preservation Act (NHPA).

The USAF is preparing an Environmental Assessment (EA) in accordance with the National Environmental Policy Act (NEPA) to evaluate the potential impacts associated with the addition of seventeen (17) F-35A Joint Strike Fighters, three (3) F-22As, and contractor-owned contractor-operated Adversary AIR (COCO ADAIR) at Nellis AFB. Facility construction, demolition, renovation, addition, as well as an increase in personnel would be necessary to support the proposed actions.

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99TH CIVIL ENGINEER SQUADRON (ACC)
NELLIS AIR FORCE BASE, NEVADA

Douglas C. Fitzpatrick
Deputy Base Civil Engineer, 99 CES
6020 Beale Ave.
Nellis AFB, NV 89191

Timothy Williams
Chairperson
Ft. Mojave Tribe
500 Merriman Avenue
Needles, CA 92363

Subject: Introduction of the Proposed Addition of Seventeen (17) F-35A Joint Strike Fighters, Three (3) F-22As, and Contractor-Owned Contractor-Operated Adversary Air (COCO ADAIR); and Section 106 Consultation Invitation for Nellis Air Force Base (AFB)

Dear Chairperson Williams

The purpose of this letter is twofold: to give you an opportunity to review and comment on a proposed action in which the Ft. Mojave Tribe may have an interest, and to invite the Ft. Mojave Tribe to participate in government-to-government consultation with the United States Air Force (USAF) pursuant to Section 106 of the National Historic Preservation Act (NHPA).

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Deputy Base Civil Engineer

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Interagency and Intergovernmental Coordination and Consultations Mailing List

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Chairperson Allen Summers
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Chairperson Dennis Patch
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Chairperson Rodney Mike
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Chairperson Carl Dahlberg
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Chairperson Curtis Anderson
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Chairperson Richard Button
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Chairperson Laura Watters
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Native American Coordinator Richard Arnold
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Chairperson White Dove Kennedy
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Chairperson Ronnie Snooks
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Chairperson Shane Saulque
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25669 Highway 6, PMB I
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Chairperson James Rambeau, Sr.
Big Pine Paiute Tribe
P.O. Box 700
Big Pine, CA 93513

Elder Ross Stone
Big Pine Paiute Tribe
P.O. Box 700
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Chairperson Timothy Williams
Ft. Mojave Tribe
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Needles, CA 92363

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BLM - Battle Mountain District Office
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Battle Mountain, NV 89820

City of North Las Vegas
Community Development, Planning & Zoning Division
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North Las Vegas, NV 89030

Director of Planning Services John Raborn
Regional Transportation Commission of Southern Nevada
600 S. Grand Central Parkway, Suite 350
Las Vegas, NV 89106

Chief Executive Officer Tina Quigley
Regional Transportation Commission of Southern Nevada
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Community Development, Planning, & Zoning Division
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Clark County Commission
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Las Vegas, NV 89109

Commissioner Edward Frasier III
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500 S. Grand Central Parkway, First Floor
Las Vegas, NV 89155

Assistant County Manager Randy Tarr
Clark County Department of Air Quality & Environmental Management
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Trustee, District F Danielle Ford
Clark County School District
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Office Manager
Nevada Department of Wildlife
Southern Region - Henderson Office
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Resource Management Officer Cayenne Engel
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Nevada Division of State Lands
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Carson City, NV 89701-5246

Administrator Kristin Szabo
Nevada Natural Heritage Program
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Deputy Director of Resource Management Jack Robb
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Supervisory Habitat Biologist D. Bradford Hardenbrook
Nevada Department of Wildlife - Southern Region
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Scott Carey
Nevada State Clearinghouse - Division of Budget and Planning
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Carson City, NV 89701

AFFTC Technical Library
412 TW/TSDL
Edwards AFB, CA 93524

Bureau of Land Management - Barstow Area Office
2601 Barstow Road
Barstow, CA 92311-3221

Bureau of Land Management - Ridgecrest Area Office
300 S. Richmond Road
Ridgecrest, CA 93555-4436

Edwards AFB Base Library
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Charles Lieber
Federal Aviation Administration
Western Pacific Region - Airspace Management Branch
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Lawndale, CA 90261

Head of Environmental Planning John O'gara
Naval Air Weapons Station
Environmental Office Code 8G0000D #1
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USDA Forest Service - Pacific Southwest Region - Sequoia National Forest
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Porterville, CA 93257

U.S. Department of the Interior - National Park Service - Death Valley National Park
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Death Valley, CA 92328

U.S. Environmental Protection Agency - Region IX - EIS Review Section
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APCO Charles L. Fryxell
Antelope Valley Air Quality Management District
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Lancaster, CA 93639-4409

Operations Manager Bret Banks
Antelope Valley Air Quality Management District
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City of Lancaster - Planning Department
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Lancaster, CA 93534

Inyo County Free Library - Furnace Creek Branch
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Death Valley, CA 92328

Environnemental Lead Jerry Schwartz
Surveillance Systems Engineering Group FAA, AND-402
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Kern County APCD
2700 M Street, Suite 302
Bakersfield, CA 93301-2370

Kern County Department of Planning and Development Services
2700 M Street, Suite 100
Bakersfield, CA 93301-2323

Kern County Library - Boron Branch
26967 20 Mule Team road
Boron, CA 93516

Kern County Library - California City Branch
9507 California City Boulevard
California City, CA 93505

Kern County Library - Mojave Branch
16916-1/2 Highway 14
Mojave, CA 93501

Kern County Library - Ridgecrest Branch
131 East Las Flores Ave
Ridgecrest, CA 93555

Kern County Library - Wanda Kirk Branch
(Rosamond)
3611 Rosamond Boulevard
Rosamond, CA 93560

Branch Supervisor Karen Liefield
Kern River Valley Library
7054 Lake Isabella Boulevard
Lake Isabella, CA 93240

Los Angeles County Library - Lancaster Branch
601 W. Lancaster Boulevard
Lancaster, CA 93534

APCO Charles L. Fryxell
Mojave Desert AQMD
14306 Park Ave.
Victorville, CA 92392-2310

Director of Public Works Muhammad Bari
HQ NTC Ft. Irwin - Attn: AFZJ-PW-EV
PO Box 105097 Building 285
Fort Irwin, CA 92310-5097

Office of Planning and Research - California
State Clearinghouse
PO Box 3044
Sacramento, CA 95812-3044

San Bernardino County - Land Use Services
Department Planning Division
385 N. Arrowhead Ave., 1st Floor
San Bernardino, CA 92415-0182

Sierra Club - Antelope Valley Group
P.O. Box 901875
Palmdale, CA 93590

California Department of Fish and Game
1416 Ninth Street
Sacramento, CA 95814

California Department of Parks and Recreation
P.O. Box 942896
Sacramento, CA 94296

Native American Heritage Commission
915 Capital Mall, Room 364
Sacramento, CA 95814

US Senator Kamala D. Harris
United States Senate
112 Hart Senate Office Building
Washington, DC 20510

US Senator Diane Feinstein
United States Senate
331 Hart Senate Office Building
Washington, DC 20510

Congressman Tom McClintock
Roseville Office
200A Douglas Blvd, Suite 240
Roseville, CA 95661

Congressman Paul Cook
Apple Valley Town Hall
14955 Dale Evans Parkway
Apple Valley, CA 92307

Congressman Devin Nunes
Visalia Office
113 North Church Street
Visalia, CA 93291

Congressman Kevin McCarthy
Bakersfield Office
4100 Empire Drive Suite 150
Bakersfield, CA 93309

Congressman TJ Cox
Bakersfield Office
2700 M St. Suite 250B
Bakersfield, CA 93301

Congressman Steve Horsford
Las Vegas Office
2250 N Las Vegas Blvd Suite 500
North Las Vegas, NV 89030

Congresswoman Katie Hill
Palmdale Office
1008 W. Ave M14 Suite E
Palmdale, CA 93551

Glen Knowles
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US Fish and Wildlife Service
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4701 North Torrey Pines Drive
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Desert National Wildlife Refuge Complex
4701 North Torrey Pines Drive
Las Vegas, NV 89130

U.S. Fish and Wildlife Service
Ventura Field Office
2493 Portola Road, Suite B
Ventura, CA 93003-7726

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Appendix A-2
Correspondence Received

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USDA
United States Department of Agriculture

September 15, 2020

Mr. Tod Oppenborn
6020 Beale Ave.
Nellis AFB, NV 89191

Re: Environmental Assessment

Dear Mr. Oppenborn:

Thank you for the opportunity to provide comments regarding the preparation of an Environmental Assessment (EA) for additional fighter planes at Nellis Air Force Base. This project appears within an existing building complex, the USDA Natural Resources Conservation Service – Nevada State Office does not have any comments for the EA.

RAY DOTSON Digitally signed by RAY DOTSON Date: 2020.09.15 17:54:49 -07'00'

Ray Dotson
State Conservationist

Natural Resources Conservation Service
1365 Corporate Blvd., Reno, NV 89502
Phone: (775) 857-8500 Toll Free Fax: (855) 816-0893

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APPENDIX B.
DETAILED FACILITY FIGURES

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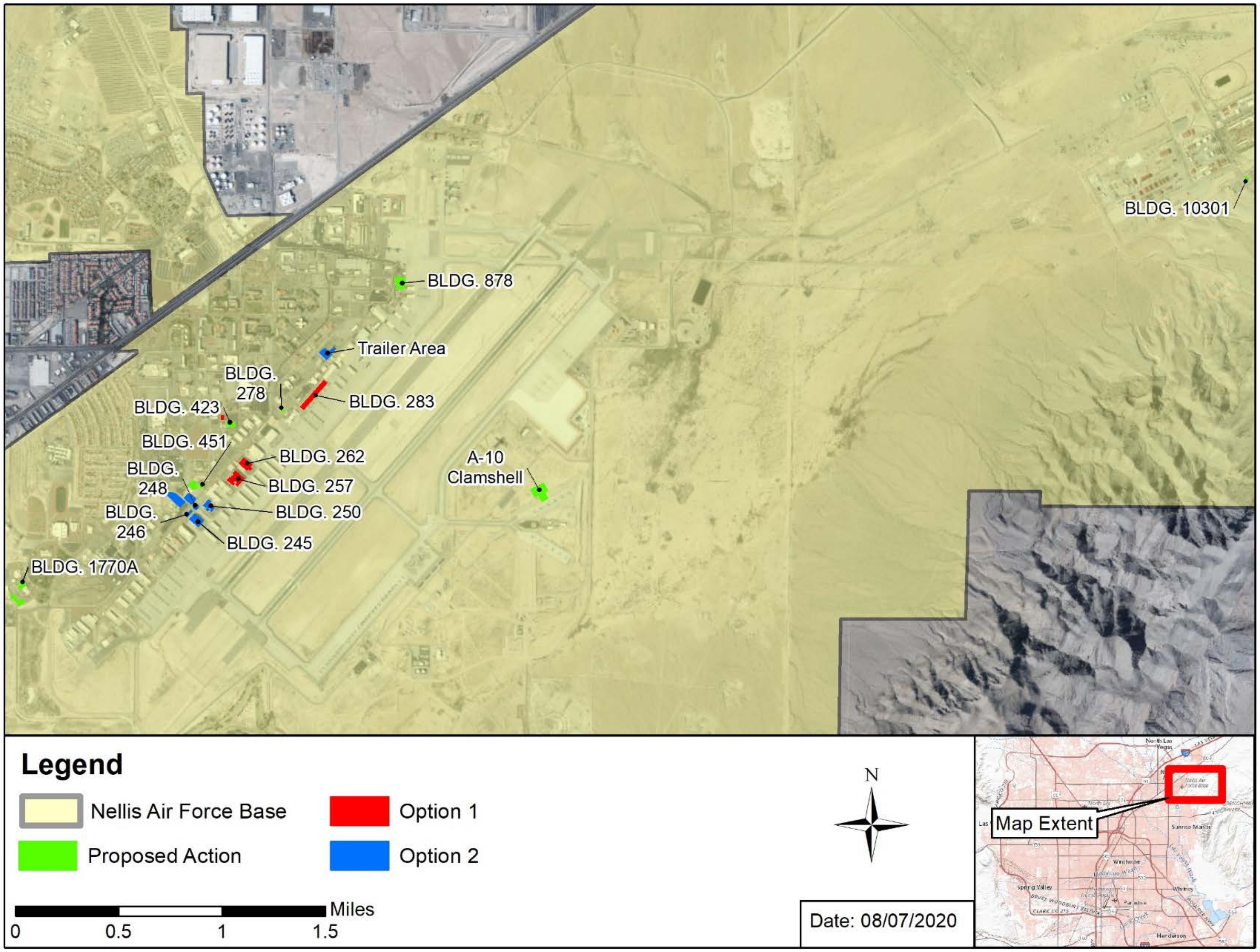

Figure B-1. Location of Facilities Proposed for Demolition/Renovation/Construction at Nellis Air Force Base under Options 1 and 2

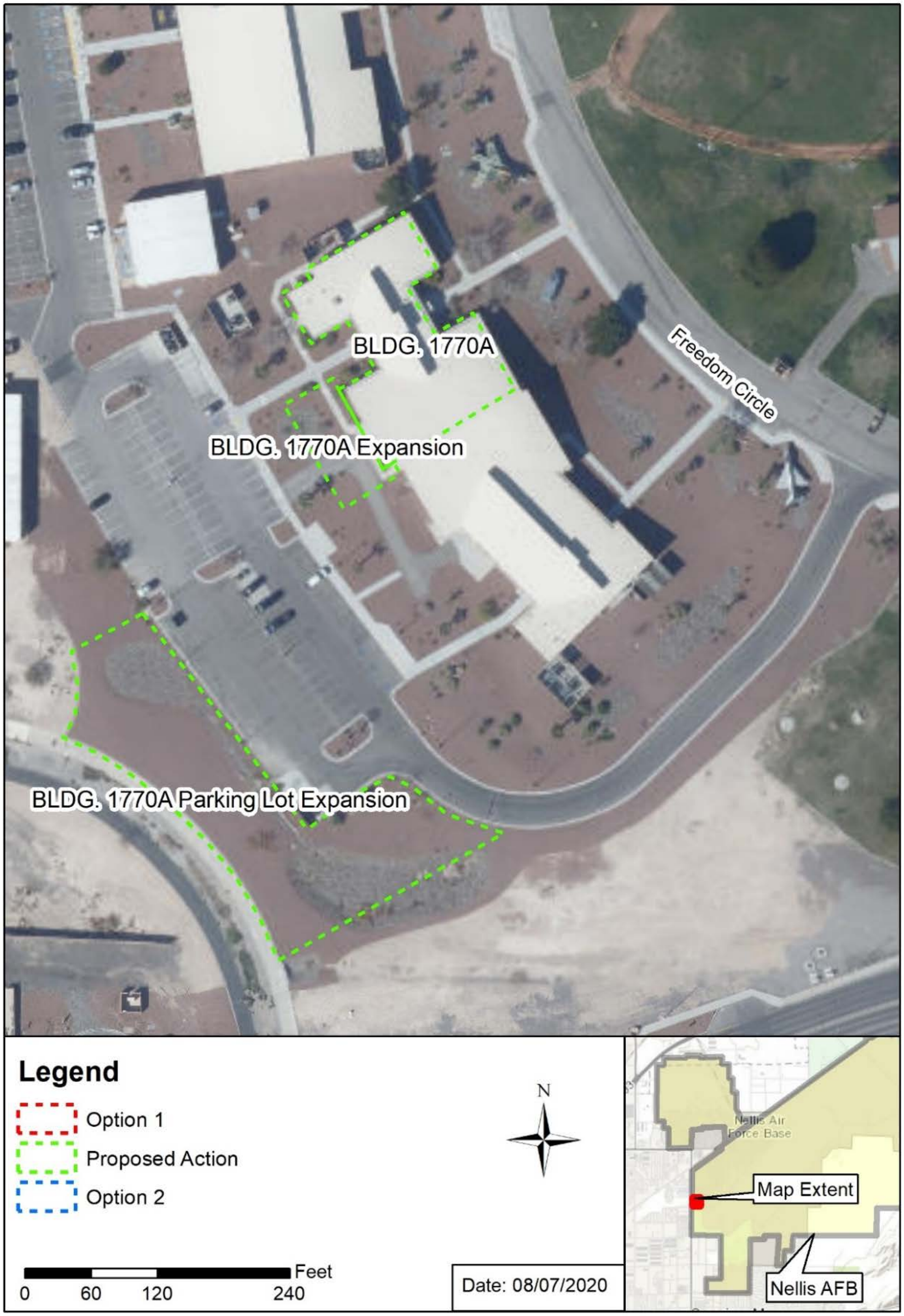

Figure B-2. Building 1770A Addition and Parking Lot

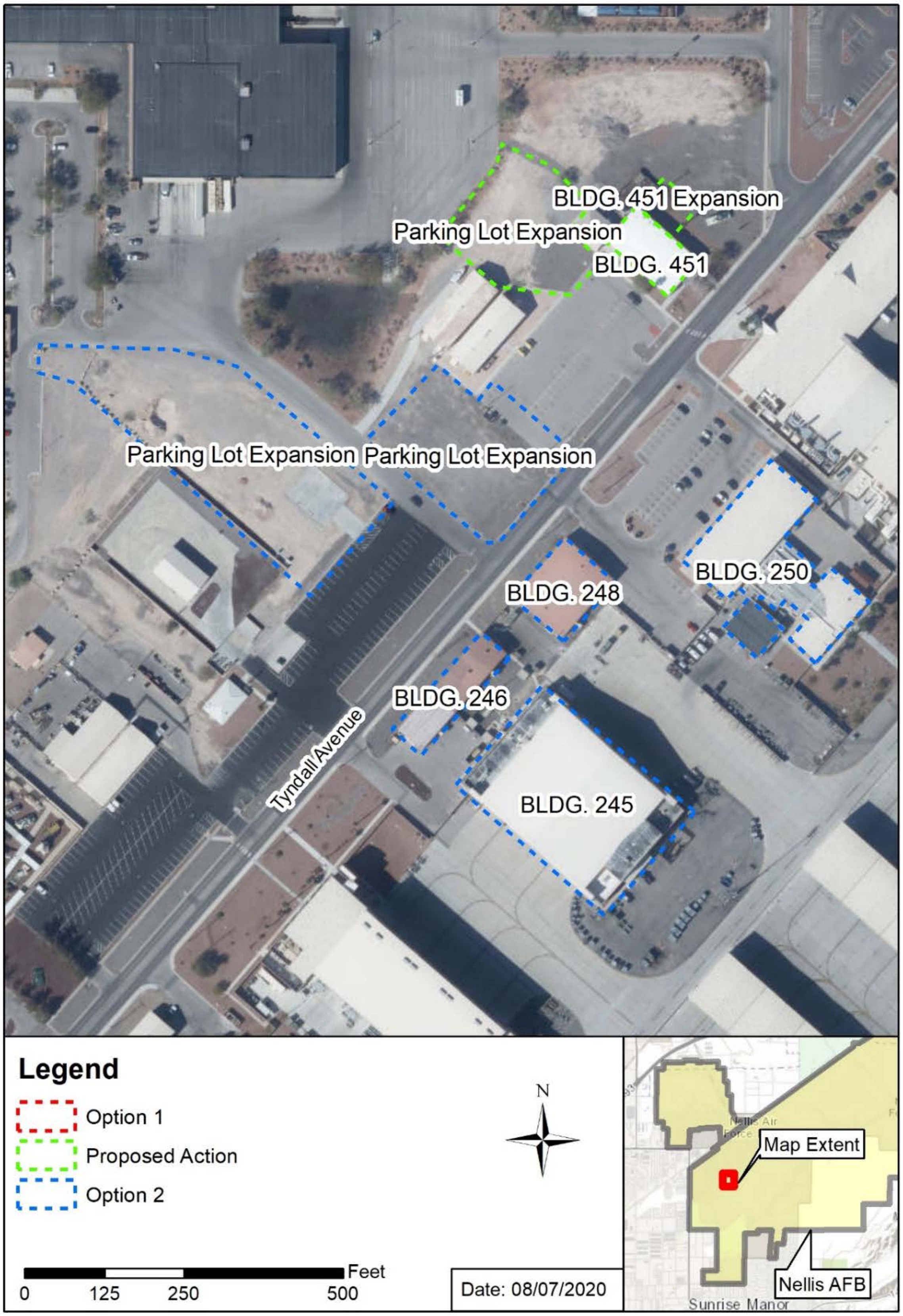

Figure B-3. Buildings 451, 250, 245, 246, 248

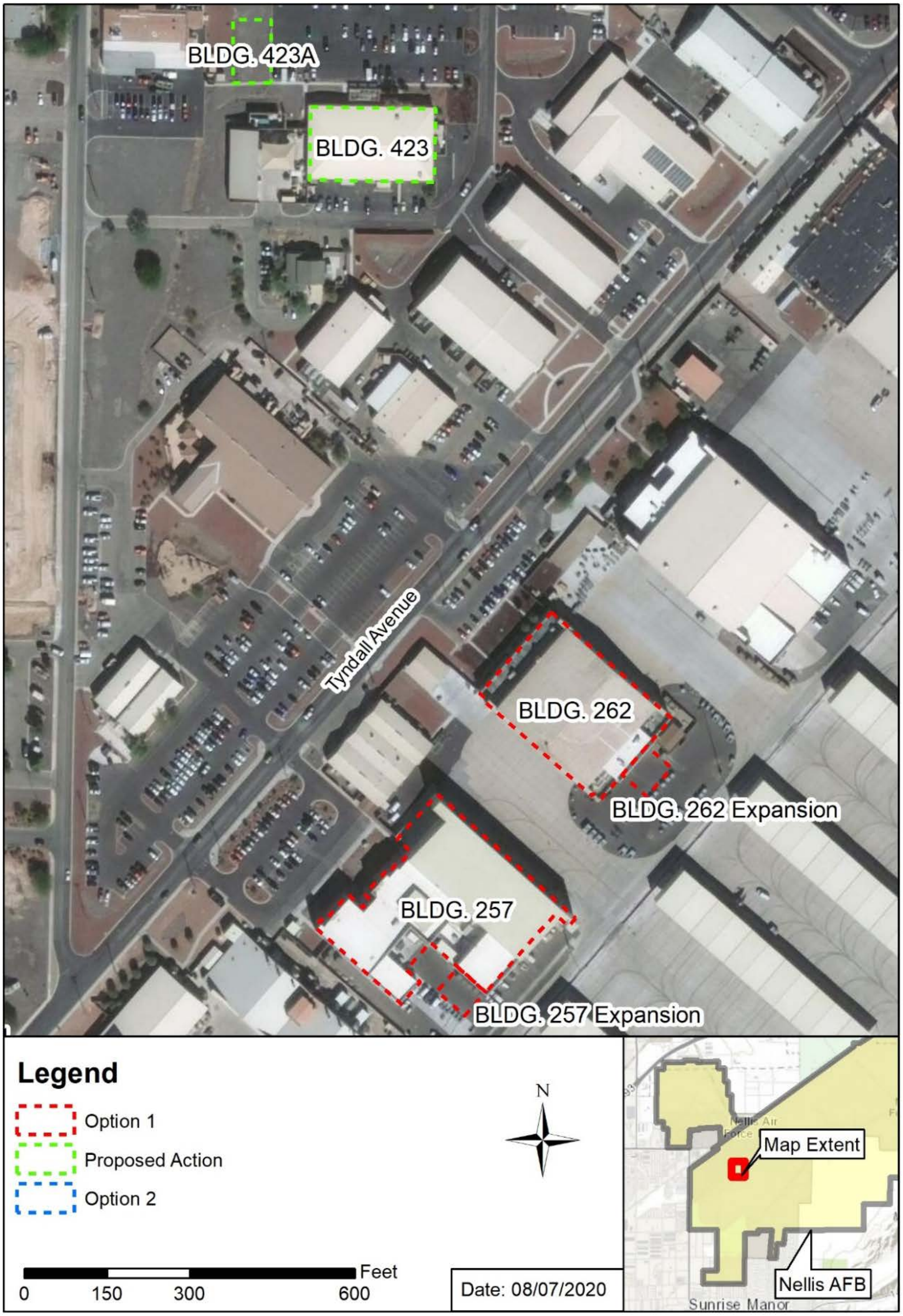

Figure B-4. Buildings 423, 262, and 257

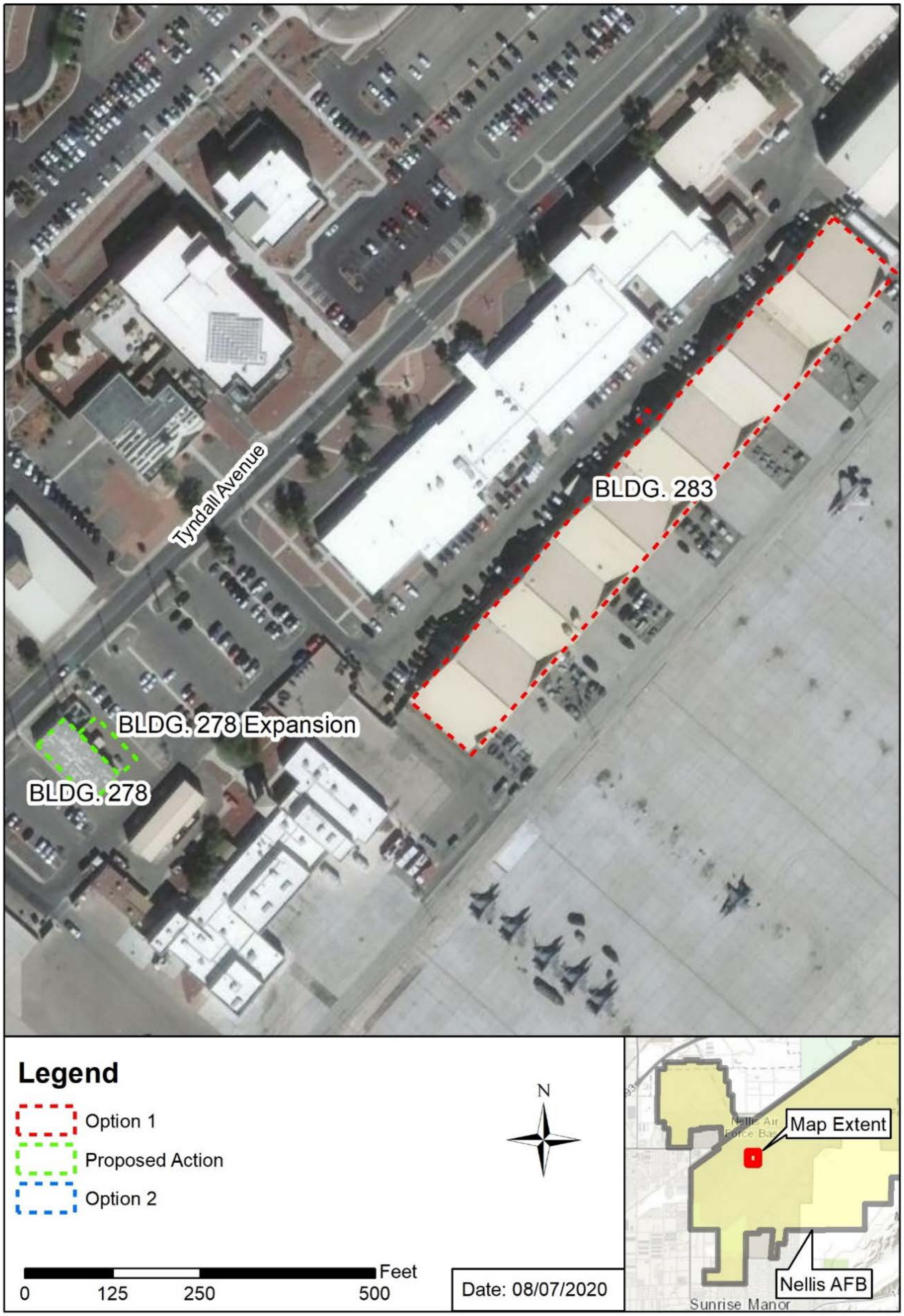

Figure B-5. Buildings 283 and 278

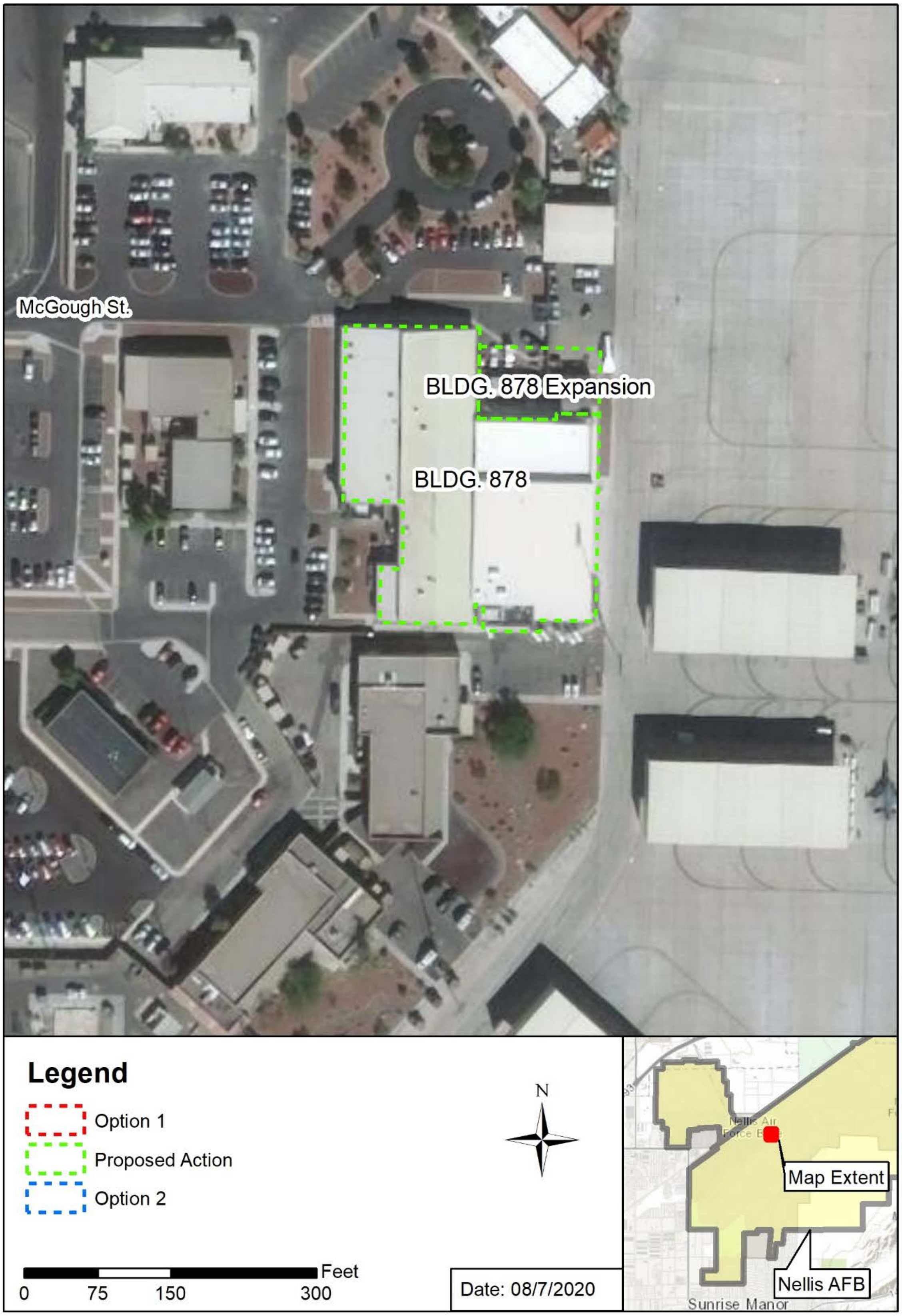

Figure B-6. Building 878

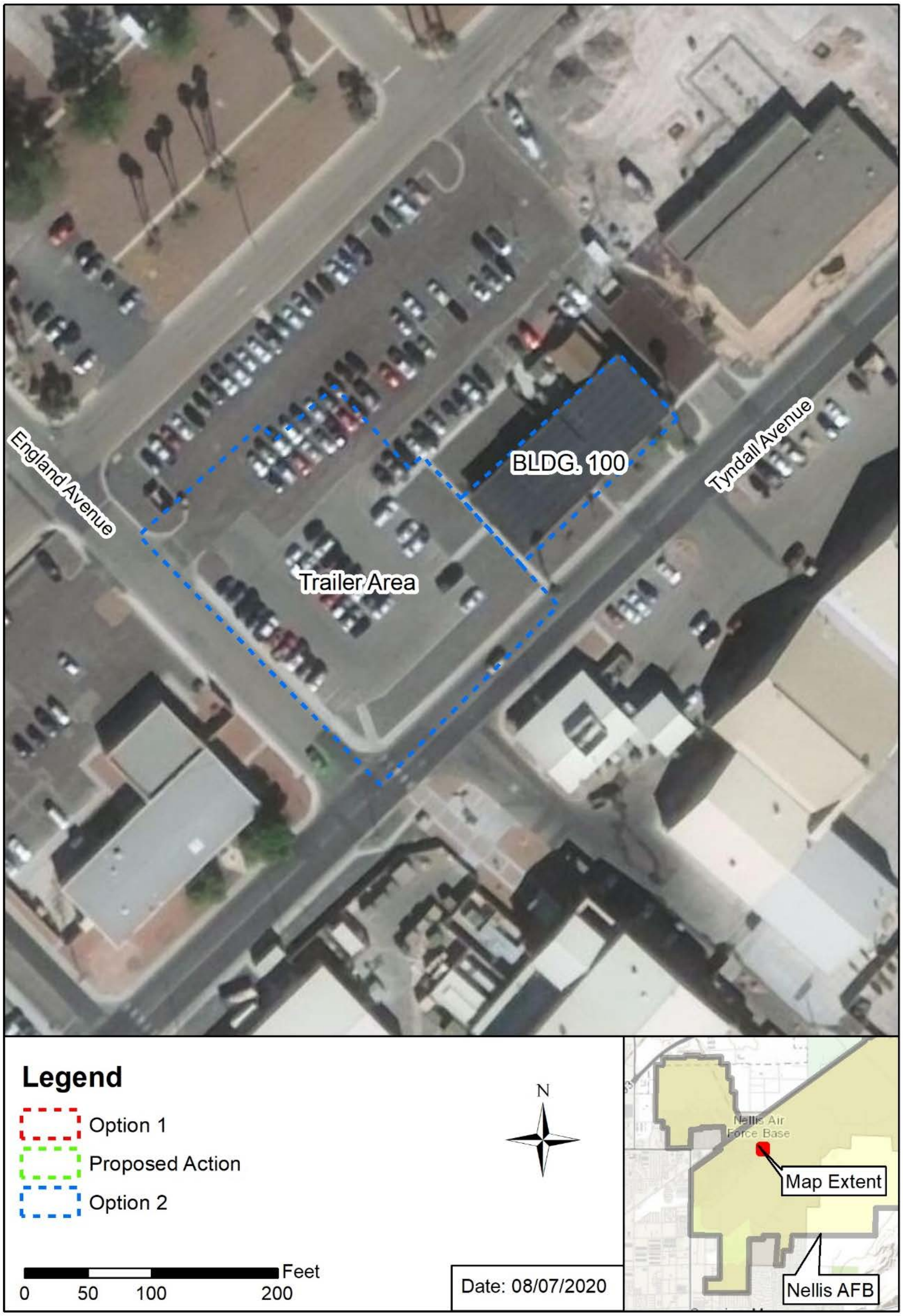

Figure B-7. Trailers Near Building 100

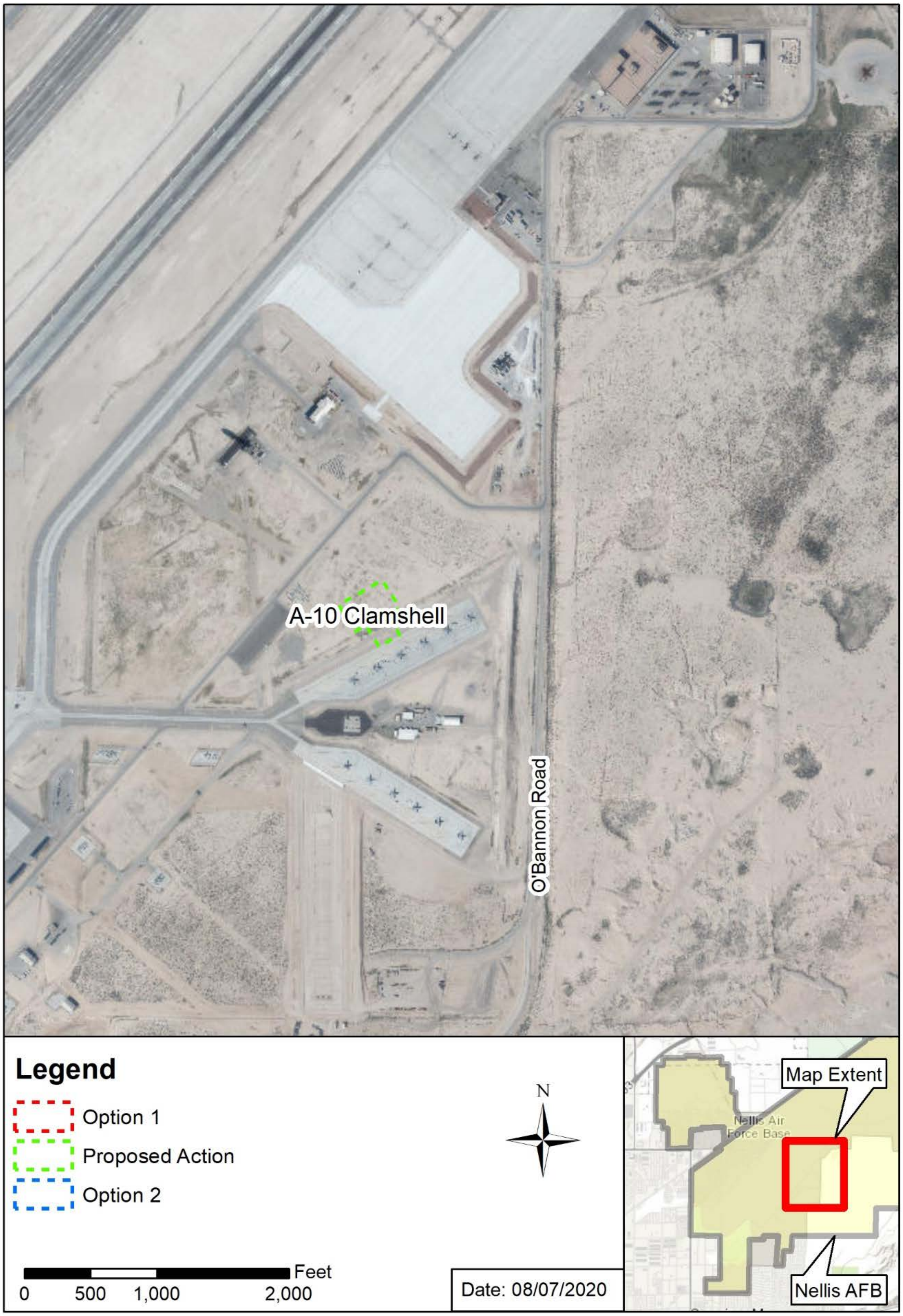

Figure B-8. A-10 Clamshell

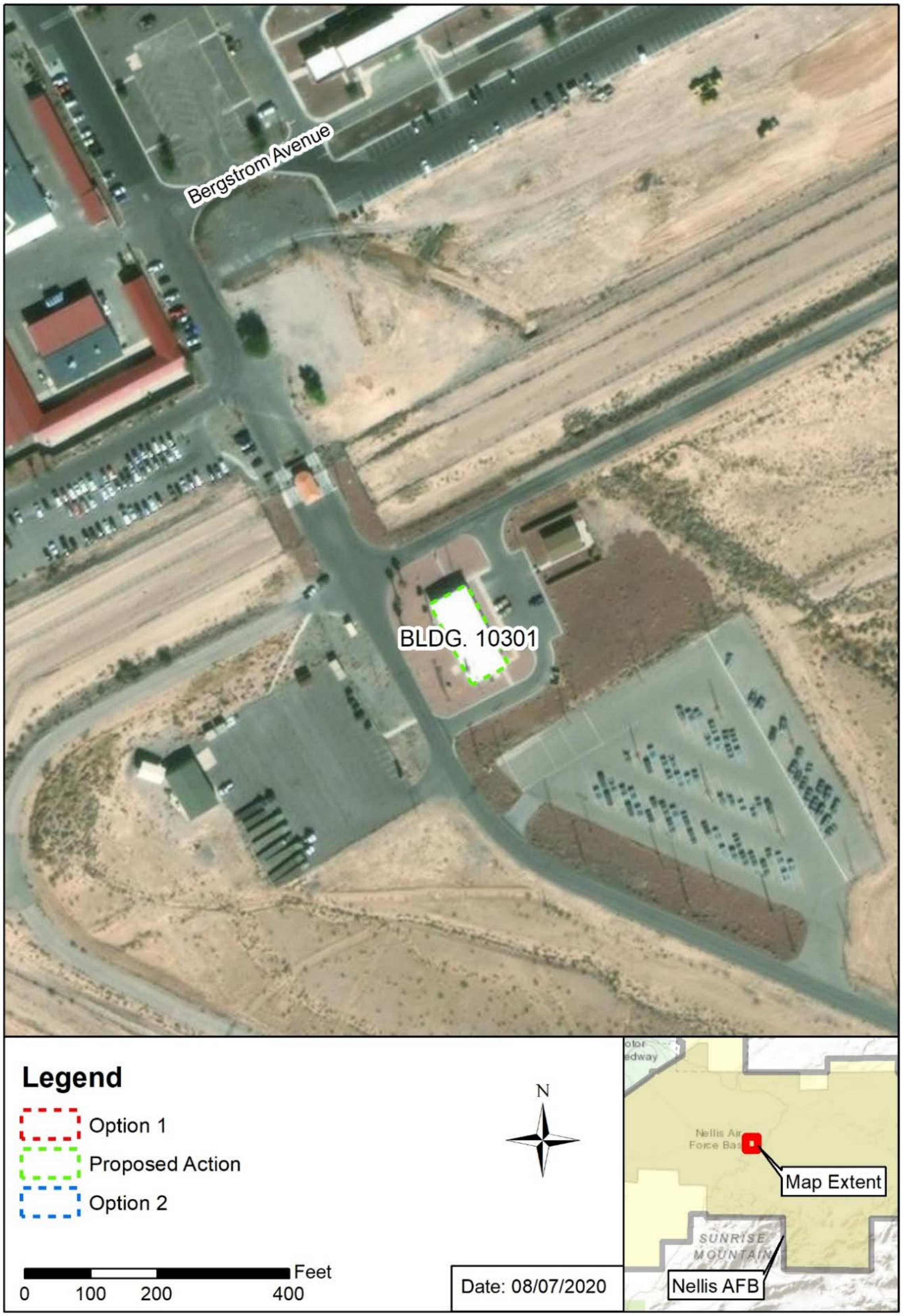

Figure B-9. Building 10301

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APPENDIX C.
SOUND, NOISE, AND POTENTIAL EFFECTS

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Table of Contents

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Appendix C.1
Sound, Noise, and Potential Effects

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C.1.1 Introduction

This appendix discusses sound and noise and their potential effects on the human and natural environment. Section C.1.2 provides an overview of the basics of sound and noise. Section C.1.3 defines and describes the different metrics used to describe noise. The largest section, Section C.1.4, reviews the potential effects of noise, focusing on effects on humans but also addressing effects on property values, structures, and animals. Section C.1.5 contains the list of references cited. Appendix D-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.

C.1.2 Basics of Sound

C.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 C-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.

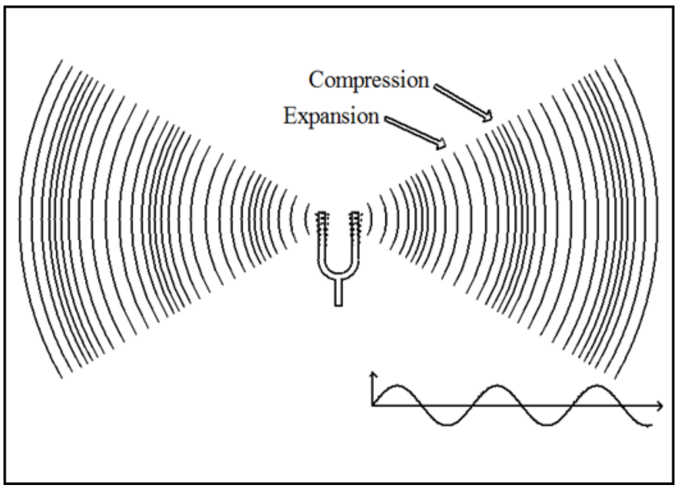


Figure C-1. Sound Waves from a Vibrating Tuning Fork.

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 is related to sound pressure. The greater the sound pressure, the more energy carried by the sound and the louder the perception of that sound.
- Frequency determines how the pitch of the sound is perceived. Low-frequency sounds are characterized as rumbles or roars, while high-frequency sounds are typified by sirens or screeches.
- <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 is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above 120 dB begin to be felt inside the human ear as discomfort. Sound levels between 130 and 140 dB are felt as pain (Berglund and Lindvall, 1995).

As shown on **Figure C-1**, the sound from a tuning fork spreads out uniformly as it travels from the source. The spreading causes the sound's intensity to decrease with increasing distance from the source. For a source such as an aircraft in flight, the sound level will decrease by about 6 dB for every doubling of the distance. For a busy highway, the sound level will decrease by 3 to 4.5 dB for every doubling of distance.

As sound travels from the source, it also is absorbed by the air. The amount of absorption depends on the frequency composition of the sound, the temperature, and the humidity conditions. Sound with high frequency content gets absorbed by the air more than sound with low frequency content. More sound is absorbed in colder and drier conditions than in hot and wet conditions. Sound is also affected by wind and temperature gradients, terrain (elevation and ground cover) and structures.

Because of the logarithmic nature of the decibel unit, sound levels cannot simply be added or subtracted and are somewhat cumbersome to handle mathematically; however, some simple rules are useful in dealing with sound levels. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. For example:

60 dB + 60 dB = 63 dB, and
80 dB + 80 dB = 83 dB.

Second, the total sound level produced by two sounds of different levels is usually only slightly more than the higher of the two. For example:

60.0 dB + 70.0 dB = 70.4 dB.

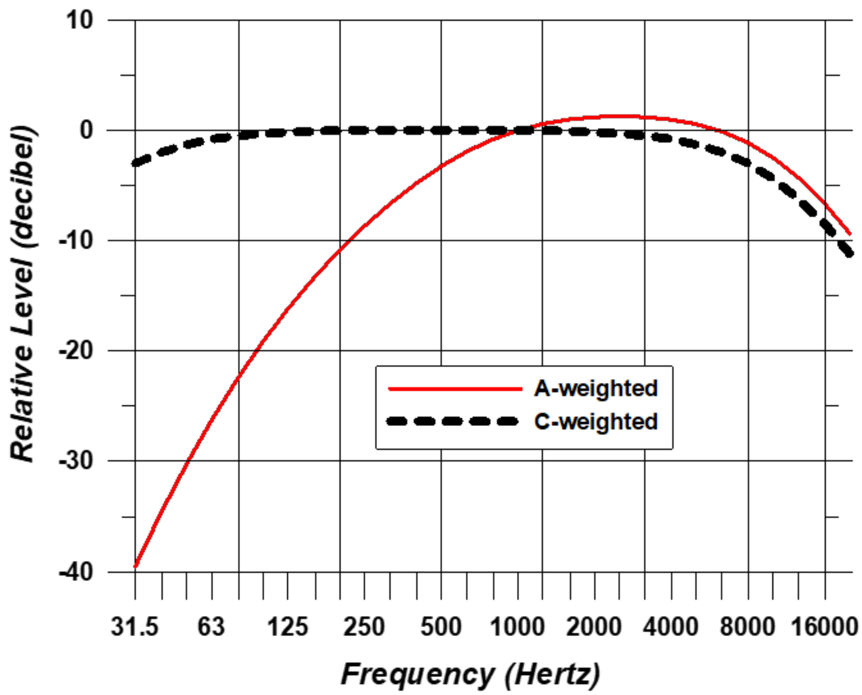
Because the addition of sound levels is different than that of ordinary numbers, this process is often referred to as "decibel addition."

The minimum change in the sound level of individual events that an average human ear can detect is about 3 dB. On average, a person perceives a change in sound level of about 10 dB as a doubling (or halving) of the sound's loudness (Berglaund and Lindvall, 1995). This relation holds true for loud and quiet sounds. A decrease in sound level of 10 dB actually represents a 90 percent decrease in sound intensity but only a 50 percent decrease in perceived loudness because the human ear does not respond linearly.

Sound frequency is measured in terms of cycles per second or hertz (Hz). The normal ear of a young person can detect sounds that range in frequency from about 20 Hz to 20,000 Hz. As we get older, we lose the ability to hear high frequency sounds. Not all sounds in this wide range of frequencies are heard equally. Human hearing is most sensitive to frequencies in the 1,000 to 4,000 Hz range. The notes on a piano range from just over 27 Hz to 4,186 Hz, with middle C equal to 261.6 Hz. Most sounds (including a single note on a piano) are not simple pure tones like the tuning fork on **Figure C-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 C-2**, are adequate to quantify most environmental noises. A-weighting puts emphasis on the 1,000 to 4,000 Hz range where human hearing is most sensitive.

Very loud or impulsive sounds, such as explosions or sonic booms, can sometimes be felt, and can cause secondary effects, such as shaking of a structure or rattling of windows. These types of sounds can add to annoyance and are best measured by C-weighted sound levels, denoted dBC. C-weighting is nearly flat throughout the audible frequency range and includes low frequencies that may not be heard but cause shaking or rattling. C-weighting approximates the human ear's sensitivity to higher intensity sounds.



Source: ANSI S1.4A -1985 "Specification of Sound Level Meters"

Figure C-2. Frequency Characteristics of A- and C-Weighting.

C.1.2.2 Sound Levels and Types of Sounds

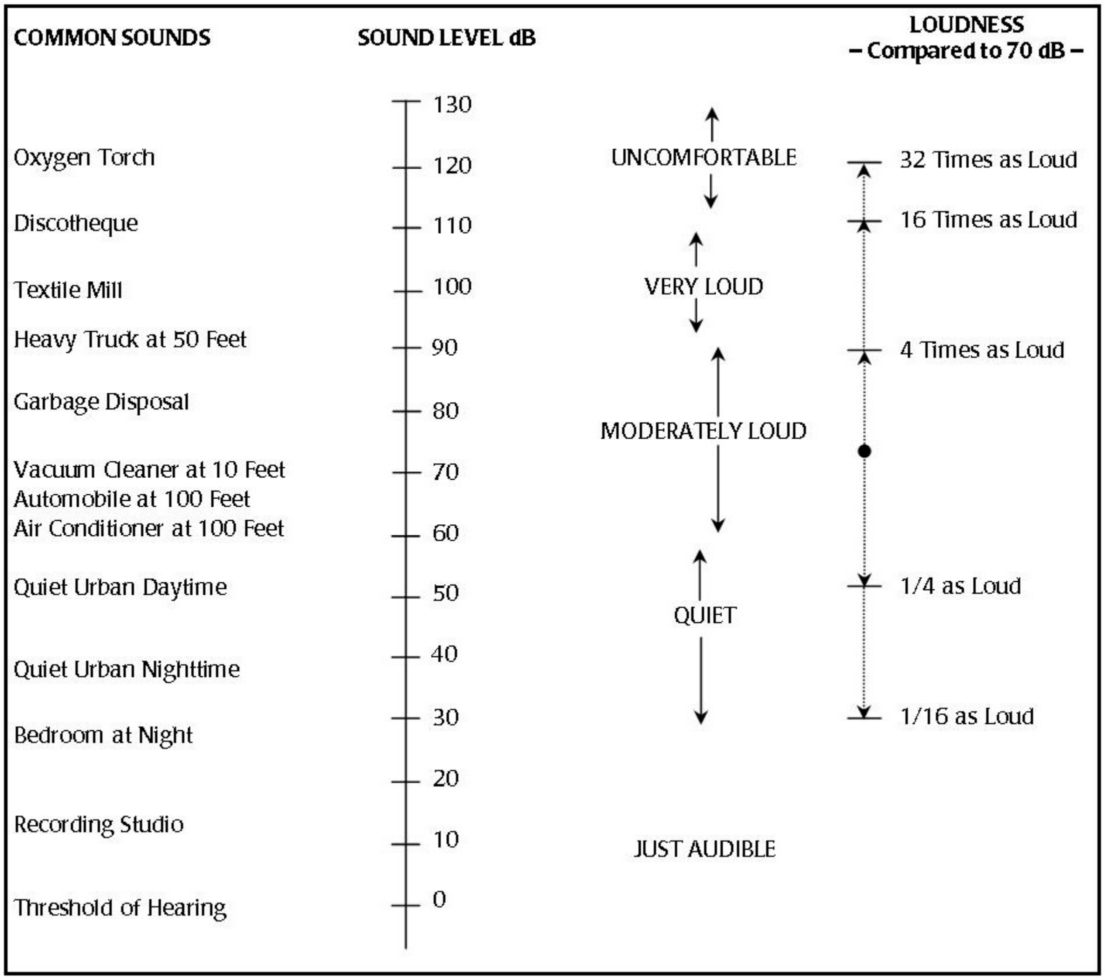
Most environmental sounds are measured using A-weighting. They're called A-weighted sound levels, and sometimes use the unit dBA or dB(A) rather than dB. When the use of A-weighting is understood, the term "A-weighted" is often omitted and the unit dB is used. Unless otherwise stated, dB units refer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

Sound becomes noise when it is unwelcome and interferes with normal activities, such as sleep or conversation. Noise is unwanted sound. Noise can become an issue when its level exceeds the ambient or background sound level. Ambient noise in urban areas typically varies from 60 to 70 dB but can be as high as 80 dB in the center of a large city. Quiet suburban neighborhoods experience ambient noise levels around 45 to 50 dB (USEPA, 1978).

Figure C-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 C.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: FICON, 1992

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

C.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.

C.1.3.1 Single Events

Maximum Sound Level (Lmax)

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 C-4**.

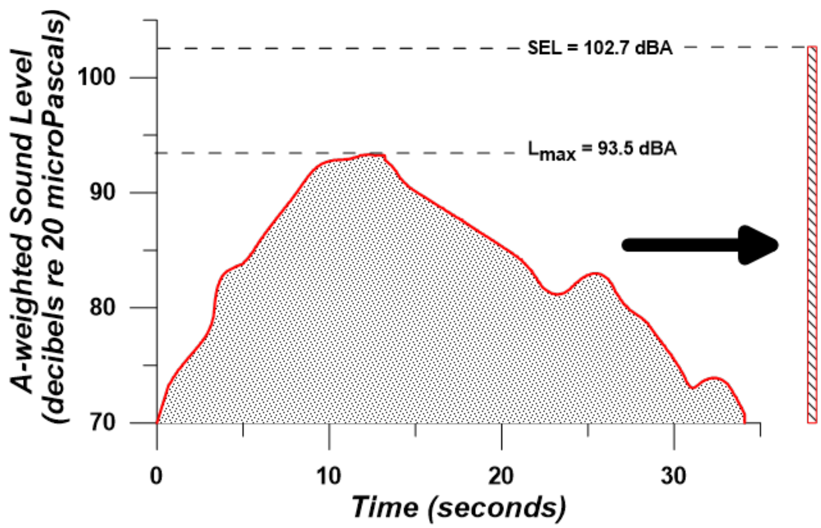
L_{max} is the maximum level that occurs over a fraction of a second. For aircraft noise, the "fraction of a second" is one-eighth of a second, denoted as "fast" response on a sound level measuring meter (ANSI, 1988). Slowly varying or steady sounds are generally measured over 1 second, denoted as "slow"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

The Peak Sound Pressure Level is the highest instantaneous level measured by a sound level measurement meter. L_{pk} is typically measured every 20 microseconds, and usually based on unweighted or linear response of the meter. It is used to describe individual impulsive events such as blast noise. Because blast noise varies from shot to shot and varies with meteorological (weather) conditions, the US Department of Defense (DOD) usually characterizes L_{pk} by the metric PK 15(met), which is the L_{pk} exceeded 15 percent of the time. The “met” notation refers to the metric accounting for varied meteorological or weather conditions.

Sound Exposure Level (SEL)

Sound Exposure Level combines both the intensity of a sound and its duration. For an aircraft flyover, SEL includes the maximum and all lower noise levels produced as part of the overflight, together with how long each part lasts. It represents the total sound energy in the event. **Figure C-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 C-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 C-4**, which also indicates two metrics (L_{max} and SEL) that are described above. Over time there can be a number of events, not all the same. Because aircraft noise events last more than a few seconds, the SEL value is larger than L_{max}. It does not directly represent the sound level heard at any given time, but rather the entire event. SEL provides a much better measure of aircraft flyover noise exposure than L_{max} alone.

Overpressure

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

C-Weighted Sound Exposure Level

CSEL is SEL computed with C frequency weighting, which is similar to A-Weighting (discussed in **Section C.1.2.2**) except that C-weighting places more emphasis on low frequencies below 1,000 hertz.

C.1.3.2 Cumulative Events

Equivalent Sound Level (Leq)

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

The time period of an L_{eq} measurement is usually related to some activity, and is given along with the value. The time period is often shown in parenthesis (e.g., L_{eq}[24] for 24 hours). The L_{eq} from 7:00 a.m. to 3:00 p.m. may give exposure of noise for a school day.

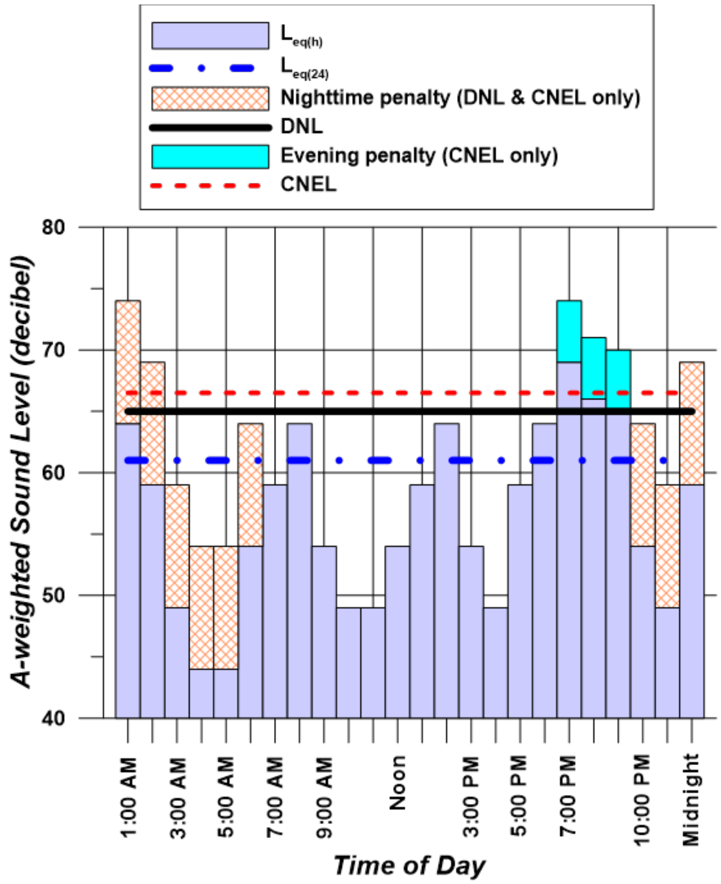
Figure C-5 gives an example of L_{eq}(24) using notional hourly average noise levels (L_{eq}(h)) for each hour of the day as an example. The L_{eq}(24) for this example is 61 dB.

Day-Night Average Sound Level (DNL or Ldn) and Community Noise Equivalent Level (CNEL)

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

CNEL is a variation of DNL specified by law in California (California Code of Regulations Title 21, Public Works) (Wyle Laboratories, 1970). CNEL has the 10-dB nighttime penalty for events between 10:00 p.m. and 7:00 a.m. but also includes a 4.8-dB penalty for events during the evening period of 7:00 p.m. to 10:00 p.m. The evening penalty in CNEL accounts for the added intrusiveness of sounds during that period. For airports and military airfields, DNL and CNEL represent the average sound level for annual average daily aircraft events.

Figure C-5 gives an example of DNL and CNEL using notional hourly average noise levels (L_{eq}[h]) for each hour of the day as an example. Note the L_{eq}(h) for the hours between 10:00 p.m. and 7:00 a.m. have a 10-dB penalty assigned. For CNEL the hours between 7p.m. and 10 p.m. have a 4.8-dB penalty assigned. The DNL for this example is 65 dB. The CNEL for this example is 66 dB.



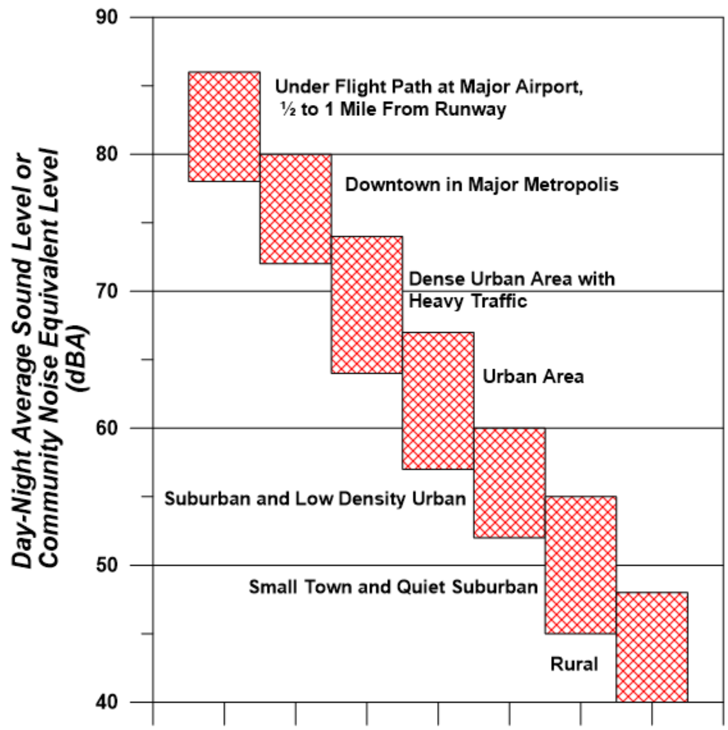
Source: Wyle Laboratories

Figure C-5. Example of L_{eq}(24), DNL and CNEL Computed from Hourly Equivalent Sound Levels.

Figure C-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).



Source: DOD 1978.

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

<u>Onset-Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}) and Onset-Rate Adjusted Monthly Community Noise Equivalent Level ($CNEL_{mr}$)</u>

Military aircraft utilizing Special Use Airspace (SUA) such as Military Training Routes (MTRs), Military Operations Areas (MOAs), and Restricted Areas/Ranges generate a noise environment that is somewhat different from that around airfields. Rather than regularly occurring operations like at airfields, activity in SUAs is highly sporadic. It is often seasonal, ranging from 10 per hour to less than 1 per week. Individual military overflight events also differ from typical community noise events in that noise from a low-altitude, high-airspeed flyover can have a rather sudden onset, with rates of up to 150 dB per second.

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

In California, a variant of the L_{dnmr} includes a penalty for evening operations (7:00 p.m. to 10:00 p.m.) and is denoted $CNEL_{mr}$.

B.1.3.3 Supplemental Metrics

<u>Number-of-Events Above (NA) a Threshold Level (L)</u>

The Number-of-Events Above (NA) metric gives the total number of events that exceed a noise level threshold (L) during a specified period of time. Combined with the selected threshold, the metric is denoted NAL. The threshold can be either SEL or L_{max}, and it is important that this selection is shown in the nomenclature. When labeling a contour line or point of interest (POI), NAL is followed by the number of events in parentheses. For example, where 10 events exceed an SEL of 90 dB over a given period of time, the nomenclature would be NA90SEL(10). Similarly, for L_{max} it would be NA90L_{max}(10). The period of time can be an average 24-hour day, daytime, nighttime, school day, or any other time period appropriate to the nature and application of the analysis.

NA is a supplemental metric. It is not supported by the amount of science behind DNL/CNEL, but it is valuable in helping to describe noise to the community. A threshold level and metric are selected that best meet the need for each situation. An L_{max} threshold is normally selected to analyze speech interference, while an SEL threshold is normally selected for analysis of sleep disturbance.

The NA metric is the only supplemental metric that combines single-event noise levels with the number of aircraft operations. In essence, it answers the question of how many aircraft (or range of aircraft) fly over a given location or area at or above a selected threshold noise level.

Time Above (TA) a Specified Level (L)

The Time Above (TA) metric is the total time, in minutes, that the A-weighted noise level is at or above a threshold. Combined with the threshold level (L), it is denoted TAL. TA can be calculated over a full 24-hour annual average day, the 15-hour daytime and 9-hour nighttime periods, a school day, or any other time period of interest, provided there is operational data for that time.

TA is a supplemental metric, used to help understand noise exposure. It is useful for describing the noise environment in schools, particularly when assessing classroom or other noise sensitive areas for various scenarios. TA can be shown as contours on a map similar to the way DNL contours are drawn.

TA helps describe the noise exposure of an individual event or many events occurring over a given time period. When computed for a full day, the TA can be compared alongside the DNL in order to determine the sound levels and total duration of events that contribute to the DNL. TA analysis is usually conducted along with NA analysis, so the results show not only how many events occur, but also the total duration of those events above the threshold.

C.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.

C.1.4.1 Annoyance

With the introduction of jet aircraft in the 1950s, it became clear that aircraft noise annoyed people and was a significant problem around airports. Early studies, such as those of Rosenblith et al. (1953) and Stevens et al. (1953) showed that effects depended on the quality of the sound, its level, and the number of flights. Over the next 20 years considerable research was performed refining this understanding and setting guidelines for noise exposure. In the early 1970s, the USEPA published its “Levels Document” (USEPA, 1974) that reviewed the factors that affected communities. DNL (still known as Ldn at the time) was identified as an appropriate noise metric, and threshold criteria were recommended.

Threshold criteria for annoyance were identified from social surveys, where people exposed to noise were asked how noise affects them. Surveys provide direct real-world data on how noise affects actual residents.

Surveys in the early years had a range of designs and formats and needed some interpretation to find common ground. In 1978, Schultz showed that the common ground was the number of people “highly annoyed,” defined as the upper 28 percent range of whatever response scale a survey used (Schultz, 1978). With that definition, he was able to show a remarkable consistency among the majority of the surveys for which data were available. **Figure C-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 C-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 nonacoustic factors. Newman and Beattie (1985) divided the nonacoustic factors into the emotional and physical variables shown in **Table C-1**.

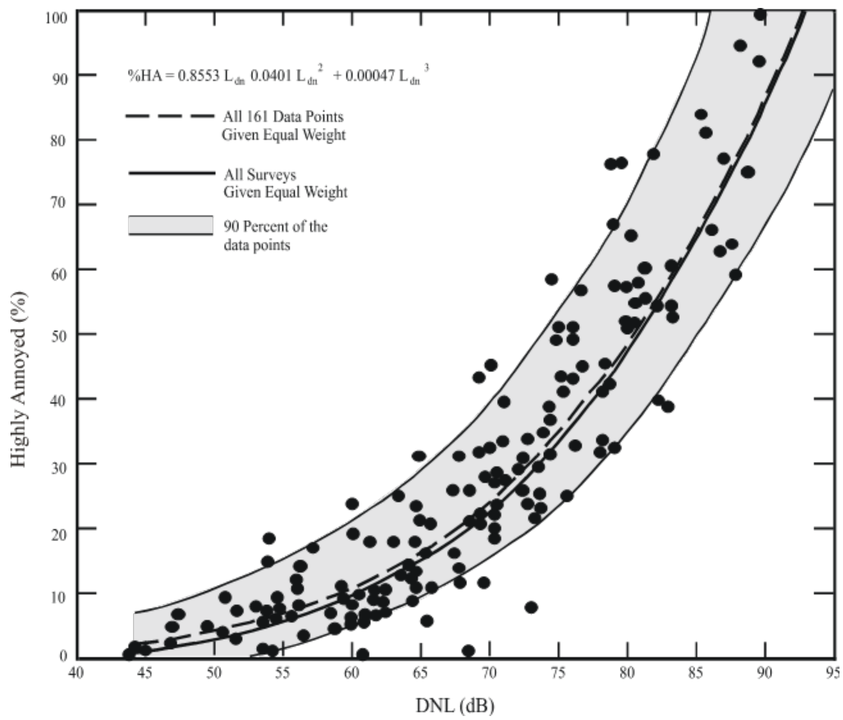


Figure C-7. Schultz Curve Relating Noise Annoyance to DNL (Schultz, 1978).

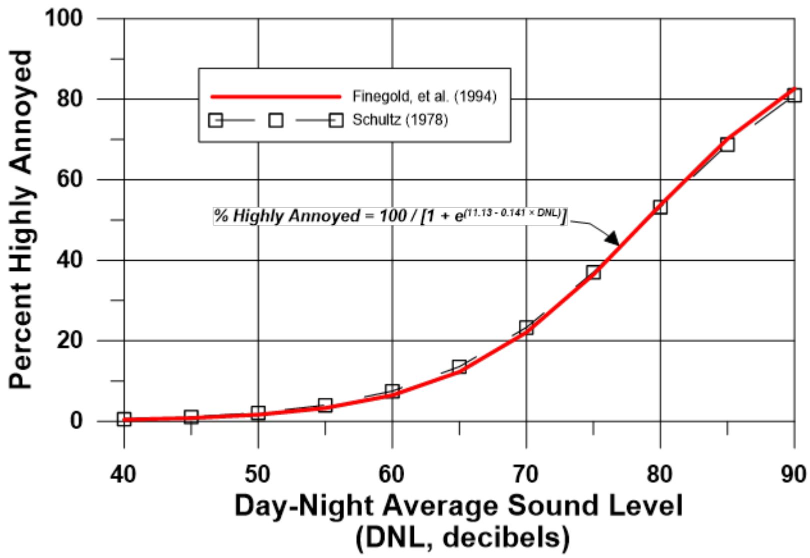


Figure C-8. Response of Communities to Noise; Comparison of Original Schultz (1978) with Finegold et al (1994).

Table C-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) recently examined the importance of some of these factors on short term annoyance. Attitudinal factors were identified as having an effect on annoyance. In formal regression analysis, however, sound level (L_{eq}) was found to be more important than attitude. A series of studies at three European airports showed that less than 20 percent of the variance in annoyance can be explained by noise alone (Márki, 2013).

A recent study by Plotkin et al. (2011) examined updating DNL to account for these factors. It was concluded that the data requirements for a general analysis were much greater than are available from most existing studies. It was noted that the most significant issue with DNL is that it is not readily understood by the public, and that supplemental metrics such as TA and NA were valuable in addressing attitude when communicating noise analysis to communities (DOD, 2009a).

A factor that is partially nonacoustic 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 C-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 DNL along with the corresponding 95 percent confidence intervals with similar results.

Table C-2
Percent Highly Annoyed for Different Transportation Noise Sources

DNL (dB)	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, 2016) contains the concept of Community Tolerance Level (L_{ct}) as the day-night sound level at which 50 percent of the people in a particular community are predicted to be highly annoyed by noise exposure. L_{ct} accounts for differences between sources and/or communities when predicting the percentage highly annoyed by noise exposure. ISO also recommended a change to the adjustment range used when comparing aircraft noise to road noise. The previous edition suggested a +3 dB to +6 dB for aircraft noise relative to road noise while the latest editions recommends an adjustment range of +5 dB to +8 dB. This adjustment range allows DNL to be correlated to consistent annoyance rates when originating from different noise sources (i.e., road traffic, aircraft, or railroad). This change to the adjustment range would increase the calculated percent highly annoyed at 65 dB DNL by approximately 2 to 5 percent greater than the previous ISO definition. **Figure C-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 2019.

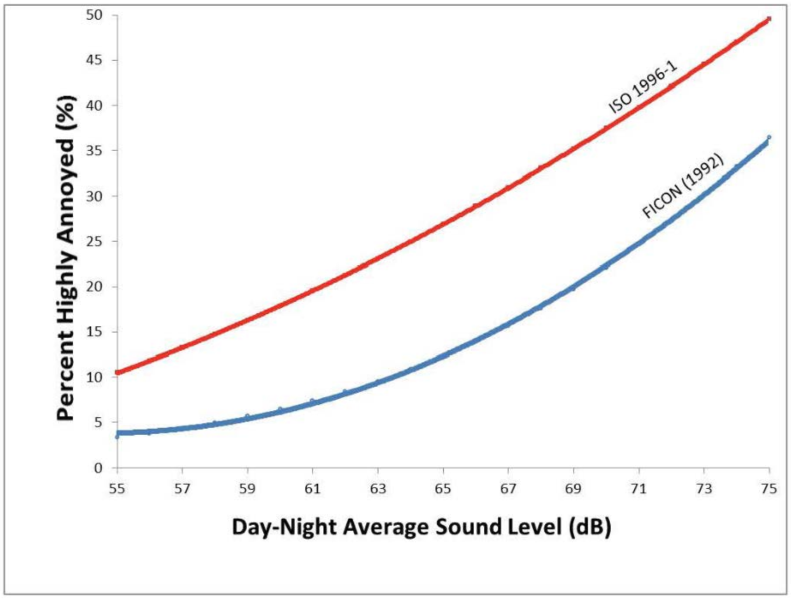


Figure C-9. Percent Highly Annoyed Comparison of ISO 1996-1 to FICON (1992).

iC.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.

<u>US Federal Criteria for Interior Noise</u>

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 C-10** shows the effect of steady indoor background sound levels on sentence intelligibility. For an average adult with normal hearing and fluency in the language, steady background indoor sound levels of less than 45 dB L_{eq} are expected to allow 100 percent sentence intelligibility.

The curve on **Figure C-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.

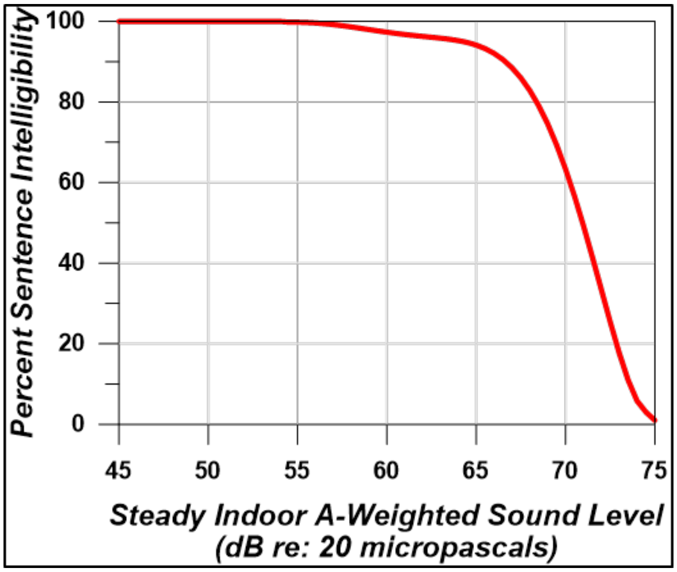


Figure C-10. Speech Intelligibility Curve (digitized from USEPA, 1974).

Classroom Criteria

For teachers to be understood, their regular voice must be clear and uninterrupted. Background noise has to be below the teacher's voice level. Intermittent noise events that momentarily drown out the teacher's voice need to be kept to a minimum. It is therefore important to evaluate the steady background level, the level of voice communication, and the single-event level due to aircraft overflights that might interfere with speech.

Lazarus (1990) found that for listeners with normal hearing and fluency in the language, complete sentence intelligibility can be achieved when the signal-to-noise ratio (i.e., a comparison of the level of the sound to the level of background noise) is in the range of 15 to 18 dB. The initial ANSI classroom noise standard (ANSI, 2002) and American Speech-Language-Hearing Association (ASLHA, 2005) guidelines concur, recommending at least a 15-dB signal-to-noise ratio in classrooms. If the teacher's voice level is at least 50 dB, the background noise level must not exceed an average of 35 dB. The National Research Council of Canada (Bradley, 1993) and WHO (1999) agree with this criterion for background noise.

For eligibility for noise insulation funding, the FAA guidelines state that the design objective for a classroom environment is 45 dB L_{eq} during normal school hours (FAA, 1985).

Most aircraft noise is not continuous. It consists of individual events like the one sketched on **Figure C-4**. Since speech interference in the presence of aircraft noise is caused by individual aircraft flyover events, a time-averaged metric alone, such as L_{eq}, is not necessarily appropriate. In addition to the background level criteria described above, single-event criteria that account for those noisy events are also needed.

A 1984 study by Wyle for the Port Authority of New York and New Jersey recommended using Speech Interference Level (SIL) for classroom noise criteria (Sharp and Plotkin, 1984). SIL is based on the maximum sound levels in the frequency range that most affects speech communication (500-2,000 Hz). The study identified an SIL of 45 dB as the goal. This would provide 90 percent word intelligibility for the short time periods during aircraft overflights. While SIL is technically the best metric for speech interference, it can be approximated by an L_{max} value. An SIL of 45 dB is equivalent to an A weighted L_{max} of 50 dB for aircraft noise (Wesler, 1986).

Lind et al. (1998) also concluded that an L_{max} criterion of 50 dB would result in 90 percent word intelligibility. Bradley (1985) recommends SEL as a better indicator. His work indicates that 95 percent word intelligibility would be achieved when indoor SEL did not exceed 60 dB. For typical flyover noise, this corresponds to an L_{max} of 50 dB. While WHO (1999) only specifies a background L_{max} criterion, they also note the SIL frequencies and that interference can begin at around 50 dB.

The United Kingdom Department for Education and Skills (UKDfES) established in its classroom acoustics guide a 30-minute time-averaged metric of L_{eq}(30min) for background levels and the metric of LA1,30min for intermittent noises, at thresholds of 30 to 35 dB and 55 dB, respectively. LA1,30min represents the A-weighted sound level that is exceeded 1 percent of the time (in this case, during a 30-minute teaching session) and is generally equivalent to the L_{max} metric (UKDfES, 2003).

Table C-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 C-3
Indoor Noise Level Criteria Based on Speech Intelligibility

Source	Metric/Level (dB)	Effects and Notes
US FAA (1985)	$L_{eq(during\ school\ hours)}$ = 45 dB	Federal assistance criteria for school sound insulation; supplemental single-event criteria may be used.
Lind et al. (1998), Sharp and Plotkin (1984), Wesler (1986)	L_{max} = 50 dB / SIL 45	Single event level permissible in the classroom.
WHO (1999)	L_{eq} = 35 dB L_{max} = 50 dB	Assumes average speech level of 50 dB and recommends signal to noise ratio of 15 dB.
US ANSI (2010)	L_{eq} = 35 dB, based on Room Volume (e.g., cubic feet)	Acceptable background level for continuous and intermittent noise.
UK DFES (2003)	$L_{eq(30min)}$ = 30-35 dB L_{max} = 55 dB	Minimum acceptable in classroom and most other learning environs.

C.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 to measure is the number of arousals or awakenings from noise events. Much of the literature has therefore focused on predicting the percentage of the population that will be awakened at various noise levels.

FICON's 1992 review of airport noise issues (FICON, 1992) included an overview of relevant research conducted through the 1970s. Literature reviews and analyses were conducted from 1978 through 1989 using existing data (Griefahn, 1978; Lukas, 1978; Pearsons et. al., 1989). Because of large variability in the data, FICON did not endorse the reliability of those results.

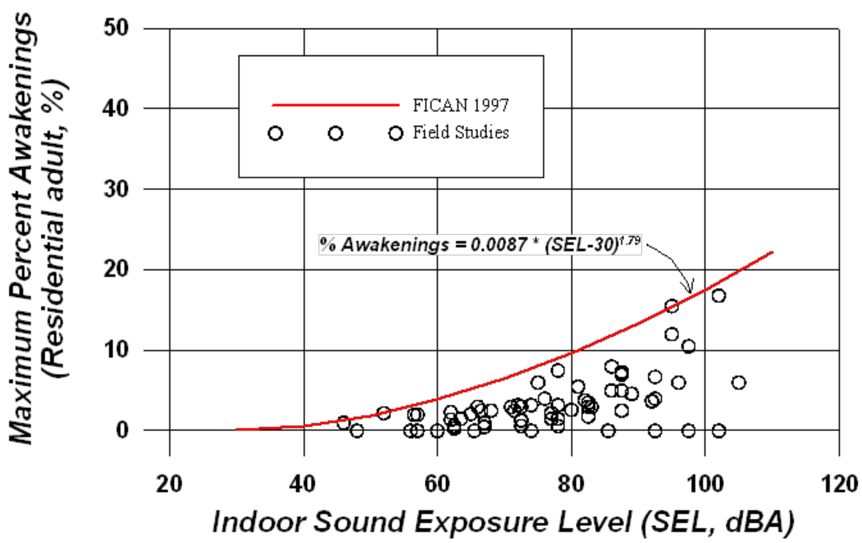
FICON did, however, recommend an interim dose-response curve, awaiting future research. That curve predicted the percent of the population expected to be awakened as a function of the exposure to SEL. This curve was based on research conducted for the US Air Force (Finegold et al., 1994). The data included 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 et al., 1994) found that 80-90 percent of sleep disturbances were not related to outdoor noise events, but rather to indoor noises and nonnoise factors. The results showed that, in real life conditions, there was less of an effect of noise on sleep than had been previously reported from laboratory studies. Laboratory sleep studies tend to show more sleep disturbance than field studies because people who sleep in their own homes are used to their environment and, therefore, do not wake up as easily (FICAN, 1997).

FICAN

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



Source: FICAN 1997

Figure C-11. FICAN 1997 Recommended Sleep Disturbance Dose-Response Relationship.

The 1997 FICAN curve represents the upper envelope of the latest field data. It predicts the maximum percent awakened for a given residential population. According to this curve, a maximum of 3 percent of people would be awakened at an indoor SEL of 58 dB. An indoor SEL of 58 dB is equivalent to an outdoor SEL of about 83 dB, with the windows closed (73 dB with windows open).

Number of Events and Awakenings

It is reasonable to expect that sleep disturbance is affected by the number of events. The German Aerospace Center (DLR Laboratory) conducted an extensive study focused on the effects of nighttime aircraft noise on sleep and related factors (Basner et al., 2004). The DLR Laboratory study was one of the largest studies to examine the link between aircraft noise and sleep disturbance. It involved both laboratory and in-home field research phases. The DLR Laboratory investigators developed a dose-response curve that predicts the number of aircraft events at various values of L_{max} expected to produce one additional awakening over the course of a night. The dose-effect curve was based on the relationships found in the field studies.

Later studies by DLR Laboratory conducted in the laboratory comparing the probability of awakenings from different modes of transportation showed that aircraft noise lead to significantly lower awakening probabilities than either road or rail noise (Basner et al., 2011). Furthermore, it was noted that the probability of awakening, per noise event, decreased as the number of noise events increased. The authors concluded that by far the majority of awakenings from noise events merely replaced awakenings that would have occurred spontaneously anyway.

A different approach was taken by an ANSI standards committee (ANSI, 2008). The committee used the average of the data shown on **Figure C-11** rather than the upper envelope, to predict average awakening from one event. Probability theory is then used to project the awakening from multiple noise events.

Currently, there are no established criteria for evaluating sleep disturbance from aircraft noise, although recent studies have suggested a benchmark of an outdoor SEL of 90 dB as an appropriate tentative criterion when comparing the effects of different operational alternatives. The corresponding indoor SEL would be approximately 25 dB lower (at 65 dB) with doors and windows closed, and approximately 15 dB lower (at 75 dB) with doors or windows open. According to the ANSI (2008) standard, the probability of awakening from a single aircraft event at this level is between 1 and 2 percent for people habituated to the noise sleeping in bedrooms with windows closed, and 2 to 3 percent with windows open. The probability of the exposed population awakening at least once from multiple aircraft events at noise levels of 90 dB SEL is shown in **Table C-4**.

Table C-4
Probability of Awakening from NA90SEL

Number of Aircraft Events at 90 dB SEL for Average 9-Hour Night	Minimum Probability of Awakening at Least Once	
	Windows Closed	Windows Open
1	1%	2%
3	4%	6%
5	7%	10%
9 (1 per hour)	12%	18%
18 (2 per hour)	22%	33%
27 (3 per hour)	32%	45%

Source: DOD, 2009b

In December 2008, FICAN recommended the use of this new standard. FICAN also recognized that more research is underway by various organizations, and that work may result in changes to FICAN's position. Until that time, FICAN recommends the use of the ANSI (2008) standard (FICAN 2008).

<u>Summary</u>

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.

C.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.

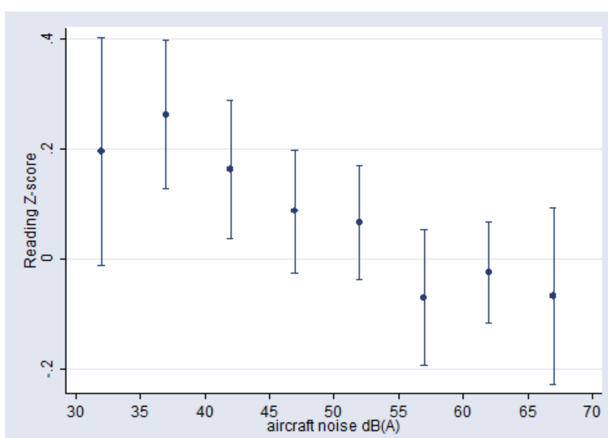
A longitudinal study reported by Evans et al. (1998), conducted prior to relocation of the old Munich airport in 1992, reported that high noise exposure was associated with deficits in long-term memory and reading comprehension in children with a mean age of 10.8 years. Two years after the closure of 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.

Figure C-12 shows RANCH's result relating noise to reading comprehension. It shows that reading falls below average (a z-score of 0) at Leq greater than 55 dB. Because the relationship is linear, reducing exposure at any level should lead to improvements in reading comprehension.

An observation of the RANCH study was that children may be exposed to aircraft noise for many of their childhood years and the consequences of long-term noise exposure were unknown. A follow-up study of the children in the RANCH project is being analyzed to examine the long-term effects on children's reading comprehension (Clark et al., 2009). Preliminary analysis indicated a trend for reading comprehension to be poorer at 15 to 16 years of age for children who attended noise-exposed primary schools.



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

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

There was also a trend for reading comprehension to be poorer in aircraft noise exposed secondary schools. Significant differences in reading scores were found between primary school children in the two different classrooms at the same school (Bronzaft and McCarthy, 1975). One classroom was exposed to high levels of railway noise while the other classroom was quiet. The mean reading age of the noise-exposed children was 3 to 4 months behind that of the control children. Studies suggest that the evidence of the effects of noise on children's cognition has grown stronger over recent years, (Stansfeld and Clark, 2015), but further analysis adjusting for confounding factors is ongoing, and is needed to confirm these initial conclusions.

Studies identified a range of linguistic and cognitive factors to be responsible for children´s unique difficulties with speech perception in noise. Children have lower stored phonological knowledge to reconstruct degraded speech reducing the probability of successfully matching incomplete speech input when compared with adults. Additionally, young children are less able than older children and adults to make use of contextual cues to reconstruct noise-masked words presented in sentential context (Klatte et al., 2013).

FICAN funded a pilot study to assess the relationship between aircraft noise reduction and standardized test scores (Eagan et al., 2004; FICAN, 2007). The study evaluated whether abrupt aircraft noise reduction within classrooms, from either airport closure or sound insulation, was associated with improvements in test scores. Data were collected in 35 public schools near three airports in Illinois and Texas. The study used several noise metrics. These were, however, all computed indoor levels, which makes it hard to compare with the outdoor levels used in most other studies.

The FICAN study found a significant association between noise reduction and a decrease in failure rates for high school students, but not middle or elementary school students. There were some weaker associations between noise reduction and an increase in failure rates for middle and elementary schools. Overall the study found that the associations observed were similar for children with or without learning difficulties, and between verbal and math/science tests. As a pilot study, it was not expected to obtain final answers but provided useful indications (FICAN, 2007).

A recent study of the effect of aircraft noise on student learning (Sharp et al., 2013) examined student test scores at a total of 6,198 US elementary schools, 917 of which were exposed to aircraft noise at 46 airports with noise exposures exceeding 55 dB DNL. The study found small but statistically significant associations between airport noise and student mathematics and reading test scores, after taking demographic and school factors into account. Associations were also observed for ambient noise and total noise on student mathematics and reading test scores, suggesting that noise levels per se, as well as from aircraft, might play a role in student achievement.

As part of the Noise-Related Annoyance, Cognition and Health (NORAH) study conducted at Frankfurt airport (Shreckenberg and Guski, 2015), reading tests were conducted on 1,209 school children at 29 primary schools. It was found that there was a small decrease in reading performance that corresponded to a one-month reading delay; however, a recent study observing children at 11 schools surrounding Los Angeles International Airport (LAX) found that the majority of distractions to elementary age students were other students followed by themselves, which includes playing with various items and daydreaming. Less than 1 percent of distractions were caused by traffic noise.

While there are many factors that can contribute to learning deficits in school-aged children, there is increasing awareness that chronic exposure to high aircraft noise levels may impair learning. This awareness has led WHO and a North Atlantic Treaty Organization (NATO) working group to conclude that daycare centers and schools should not be located near major sources of noise, such as highways, airports, and industrial sites (NATO, 2000; WHO, 1999). The awareness has also led to the classroom noise standard discussed earlier (ANSI, 2002).

C.1.4.5 Noise Effects on Animals and Wildlife

Hearing is critical to an animal's ability to react, compete, reproduce, hunt, forage, and survive in its environment. While the existing literature does include studies on possible effects of jet aircraft noise and sonic booms on wildlife, there appears to have been little concerted effort in developing quantitative comparisons of aircraft noise effects on normal auditory characteristics. Behavioral effects have been relatively well described, but the larger ecological context issues, and the potential for drawing conclusions regarding effects on populations, has not been well developed.

The relationships between potential auditory/physiological effects and species interactions with their environments are not well understood. Manci et al. (1988), assert that the consequences that physiological effects may have on behavioral patterns are vital to understanding the long-term effects of noise on wildlife. Questions regarding the effects (if any) on predator-prey interactions, reproductive success, and intraspecific behavior patterns remain.

The following discussion provides an overview of the existing literature on noise effects (particularly jet aircraft noise) on animal species. The literature reviewed here involves those studies that have focused on the observations of the behavioral effects that jet aircraft and sonic booms have on animals.

A great deal of research was conducted in the 1960s and 1970s on the effects of aircraft noise on the public and the potential for adverse ecological impacts. These studies were largely completed in response to the increase in air travel and as a result of the introduction of supersonic jet aircraft. According to Manci et al. (1988), the foundation of information created from that focus does not necessarily correlate or provide information specific to the impacts to wildlife in areas overflown by aircraft at supersonic speed or at low altitudes.

The abilities to hear sounds and noise and to communicate assist wildlife in maintaining group cohesiveness and survivorship. Social species communicate by transmitting calls of warning, introduction, and other types that are subsequently related to an individual's or group's responsiveness.

Animal species differ greatly in their responses to noise. Noise effects on domestic animals and wildlife are classified as primary, secondary, and tertiary. Primary effects are direct, physiological changes to the auditory system, and most likely include the masking of auditory signals. Masking is defined as the inability of an individual to hear important environmental signals that may arise from mates, predators, or prey. There is some potential that noise could disrupt a species' ability to communicate or could interfere with behavioral patterns (Manci et al., 1988). Although the effects are likely temporal, aircraft noise may cause masking of auditory signals within exposed faunal communities. Animals rely on hearing to avoid predators, obtain food, and communicate with, and attract, other members of their species. Aircraft noise may mask or interfere with these functions. Other primary effects, such as ear drum rupture or temporary and permanent hearing threshold shifts, are not as likely given the subsonic noise levels produced by aircraft overflights.

Secondary effects may include nonauditory effects such as stress and hypertension; behavioral modifications; interference with mating or reproduction; and impaired ability to obtain adequate food, cover, or water. Tertiary effects are the direct result of primary and secondary effects, and include population decline and habitat loss. Most of the effects of noise are mild enough that they may never be detectable as variables of change in population size or population growth against the background of normal variation (Bowles, 1995). Other environmental variables (e.g., predators, weather, changing prey base, ground-based disturbance) also influence secondary and tertiary effects, and confound the ability to identify the ultimate factor in limiting productivity of a certain nest, area, or region (Smith et al., 1988). Overall, the literature suggests that species differ in their response to various types, durations, and sources of noise (Manci et al., 1988).

Many scientific studies have investigated the effects of aircraft noise on wildlife, and some have focused on wildlife "flight" due to noise. Animal responses to aircraft are influenced by many variables, including size, speed, proximity (both height above the ground and lateral distance), engine noise, color, flight profile, and radiated noise. The type of aircraft (e.g., fixed wing versus rotor-wing [helicopter]) and type of flight mission may also produce different levels of disturbance, with varying animal responses (Smith et al., 1988). Consequently, it is difficult to generalize animal responses to noise disturbances across species.

One result of the Manci et al. (1988) literature review was the conclusion that, while behavioral observation studies were relatively limited, a general behavioral reaction in animals from exposure to aircraft noise is the startle response. The intensity and duration of the startle response appears to be dependent on which species is exposed, whether there is a group or an individual, and whether there have been some previous exposures. Responses range from flight, trampling, stampeding, jumping, or running, to movement of the head in the apparent direction of the noise source. Manci et al. (1988) reported that the literature indicated that avian species may be more sensitive to aircraft noise than mammals.

Domestic Animals

Although some studies report that the effects of aircraft noise on domestic animals is inconclusive, a majority of the literature reviewed indicates that domestic animals exhibit some behavioral responses to military overflights but generally seem to habituate to the disturbances over a period of time. Mammals in particular appear to react to noise at sound levels higher than 90 dB, with responses including the startle response, freezing (i.e., becoming temporarily stationary), and fleeing from the sound source. Many studies on domestic animals suggest that some species appear to acclimate to some forms of sound disturbance (Manci et al., 1988). Some studies have reported such primary and secondary effects as reduced milk production and rate of milk release, increased glucose concentrations, decreased levels of hemoglobin, increased heart rate, and a reduction in thyroid activity. These latter effects appear to represent a small percentage of the findings occurring in the existing literature.

Some reviewers have indicated that earlier studies, and claims by farmers linking adverse effects of aircraft noise on livestock, did not necessarily provide clear-cut evidence of cause and effect (Cottereau, 1978). In contrast, many studies conclude that there is no evidence that aircraft overflights affect feed intake, growth, or production rates in domestic animals.

Wildlife

Studies on the effects of overflights and sonic booms on wildlife have been focused mostly on avian species and ungulates such as caribou and bighorn sheep. Few studies have been conducted on marine mammals, small terrestrial mammals, reptiles, amphibians, and carnivorous mammals. Generally, species that live entirely below the surface of the water have also been ignored due to the fact they do not experience the same level of sound as terrestrial species (National Park Service, 1994). Wild ungulates appear to be much more sensitive to noise disturbance than domestic livestock. This may be due to previous exposure to disturbances. One common factor appears to be that low-altitude flyovers seem to be more disruptive in terrain where there is little cover (Manci et al., 1988).

Some physiological/behavioral responses such as increased hormonal production, increased heart rate, and reduction in milk production have been described in a small percentage of studies. A majority of the studies focusing on these types of effects have reported short-term or no effects.

The relationships between physiological effects and how species interact with their environments have not been thoroughly studied; therefore, the larger ecological context issues regarding physiological effects of jet aircraft noise (if any) and resulting behavioral pattern changes are not well understood.

Animal species exhibit a wide variety of responses to noise. It is therefore difficult to generalize animal responses to noise disturbances or to draw inferences across species, as reactions to jet aircraft noise appear to be species-specific. Consequently, some animal species may be more sensitive than other species and/or may exhibit different forms or intensities of behavioral responses. For instance, wood ducks appear to be more sensitive and more resistant to acclimation to jet aircraft noise than Canada geese in one study. Similarly, wild ungulates seem to be more easily disturbed than domestic animals.

The literature does suggest that common responses include the “startle” or “fright” response and, ultimately, habituation. It has been reported that the intensities and durations of the startle response decrease with the numbers and frequencies of exposures, suggesting no long-term adverse effects. The majority of the literature suggests that domestic animal species (cows, horses, chickens) and wildlife species exhibit adaptation, acclimation, and habituation after repeated exposure to jet aircraft noise and sonic booms.

Animal responses to aircraft noise appear to be somewhat dependent on, or influenced by, the size, shape, speed, proximity (vertical and horizontal), engine noise, color, and flight profile of planes. Helicopters also appear to induce greater intensities and durations of disturbance behavior as compared to fixed-wing aircraft. Some studies showed that animals that had been previously exposed to jet aircraft noise exhibited greater degrees of alarm and disturbance to other objects creating noise, such as boats, people, and objects blowing across the landscape. Other factors influencing response to jet aircraft noise may include wind direction, speed, and local air turbulence; landscape structures (i.e., amount and type of vegetative cover); and, in the case of bird species, whether the animals are in the incubation/nesting phase.

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Appendix C-2
Noise Modeling

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The following sections describe input data used in the noise modeling process. This data was developed in coordination with the Air Force Air Combat Command (ACC), Air Force Civil Engineer Center (AFCEC), and Nellis Air Force Base (Nellis) personnel.

C.2.1 Airfield Operations

The first step in estimating the effects of the addition of F-35s, the addition of F-22s, and the COCO ADAIR was to determine the baseline operations at Nellis AFB and associated airspace. Baseline conditions are taken from the 2017 Nellis AFB Air Installation Compatible Use Zone report. 24 TASS F-16C operational conditions from the 2017 TASS Beddown EA were validated and updated from interviews with a 24 TASS pilot and added to the baseline model. **Table C-5** contains the break out of baseline operations by aircraft type and organization. **Table C-6** contains the operations modeled for the baseline as well as proposed aircraft operations.

A SORTIE IS A SINGLE FLIGHT, BY ONE AIRCRAFT, FROM TAKEOFF TO LANDING, WHILE A SORTIE-OPERATION IS THE USE OF ONE AIRSPACE UNIT (E.G., MOA) BY ONE AIRCRAFT. THE NUMBER OF SORTIE-OPERATIONS IS USED TO QUANTIFY THE NUMBER OF USES BY AIRCRAFT AND TO ACCURATELY MEASURE POTENTIAL IMPACTS; E.G. NOISE, AIR QUALITY, AND SAFETY IMPACTS. A SORTIE-OPERATION IS NOT A MEASURE OF HOW LONG AN AIRCRAFT USES AN AIRSPACE UNIT, NOR DOES IT INDICATE THE NUMBER OF AIRCRAFT IN AN AIRSPACE UNIT DURING A GIVEN PERIOD; IT IS A MEASUREMENT FOR THE NUMBER OF TIMES A SINGLE AIRCRAFT USES A PARTICULAR AIRSPACE UNIT.

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Table C-5
Transient Baseline Operations at Nellis

Category	Sub-cat	Squadron / Unit	Aircraft Type	Departure				Instrument Arrival			Break Arrival			Non-Break Arrival			SFO Arrival			SFO Pattern			Visual Pattern			Visual ReEntry Pattern			TOTAL		
				Day (0700-2200)	Night (2200-0700)	Total	% of deps in AB takeoff roll	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	Day (0700-2200)	Night (2200-0700)	Total	Day (0700-2200)	Night (2200-0700)	Total	Day (0700-2200)	Night (2200-0700)	Total
Based	53 TEG	422 TES	A-10C	884	27	911	n/a	-	-	-	707	-	707	177	27	204	-	-	-	-	-	-	-	-	-	-	-	-	1,768	54	1,822
			F-15C	547	-	547	50%	-	-	-	493	-	493	54	-	54	-	-	-	-	-	-	54	-	54	-	-	-	1,148	-	1,148
			F-15E	590	11	601	100%	-	11	11	530	-	530	60	-	60	-	-	-	-	-	-	62	-	62	-	-	-	1,242	22	1,264
			F-16C	504	59	563	80%	-	28	28	454	-	454	25	2	27	54	-	54	-	-	-	112	-	112	-	-	-	1,149	89	1,238
			F-22	592	-	592	0%	53	-	53	533	-	533	6	-	6	-	-	-	-	-	-	59	-	59	-	-	-	1,243	-	1,243
			F-35A	1,075	120	1,195	68% day; 15% night	75	120	195	914	-	914	11	-	11	75	-	75	4	-	4	8	-	8	8	-	8	2,170	240	2,410
	57 WING	16 WPS	F-16C	1,140	126	1,266	75%	57	81	138	1,006	-	1,006	54	46	100	22	-	22	24	-	24	120	-	120	6	-	6	2,429	253	2,682
		17 WPS	F-15E	902	9	911	100%	-	9	9	857	-	857	45	-	45	-	-	-	-	-	-	272	-	272	-	-	-	2,076	18	2,094
		34 WPS	HH-60G	324	-	324	n/a	-	-	-	-	-	-	203	121	324	-	-	-	-	-	-	174	-	174	-	-	-	701	121	822
		433 WPS	F-15C	767	88	855	40%	-	44	44	723	44	767	44	-	44	-	-	-	-	-	-	88	-	88	44	-	44	1,666	176	1,842
			F-22	504	88	592	0%	9	44	53	533	-	533	6	-	6	-	-	-	-	-	-	59	-	59	-	-	-	1,111	132	1,243
		64 AGRS	F-16C	2,478	103	2,581	74%	116	258	374	2,097	-	2,097	110	-	110	-	-	-	-	-	-	234	-	234	24	-	24	5,059	361	5,420
		65 AGRS	F-15C	-	-	-	0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		66 WPS	A-10C	1,138	47	1,185	n/a	-	-	-	703	-	703	422	60	482	-	-	-	-	-	-	70	-	70	-	-	-	2,333	107	2,440
	24 TASS		F-16C	1,159	128	1,287	90%	58	82	140	1,024	-	1,024	55	46	101	22	-	22	26	-	26	122	-	122	6	-	6	2,472	256	2,728
	66 RQS		HH-60G	876	35	911	n/a	-	-	-	-	-	-	876	35	911	-	-	-	-	-	-	3,646	-	3,646	-	-	-	5,398	70	5,468
	88 TES		HH-60G	137	-	137	n/a	-	-	-	-	-	-	123	14	137	-	-	-	-	-	-	174	-	174	-	-	-	434	14	448
	DOE REMOTE SENSING LAB		C-12	88	4	92	n/a	-	-	-	-	-	-	88	4	92	-	-	-	-	-	-	62	-	62	-	-	-	238	8	246
			Bell 412	100	4	104	n/a	-	-	-	-	-	-	100	4	104	-	-	-	-	-	-	-	-	-	-	-	-	200	8	208
	Thunderbirds		F-16C	1,415	-	1,415	40%	22	-	22	1,214	-	1,214	175	-	175	4	-	4	10	-	10	12	-	12	-	-	-	2,852	-	2,852
BASED TOTAL				**15,220**	**849**	**16,069**	**-**	**390**	**677**	**1,067**	**11,788**	**44**	**11,832**	**2,634**	**359**	**2,993**	**177**	**-**	**177**	**64**	**-**	**64**	**5,328**	**-**	**5,328**	**88**	**-**	**88**	**35,689**	**1,929**	**37,618**

Table C-5 (cont'd)
Transient Baseline Operations at Nellis

Category	Sub-cat	Squadron / Unit	Aircraft Type	Departure				Instrument Arrival			Break Arrival			Non-Break Arrival			SFO Arrival			SFO Pattern			Visual Pattern			Visual ReEntry Pattern			TOTAL		
				Day (0700-2200)	Night (2200-0700)	Total	% of deps in AB takeoff roll	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	Day (0700-2200)	Night (2200-0700)	Total	Day (0700-2200)	Night (2200-0700)	Total	Day (0700-2200)	Night (2200-0700)	Total
Transient	Military - no MFE	attack jet	A-10	32	-	32	n/a	-	-	-	-	-	-	32	-	32	-	-	-	-	-	-	-	-	-	-	-	-	64	-	64
		fighter	F-15	26	-	26	-	-	-	-	-	-	-	26	-	26	-	-	-	-	-	-	-	-	-	-	-	-	52	-	52
			F-16	12	-	12	-	-	-	-	-	-	-	12	-	12	-	-	-	-	-	-	-	-	-	-	-	-	24	-	24
			F-18	93	-	93	-	-	-	-	-	-	-	93	-	93	-	-	-	-	-	-	-	-	-	-	-	-	186	-	186
			F-22	21	-	21	-	-	-	-	-	-	-	21	-	21	-	-	-	-	-	-	-	-	-	-	-	-	42	-	42
		jet trainer (T-38, F-5)	T-38	63	-	63	100%	-	-	-	-	-	-	63	-	63	-	-	-	-	-	-	-	-	-	-	-	-	126	-	126
		tanker	KC-10	99	3	102	n/a	-	-	-	-	-	-	99	3	102	-	-	-	-	-	-	-	-	-	-	-	-	198	6	204
		tanker (A330/KC-30*)	C-17	4	-	4	n/a	-	-	-	-	-	-	4	-	4	-	-	-	-	-	-	-	-	-	-	-	-	8	-	8
		tanker/other (E-3, E-6, KC-135)	KC-135	103	2	105	n/a	-	-	-	-	-	-	103	2	105	-	-	-	-	-	-	-	-	-	-	-	-	206	4	210
		large 4-eng jet (An-124, C-17, C-5)	C-17	268	4	272	n/a	-	-	-	-	-	-	268	4	272	-	-	-	-	-	-	-	-	-	-	-	-	536	8	544
		2-eng jet Narrow-body (C-32, C-40, C-9, P-8)	B-737	38	1	39	n/a	-	-	-	-	-	-	38	1	39	-	-	-	-	-	-	-	-	-	-	-	-	76	2	78
		large 4-eng prop (C-160**, C-130, P-3) and Tiltrotor**	C-130	278	1	279	n/a	-	-	-	-	-	-	278	1	279	-	-	-	-	-	-	-	-	-	-	-	-	556	2	558
		large 2-eng prop (C-160, C-146, E/C-2)	C-130 / 2	22	-	22	n/a	-	-	-	-	-	-	22	-	22	-	-	-	-	-	-	-	-	-	-	-	-	44	-	44
		small jet (C-20, C-21, C-35, C-37, C-38, Falcon 900, T-1, T-39)	C-21	76	1	77	n/a	-	-	-	-	-	-	76	1	77	-	-	-	-	-	-	-	-	-	-	-	-	152	2	154
		2-eng turboprop	C-12	102	-	102	n/a	-	-	-	-	-	-	102	-	102	-	-	-	-	-	-	-	-	-	-	-	-	204	-	204
		1-eng turboprop (T-6, P-51)	T-6	16	-	16	n/a	-	-	-	-	-	-	16	-	16	-	-	-	-	-	-	-	-	-	-	-	-	32	-	32
		small prop (C-182)	GASEPF	-	-	-	n/a	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		helo (H-1, H-3, H-64, H-46, H-47, H-60, H-65)	HH-60	63	-	63	n/a	-	-	-	-	-	-	63	-	63	-	-	-	-	-	-	-	-	-	-	-	-	126	-	126
Tr	non-MFE			1,316	12	1,328		-	-	-	-	-	-	1,316	12	1,328	-	-	-	-	-	-	-	-	-	-	-	-	2,632	24	2,656

Table C-5 (cont'd)
Transient Baseline Operations at Nellis

Category	Sub-cat	Squadron / Unit	Aircraft Type	Departure				Instrument Arrival			Break Arrival			Non-Break Arrival			SFO Arrival			SFO Pattern			Visual Pattern			Visual ReEntry Pattern			TOTAL		
				Day (0700-2200)	Night (2200-0700)	Total	% of deps in AB takeoff roll	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	Day (0700-2200)	Night (2200-0700)	Total	Day (0700-2200)	Night (2200-0700)	Total	Day (0700-2200)	Night (2200-0700)	Total
Transient	Military - Red Flag 3 per year	fighter	F-15	947	-	947	-	-	-	-	-	-	-	947	-	947	-	-	-	-	-	-	-	-	-	-	-	-	1,894	-	1,894
			F-16	132	-	132	-	-	-	-	-	-	-	132	-	132	-	-	-	-	-	-	-	-	-	-	-	-	264	-	264
			F-18	2,630	-	2,630	-	-	-	-	-	-	-	2,630	-	2,630	-	-	-	-	-	-	-	-	-	-	-	-	5,260	-	5,260
			F-22	237	-	237	-	-	-	-	-	-	-	237	-	237	-	-	-	-	-	-	-	-	-	-	-	-	474	-	474
		fighter (foreign; UK-10 (Typhoon))	F-18A/C	815	-	815	-	-	-	-	-	-	-	815	-	815	-	-	-	-	-	-	-	-	-	-	-	-	1,630	-	1,630
		bomber (B-2)	B-1	815	-	815	100%	-	-	-	-	-	-	815	-	815	-	-	-	-	-	-	-	-	-	-	-	-	1,630	-	1,630
		tanker	KC-135	342	-	342	n/a	-	-	-	-	-	-	342	-	342	-	-	-	-	-	-	-	-	-	-	-	-	684	-	684
		large 4-eng jet (E-3A/D, E-8 JSTARS)	KC-135	315	-	315	n/a	-	-	-	-	-	-	315	-	315	-	-	-	-	-	-	-	-	-	-	-	-	630	-	630
		2-eng jet Narrow-body (E-7)	B-737-300 B1	105	-	105	n/a	-	-	-	-	-	-	105	-	105	-	-	-	-	-	-	-	-	-	-	-	-	210	-	210
		large 4 eng prop (P-3, C-130)	C-130	342	-	342	n/a	-	-	-	-	-	-	342	-	342	-	-	-	-	-	-	-	-	-	-	-	-	684	-	684
		small jet (R-1, RC-35)	C-21	210	-	210	n/a	-	-	-	-	-	-	210	-	210	-	-	-	-	-	-	-	-	-	-	-	-	420	-	420
		MQ-1 and MQ-9	MQ-x	210	-	210	n/a	-	-	-	-	-	-	210	-	210	-	-	-	-	-	-	-	-	-	-	-	-	420	-	420
		helo (H-60)	HH-60	132	-	132	n/a	-	-	-	-	-	-	132	-	132	-	-	-	-	-	-	-	-	-	-	-	-	264	-	264
	Military - Green Flag; CY14x1	attack jet (AV-8)	F-18	103	-	103	-	-	-	-	-	-	-	103	-	103	-	-	-	-	-	-	-	-	-	-	-	-	206	-	206
		fighter (F-15E/S)	F-15	343	-	343	-	-	-	-	-	-	-	343	-	343	-	-	-	-	-	-	-	-	-	-	-	-	686	-	686
		fighter (F-16)	F-16	1,075	-	1,075	-	-	-	-	-	-	-	1,075	-	1,075	-	-	-	-	-	-	-	-	-	-	-	-	2,150	-	2,150
		fighter (legacy F-18)	F-18	84	-	84	-	-	-	-	-	-	-	84	-	84	-	-	-	-	-	-	-	-	-	-	-	-	168	-	168
		fighter (Super Hornet, Growler)	F-18E/F	180	-	180	-	-	-	-	-	-	-	180	-	180	-	-	-	-	-	-	-	-	-	-	-	-	360	-	360
		bomber	B-1	168	-	168	100%	-	-	-	-	-	-	168	-	168	-	-	-	-	-	-	-	-	-	-	-	-	336	-	336
			B-52	26	-	26	n/a	-	-	-	-	-	-	26	-	26	-	-	-	-	-	-	-	-	-	-	-	-	52	-	52
		tanker (KC-135)	KC-135	106	-	106	n/a	-	-	-	-	-	-	106	-	106	-	-	-	-	-	-	-	-	-	-	-	-	212	-	212
		large 4-eng jet (E-3, E-8 JSTARS)	KC-135	105	-	105	n/a	-	-	-	-	-	-	105	-	105	-	-	-	-	-	-	-	-	-	-	-	-	210	-	210
		2-eng turboprop	C-12	18	-	18	n/a	-	-	-	-	-	-	18	-	18	-	-	-	-	-	-	-	-	-	-	-	-	36	-	36
Transien	Red Flag (3 per year)			7,232	-	7,232		-	-	-	-	-	-	7,232	-	7,232	-	-	-	-	-	-	-	-	-	-	-	-	14,464	-	14,464
	Green Flag (total)			2,208	-	2,208		-	-	-	-	-	-	2,208	-	2,208	-	-	-	-	-	-	-	-	-	-	-	-	4,416	-	4,416
	TRANSIENT TOTAL			**10,756**	**12**	**10,768**		**-**	**-**	**-**	**-**	**-**	**-**	**10,756**	**12**	**10,768**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**21,512**	**24**	**21,536**
GRAND TOTAL				**25,976**	**861**	**26,837**		**390**	**677**	**1,067**	**11,788**	**44**	**11,832**	**13,390**	**371**	**13,761**	**177**	**-**	**177**	**64**	**-**	**64**	**5,328**	**-**	**5,328**	**88**	**-**	**88**	**57,201**	**1,953**	**59,154**

Notes:
1) Each pattern is a closed-circuit flight track that represents 2 two operations -- one arrival plus one departure

Table C-6
Based Baseline Operations at Nellis Plus Proposed Action Operations (Transient Operations Do Not Change)

Category	Sub-cat	Squadron / Unit	Aircraft Type	Departure				Instrument Arrival			Break Arrival			Non-Break Arrival			SFO Arrival			SFO Pattern			Visual Pattern[1]			Visual ReEntry Pattern			TOTAL		
				Day (0700-2200)	Night (2200-0700)	Total	% of deps in AB takeoff roll	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	Day (0700-2200)	Night (2200-0700)	Total	Day (0700-2200)	Night (2200-0700)	Total	Day (0700-2200)	Night (2200-0700)	Total
Based	53 TEG	422 TES	A-10C	884	27	911	n/a	-	-	-	707	-	707	177	27	204	-	-	-	-	-	-	-	-	-	-	-	-	1,768	54	1,822
			F-15C	547	-	547	50%	-	-	-	493	-	493	54	-	54	-	-	-	-	-	-	54	-	54	-	-	-	1,148	-	1,148
			F-15E	590	11	601	100%	-	11	11	530	-	530	60	-	60	-	-	-	-	-	-	62	-	62	-	-	-	1,242	22	1,264
			F-16C	504	59	563	80%	-	28	28	454	-	454	25	2	27	54	-	54	-	-	-	112	-	112	-	-	-	1,149	89	1,238
			F-22	592	-	592	0%	53	-	53	533	-	533	6	-	6	-	-	-	-	-	-	59	-	59	-	-	-	1,243	-	1,243
			F-35A (proposed)	416	46	462	68% day; 15% night	29	46	75	354	-	354	4	-	4	29	-	29	2	-	2	4	-	4	4	-	4	842	92	934
			F-35A	1,075	120	1,195	68% day; 15% night	75	120	195	914	-	914	11	-	11	75	-	75	4	-	4	8	-	8	8	-	8	2,170	240	2,410
	57 WING	16 WPS	F-16C	1,140	126	1,266	75%	57	81	138	1,006	-	1,006	54	46	100	22	-	22	24	-	24	120	-	120	6	-	6	2,429	253	2,682
		17 WPS	F-15E	902	9	911	100%	-	9	9	857	-	857	45	-	45	-	-	-	-	-	-	272	-	272	-	-	-	2,076	18	2,094
		34 WPS	HH-60G	324	-	324	n/a	-	-	-	-	-	-	203	121	324	-	-	-	-	-	-	174	-	174	-	-	-	701	121	822
		433 WPS	F-15C	767	88	855	40%	-	44	44	723	44	767	44	-	44	-	-	-	-	-	-	88	-	88	44	-	44	1,666	176	1,842
			F-22	504	88	592	0%	9	44	53	533	-	533	6	-	6	-	-	-	-	-	-	59	-	59	-	-	-	1,111	132	1,243
		64 AGRS	F-16C	2,478	103	2,581	74%	116	258	374	2,097	-	2,097	110	-	110	-	-	-	-	-	-	234	-	234	24	-	24	5,059	361	5,420
		65 AGRS	F-35A (proposed)	1,454	60	1,514	68% day; 15% night	68	151	219	1,230	-	1,230	65	-	65	-	-	-	-	-	-	136	-	136	14	-	14	2,967	211	3,178
		66 WPS	A-10C	1,138	47	1,185	n/a	-	-	-	703	-	703	422	60	482	-	-	-	-	-	-	70	-	70	-	-	-	2,333	107	2,440
	24 TASS		F-16C	1,159	128	1,287	90%	58	82	140	1,024	-	1,024	55	46	101	22	-	22	26	-	26	122	-	122	6	-	6	2,472	256	2,728
	COCO ADAIR (proposed)[2]		F1 Mirage	1,680	70	1,750	100%	78	175	253	1,422	-	1,422	75	-	75	-	-	-	-	-	-	314	-	314	157	-	157	3,726	245	3,971
			A-4N	840	35	875	n/a	39	88	127	711	-	711	37	-	37	-	-	-	-	-	-	158	-	158	79	-	79	1,864	123	1,987
			L-159	840	35	875	n/a	39	88	127	711	-	711	37	-	37	-	-	-	-	-	-	158	-	158	79	-	79	1,864	123	1,987
	66 RQS		HH-60G	876	35	911	n/a	-	-	-	-	-	-	876	35	911	-	-	-	-	-	-	3,646	-	3,646	-	-	-	5,398	70	5,468
	88 TES		HH-60G	137	-	137	n/a	-	-	-	-	-	-	123	14	137	-	-	-	-	-	-	174	-	174	-	-	-	434	14	448
	DOE REMOTE SENSING LAB		C-12	88	4	92	n/a	-	-	-	-	-	-	88	4	92	-	-	-	-	-	-	62	-	62	-	-	-	238	8	246
			Bell 412	100	4	104	n/a							100	4	104													200	8	208
	Thunderbirds		F-16C	1,415	-	1,415	40%	22	-	22	1,214	-	1,214	175	-	175	4	-	4	10	-	10	12	-	12	-	-	-	2,852	-	2,852
BASED TOTAL				**20,450**	**1,095**	**21,545**	-	**643**	**1,225**	**1,868**	**16,216**	**44**	**16,260**	**2,852**	**359**	**3,211**	**206**	-	**206**	**66**	-	**66**	**6,098**	-	**6,098**	**421**	-	**421**	**46,952**	**2,723**	**49,675**
Tr	**TRANSIENT TOTAL**			**10,756**	**12**	**10,768**		-	-	-	-	-	-	**10,756**	**12**	**10,768**	-	-	-	-	-	-	-	-	-	-	-	-	**21,512**	**24**	**21,536**
GRAND TOTAL				**31,206**	**1,107**	**32,313**		**643**	**1,225**	**1,868**	**16,216**	**44**	**16,260**	**13,608**	**371**	**13,979**	**206**	-	**206**	**66**	-	**66**	**6,098**	-	**6,098**	**421**	-	**421**	**68,464**	**2,747**	**71,211**

Notes:
1) Each pattern is a closed-circuit flight track that represents 2 two operations -- one arrival plus one departure
2) Contractor Owned Contractor Operated Adversary Aircraft will be modeled with surrogates: F1 Mirage represented with an F-16C, A-4N with an A-4C, and L-159 with a T-45.

C.2.2 Runway and Flight Track Use

This section describes the flight tracks used by the aircraft operating out of Nellis as well as the runway utilization. Utilization percentages are provided for each runway as well as the split usages in **Table C-7**. Flight track maps for all aircraft are presented on **Figure C-13** (departures), **Figure C-14** (arrivals), and **Figure C-15** (closed patterns). Closed pattern flight tracks represent aircraft patterns that depart and arrive on the same runway. Example flight profiles that use closed pattern flight tracks are simulated flame out and visual flight rules pattern profiles.

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Table C-7
Runway Usage for Based Aircraft at Nellis

Operation Type	Direction / Pad	53 TEG--422 TES										422 TES & 16 WPS		57 WING 16 WPS		57 WING 17 WPS		57 WING 34 WPS		57 WING--433 WPS	
		A-10C (fut F-16)		F-15C		F-15E		F-16C (baseline only)		F-22		F-35A		F-16C (baseline only)		F-15E		HH-60G		F-15C	
		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)	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	03	75%	75%	70%	0%	40%	40%	40%	40%	60%	0%	58%	100%	60%	60%	50%	50%	0%	0%	50%	50%
	21	25%	25%	30%	0%	60%	60%	60%	60%	40%	0%	42%	0%	40%	40%	50%	50%	0%	0%	50%	50%
	JOLLY	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	100%	0%	0%
Instrument Arrival	21	0%	0%	0%	0%	0%	100%	0%	100%	100%	0%	100%	100%	100%	100%	0%	100%	0%	0%	0%	100%
Break Arrival	03	35%	0%	25%	0%	25%	25%	44%	0%	40%	0%	58%	0%	20%	0%	50%	0%	0%	0%	25%	25%
	21	65%	0%	75%	0%	75%	75%	56%	0%	60%	0%	42%	0%	80%	0%	50%	0%	0%	0%	75%	75%
Non-Break Arrival	03	35%	0%	25%	0%	25%	25%	40%		40%	0%	59%	0%	20%	41%	50%	0%	0%	0%	25%	0%
	21	65%	100%	75%	0%	75%	75%	60%	100%	60%	0%	41%	100%	80%	59%	50%	0%	0%	0%	75%	0%
	JOLLY	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	100%	0%	0%
SFO Arrivals	03	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	21	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	100%	0%	100%	0%	0%	0%	0%	0%	0%	0%
SFO Pattern	03	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	13%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	21	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	87%	0%	100%	0%	0%	0%	0%	0%	0%	0%
Visual Pattern	03	25%	0%	25%	0%	25%	25%	20%	0%	25%	25%	26%	0%	16%	0%	50%	0%	0%	0%	25%	0%
	21	75%	0%	75%	0%	75%	75%	80%	0%	75%	75%	74%	0%	84%	0%	50%	0%	0%	0%	75%	0%
	GOLF	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%
Visual ReEntry Pattern	03	0%	0%	0%	0%	0%	0%	0%	0%		0%	20%	0%	8%	0%	0%	0%	0%	0%	8%	0%
	21	0%	0%	0%	0%	0%	0%	0%	0%		0%	80%	0%	92%	0%	0%	0%	0%	0%	92%	0%

Operation Type	Direction / Pad	57 WING--433 WPS		57 WING 64 AGRS		57 WING 65 AGRS		57 WING 66 WPS		CIG		66 RQS		88 TES		DOE REMOTE SENSING LAB		Thunderbirds	
		F-22		F-16C		F-35A (fut)		A-10C (fut F-16C)		F-16C (fut only)		HH-60G		HH-60G		C-12		F-16C (fut F-35A)	
		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)	Day (0700-2200)	Night (2200-0700)	Day (0700-2200)	Night (2200-0700)	Day (0700-2200)	Night (2200-0700)
Departure	03	50%	50%	45%	45%	45%	45%	66%	66%	60%	60%	0%	0%	0%	0%	25%	25%	41%	0%
	21	50%	50%	55%	55%	55%	55%	34%	34%	40%	40%	0%	0%	0%	0%	75%	75%	59%	0%
	JOLLY	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	100%	100%	100%	0%	0%	0%	0%
Instrument Arrival	21	100%	100%	100%	100%	100%	100%	0%	0%	100%	100%	0%	0%	0%	0%	0%	0%	100%	0%
Break Arrival	03	25%	0%	30%	0%	30%	0%	37%	0%	20%	0%	0%	0%	0%	0%	0%	0%	18%	0%
	21	75%	0%	70%	0%	70%	0%	63%	0%	80%	0%	0%	0%	0%	0%	0%	0%	82%	0%
Non-Break Arrival	03		0%	30%	0%	30%	0%	27%	0%	20%	41%	0%	0%	0%	0%	14%	3%	0%	0%
	21	100%	0%	70%	0%	70%	0%	73%	100%	80%	59%	0%	0%	0%	0%	86%	97%	100%	0%
	JOLLY	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	100%	100%	100%	0%	0%	0%	0%
SFO Arrivals	03	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	21	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	0%
SFO Pattern	03	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	21	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	100%	0%
Visual Pattern	03	25%	25%	25%	0%	25%	0%	35%	0%	16%	0%	0%	0%	0%	0%	14%	14%	16%	0%
	21	75%	75%	75%	0%	75%	0%	65%	0%	84%	0%	0%	0%	0%	0%	86%	86%	84%	0%
	GOLF	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%	0%	0%	0%	0%	0%
Visual ReEntry Pattern	03	0%	0%	8%	0%	8%	0%	0%	0%	8%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	21	0%	0%	92%	0%	92%	0%	0%	0%	92%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Table C-7 (cont'd)
Runway Usage for Transient Aircraft at Nellis

Operation Type	Runway / PadHead	53 TEG--422 TES										422 TES & 16 WPS		57 WING 16 WPS		57 WING 17 WPS		57 WING 34 WPS	
		A-10C		F-15C		F-15E		F-16C		F-22		F-35A		F-16C		F-15E		HH-60G	
		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)	Day (0700-2200)	Night (2200-0700)	Day (0700-2200)	Night (2200-0700)	Day (0700-2200)	Night (2200-0700)
Departure	03L	15%	15%	80%	0%	80%	80%	80%	80%	80%	0%	80%	80%	50%	50%	90%	95%	0%	0%
	03R	85%	85%	20%	0%	20%	20%	20%	20%	20%	0%	20%	20%	50%	50%	10%	5%	0%	0%
	03R-Bravo	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	21L	85%	85%	20%	0%	20%	20%	20%	20%	20%	0%	20%	0%	50%	50%	10%	5%	0%	0%
	21R	15%	15%	80%	0%	80%	80%	80%	80%	80%	0%	80%	0%	50%	50%	90%	95%	0%	0%
	JOLLYN	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	90%	90%
	JOLLYS	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	10%
Instrument Arrivals	21L	0%	0%	0%	0%	0%	100%	0%	100%	100%	0%	100%	100%	100%	100%	0%	100%	0%	0%
	21R	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Break Arrival	03L	15%	0%	95%	0%	90%	90%	85%	0%	90%	0%	56%	0%	40%	0%	90%	0%	0%	0%
	03R	85%	0%	5%	0%	10%	10%	15%	0%	10%	0%	44%	0%	60%	0%	10%	0%	0%	0%
	21L	85%	0%	5%	0%	10%	10%	18%	0%	10%	0%	42%	0%	60%	0%	10%	0%	0%	0%
	21R	15%	0%	95%	0%	90%	90%	82%	0%	90%	0%	58%	0%	40%	0%	90%	0%	0%	0%
Non-Break Arrival	03L	15%	0%	95%	0%	90%	90%	85%		90%	0%	41%	0%	40%	40%	90%	0%	0%	0%
	03R	85%	0%	5%	0%	10%	10%	15%	0%	10%	0%	59%	0%	60%	60%	10%	0%	0%	0%
	21L	85%	100%	5%	0%	10%	10%	15%	15%	10%	0%	51%	51%	60%	60%	10%	0%	0%	0%
	21R	15%	0%	95%	0%	90%	90%	85%	85%	90%	0%	49%	49%	40%	40%	90%	0%	0%	0%
	JOLLYN	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	90%	90%
	JOLLYS	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	10%
SFO Arrival	21L	0%	0%	0%	0%	0%	0%	85%	0%	0%	0%	0%	0%	60%	0%	0%	0%	0%	0%
	21R	0%	0%	0%	0%	0%	0%	15%	0%	0%	0%	100%	0%	40%	0%	0%	0%	0%	0%
SFO Pattern	03L	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%
	03R	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	21L	0%	0%	0%	0%	0%	0%	85%	0%	0%	0%	100%	0%	60%	0%	0%	0%	0%	0%
	21R	0%	0%	0%	0%	0%	0%	15%	0%	0%	0%	0%	0%	40%	0%	0%	0%	0%	0%
Visual Pattern	03L	0%	0%	95%	0%	90%	90%	40%	0%	90%	90%	72%	0%	40%	0%	90%	0%	0%	0%
	03R	100%	0%	5%	0%	10%	10%	60%	0%	10%	10%	28%	0%	60%	0%	10%	0%	0%	0%
	21L	100%	0%	5%	0%	10%	10%	60%	0%	10%	10%	25%	0%	60%	0%	10%	0%	0%	0%
	21R	0%	0%	95%	0%	90%	90%	40%	0%	90%	90%	75%	0%	40%	0%	90%	0%	0%	0%
	GOLF03	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	50%	0%
	GOLF21	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	50%	0%
Visual ReEntry Pattern	03L	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%	0%	100%	0%	0%	0%	0%	0%
	03R	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	21L	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	65%	0%	0%	0%	0%	0%
	21R	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%	100%	0%	35%	0%	0%	0%	0%	0%

Operation Type	Runway / PadHead	57 WING--433 WPS				57 WING 64 AGRS		57 WING 65 AGRS		57 WING 66 WPS		24 TASS		66 RQS		88 TES		DOE REMOTE SENSING LAB		Thunderbirds		COCO ADAIR	
		F-15C		F-22		F-16C		F-35A		A-10C		F-16C		HH-60G		HH-60G		C-12		F-16C		Mirage F1, A-4N, L-159	
		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)	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	03L	90%	90%	90%	90%	90%	90%	90%	90%	34%	34%	50%	50%	0%	0%	0%	0%	0%	0%	90%	0%	90%	90%
	03R	10%	10%	10%	10%	10%	10%	10%	10%	66%	66%	50%	50%	0%	0%	0%	0%	0%	0%	10%	0%	10%	10%
	03R-Bravo	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	100%	0%	0%	0%	0%
	21L	10%	10%	10%	10%	10%	10%	10%	10%	65%	65%	50%	50%	0%	0%	0%	0%	100%	100%	10%	0%	10%	10%
	21R	90%	90%	90%	90%	90%	90%	90%	90%	35%	35%	50%	50%	0%	0%	0%	0%	0%	0%	90%	0%	90%	90%
	JOLLYN	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	90%	90%	90%	90%	0%	0%	0%	0%	0%	0%
	JOLLYS	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	10%	10%	10%	0%	0%	0%	0%	0%	0%
Instrument Arrivals	21L	0%	100%	100%	100%	100%	100%	100%	100%	0%	0%	100%	100%	0%	0%	0%	0%	0%	0%	100%		100%	100%
	21R	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Break Arrival	03L	90%	90%	90%	0%	90%	0%	90%	0%	25%	0%	40%	0%	0%	0%	0%	0%	0%	0%	90%	0%	90%	0%
	03R	10%	10%	10%	0%	10%	0%	10%	0%	75%	0%	60%	0%	0%	0%	0%	0%	0%	0%	10%	0%	10%	0%
	21L	10%	10%	10%	0%	10%	0%	10%	0%	83%	0%	60%	0%	0%	0%	0%	0%	0%	0%	10%	0%	10%	0%
	21R	90%	90%	90%	0%	90%	0%	90%	0%	17%	0%	40%	0%	0%	0%	0%	0%	0%	0%	90%	0%	90%	0%
Non-Break Arrival	03L	90%	0%	0%	0%	100%	0%	100%	0%	25%	0%	40%	40%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%
	03R	10%	0%	0%	0%	0%	0%	0%	0%	75%	0%	60%	60%	0%	0%	0%	0%	100%	100%	0%	0%	0%	0%
	21L	10%	0%	10%	0%	0%	0%	0%	0%	69%	69%	60%	60%	0%	0%	0%	0%	100%	100%	10%	0%	0%	0%
	21R	90%	0%	90%	0%	100%	0%	100%	0%	31%	31%	40%	40%	0%	0%	0%	0%	0%	0%	90%	0%	100%	0%
	JOLLYN	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	90%	90%	90%	90%	0%	0%	0%	0%	0%	0%
	JOLLYS	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	10%	10%	10%	10%	0%	0%	0%	0%	0%	0%
SFO Arrival	21L	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	60%	0%	0%	0%	0%	0%	0%	0%	60%	0%	0%	0%
	21R	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	40%	0%	0%	0%	0%	0%	0%	0%	40%	0%	0%	0%
SFO Pattern	03L	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	03R	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	21L	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	60%	0%	0%	0%	0%	0%	0%	0%	60%	0%	0%	0%
	21R	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	40%	0%	0%	0%	0%	0%	0%	0%	40%	0%	0%	0%
Visual Pattern	03L	90%	0%	90%	90%	90%	0%	95%	0%	0%	0%	40%	0%	0%	0%	0%	0%	0%	0%	90%	0%	90%	0%
	03R	10%	0%	10%	10%	10%	0%	5%	0%	100%	0%	60%	0%	0%	0%	0%	0%	100%	100%	10%	0%	10%	0%
	21L	10%	0%	10%	10%	10%	0%	5%	0%	100%	0%	60%	0%	0%	0%	0%	0%	100%	100%	10%	0%	10%	0%
	21R	90%	0%	90%	90%	90%	0%	95%	0%	0%	0%	40%	0%	0%	0%	0%	0%	0%	0%	90%	0%	90%	0%
	GOLF03	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	50%	0%	50%	0%	0%	0%	0%	0%	0%	0%
	GOLF21	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	50%	0%	50%	0%	0%	0%	0%	0%	0%	0%
Visual ReEntry Pattern	03L	100%	0%	0%	0%	100%	0%	100%	0%	0%	0%	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	100%	0%
	03R	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	21L	65%	0%	0%	0%	65%	0%	65%	0%	0%	0%	65%	0%	0%	0%	0%	0%	0%	0%	0%	0%	65%	0%
	21R	35%	0%	0%	0%	35%	0%	35%	0%	0%	0%	35%	0%	0%	0%	0%	0%	0%	0%	0%	0%	35%	0%

Table C-7 (cont'd)
Runway Usage for Transient Aircraft at Nellis

		A-10C		F-15C		F-16C		F-18A/C		F-22		T-38C		B-52H		B-1	
		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)	Day (0700-2200)	Night (2200-0700)	Day (0700-2200)	Night (2200-0700)
Departure	03L	10%	0%	90%	0%	90%	0%	90%	0%	90%	0%	0%	0%	100%	0%	0%	0%
	03R	90%	0%	10%	0%	10%	0%	10%	0%	10%	0%	100%	0%	0%	0%	100%	0%
	21L	90%	0%	10%	0%	10%	0%	10%	0%	10%	0%	100%	0%	0%	0%	100%	0%
	21R	10%	0%	90%	0%	90%	0%	90%	0%	90%	0%	0%	0%	100%	0%	0%	0%
Non-Break Arrival	03L	10%	0%	90%	0%	90%	0%	90%	0%	90%	0%	0%	0%	100%	0%	0%	0%
	03R	90%	0%	10%	0%	10%	0%	10%	0%	10%	0%	100%	0%	0%	0%	100%	0%
	21L	90%	0%	10%	0%	10%	0%	10%	0%	10%	0%	100%	0%	0%	0%	100%	0%
	21R	10%	0%	90%	0%	90%	0%	90%	0%	90%	0%	0%	0%	100%	0%	0%	0%

		KC-10A		KC-135R		C-17		B-737-300		C-130H&N&P		C-21A		MQ-x (CITATIONX)		C-12		T-6		GASEPF		HH-60G	
		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)	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	03L	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	03R	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	0%	100%	0%	100%	0%	100%	0%	100%	0%
	21L	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	0%	100%	0%	100%	0%	100%	0%	100%	0%
	21R	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Non-Break Arrival	03L	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
	03R	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	0%	100%	0%	100%	0%	100%	0%	100%	0%
	21L	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	0%	100%	0%	100%	0%	100%	0%	100%	0%
	21R	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

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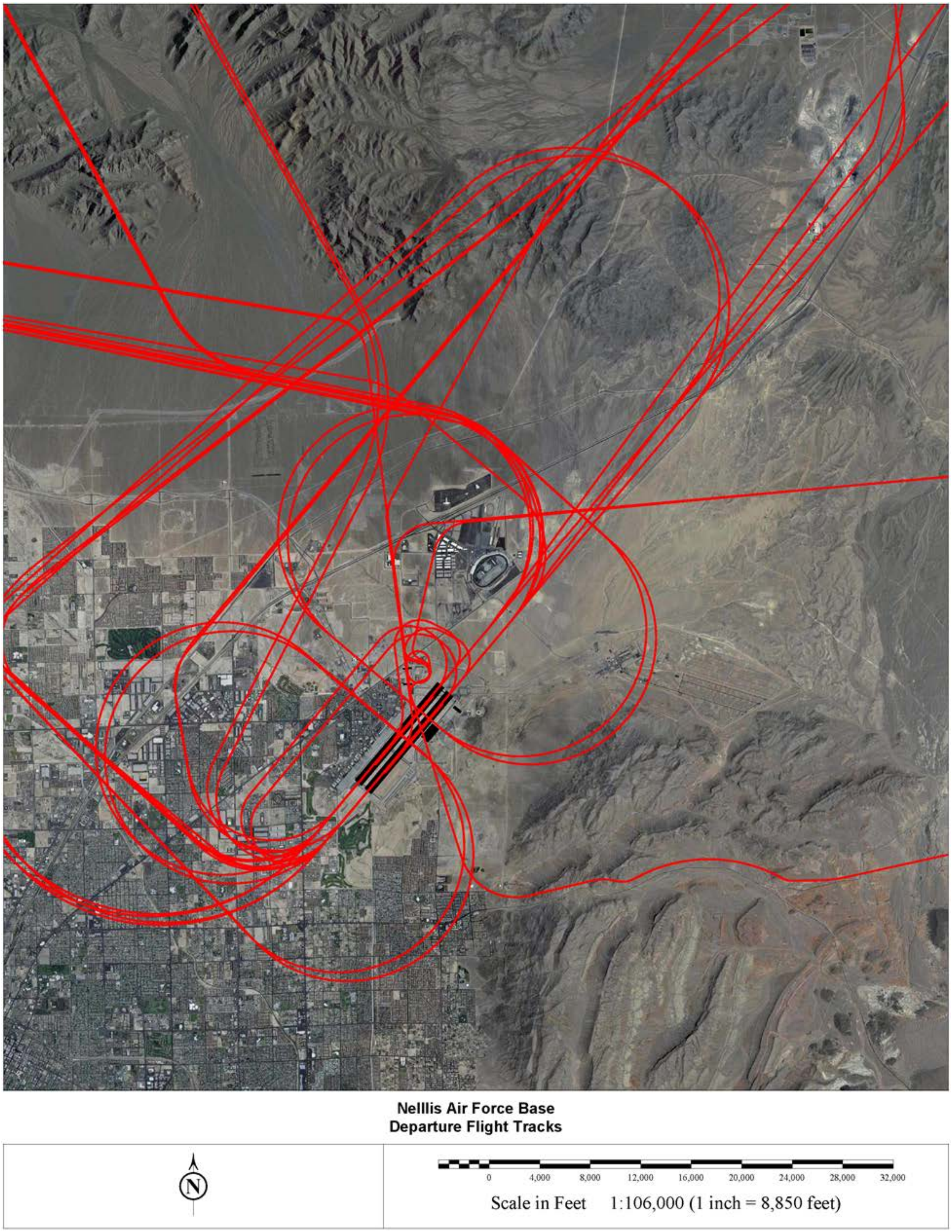


Figure C-13. Departure Flight Tracks at Nellis.

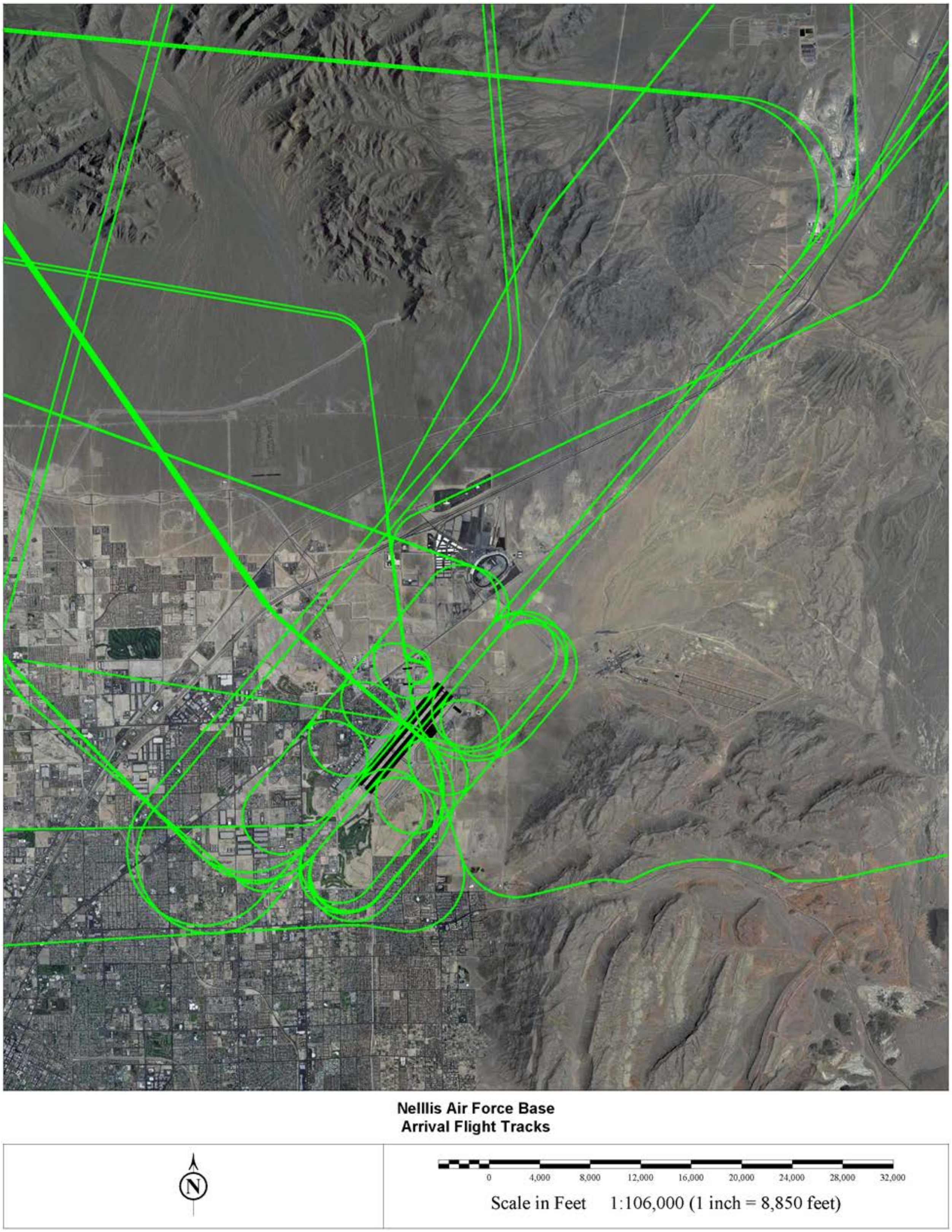


Figure C-14. Arrival Flight Tracks at Nellis.

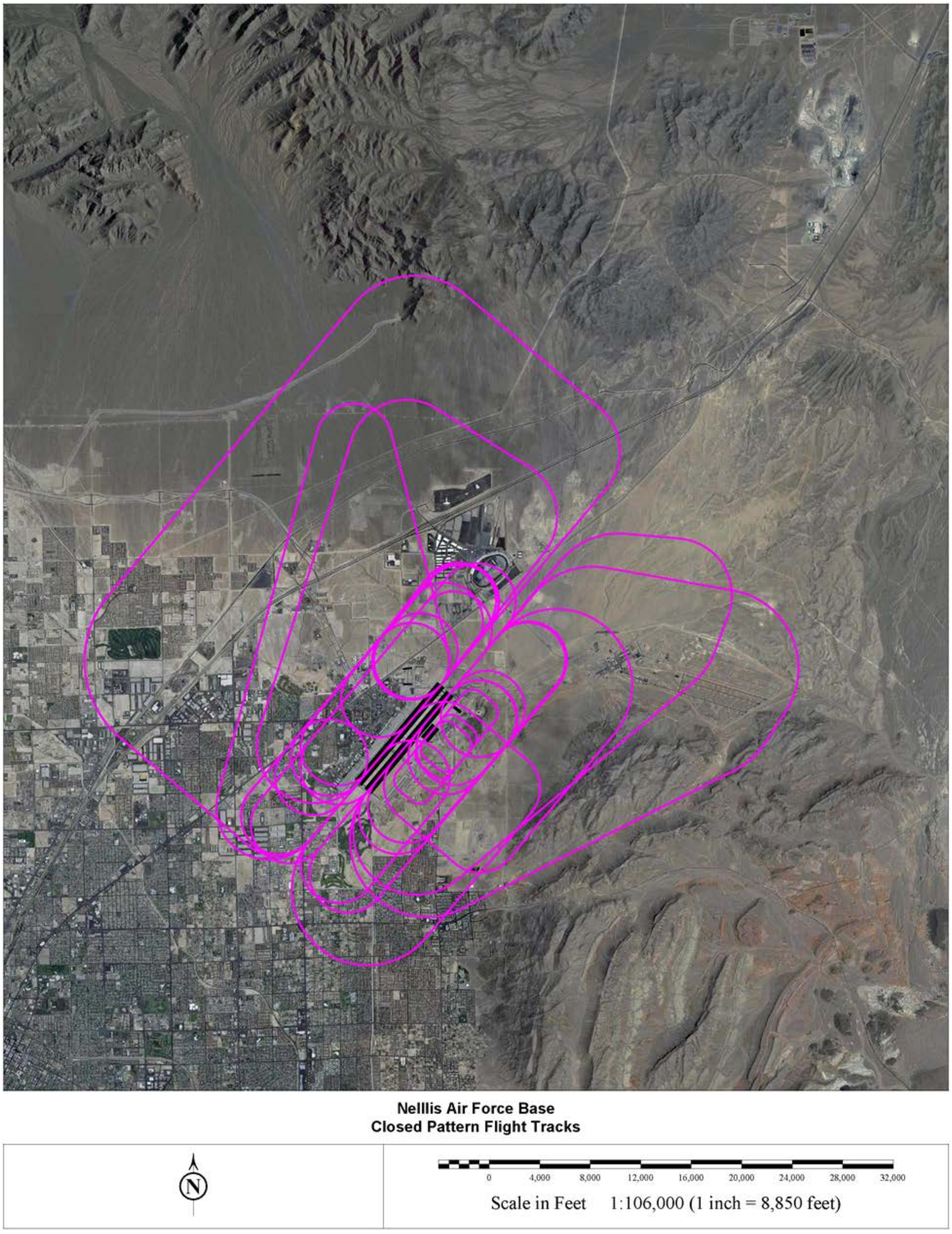


Figure C-15. Closed Pattern Flight Tracks at Nellis.

C.2.3 Flight Profiles and Aircraft

The Proposed Action would locate contractor aircraft at Nellis with the appropriate capabilities to respond to the needs of the fighters at the base. In addition to the contractor aircraft, 17 F-35 aircraft will be moved to Nellis. The F-35 aircraft will be split into how they are used: 11 will be used to form the 65 AGRS and 6 will be added to the 422 TES. The Flight track and runway utilization of the F-35s added to the 422 TES will follow the usage of the existing F-35s in that squadron. The 65 AGRS and contractor aircraft will follow the track and runway utilization of the 64 AGRS.

The contractor will be providing aircraft with differing capabilities to fulfill the mission. Three aircraft that will be used by the contractor are the F1 Mirage, the A-4N, and the L-159. Because the noise model does not have those specific aircraft in its database, surrogates have been chosen to represent their noise emissions. The F1 Mirage will be represented by the F-16C, the A-4N by the A-4C, and the L-159 by the T-45. The surrogates for the contractor aircraft are presented in **Table C-8.**

Table C-8
Contractor Aircraft Noise Surrogates

Contractor Aircraft	F1 Mirage	A-4N	L-159
Noise Surrogate	F-16C	A-4C	T-45

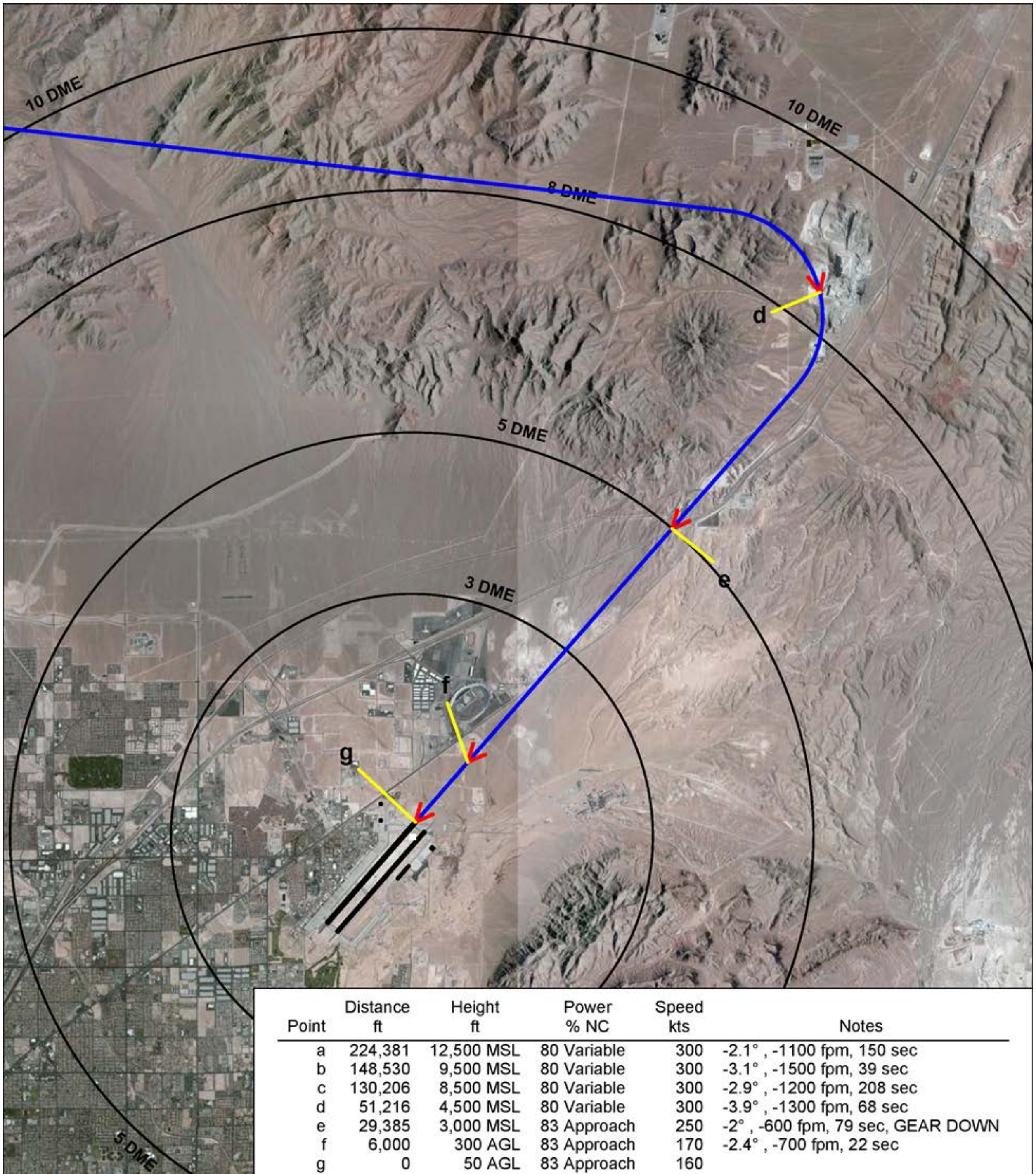
This section details the representative profiles for aircraft involved with the Proposed Action at Nellis. This includes the F-16C aircraft of the 64 AGRS, which will be used as a surrogate for the F1 Mirage, the F-35s of the 422 TES, whose operations will be increased by the addition of 7 additional aircraft, and the additional contractor aircraft, the A-4N and the L-159. The F-35s used to form the 65 AGRS will have the same profiles of the F-35s of the 422 TES. The other aircraft at Nellis have profiles that were detailed in the recent AICUZ and are not presented here for brevity.

Representative profiles provide the speed and power setting of each type of aircraft as a function of distance along the flight track for the representative maneuvers. For modeling purposes, the appropriate profile is used for all flight tracks that conform to that maneuver type. For example, all overhead break arrival tracks utilize the representative profile for modeling that maneuver.

The operations tables (**Tables C-5 and C-6**) can be used with the runway usage table (**Table C-7**) to understand the distribution of the following representative profiles that will be modeled on tracks associated with each runway. One important point to note in looking at flight profiles: the description of the power setting indicates the aircraft's configuration. For modeling noise emissions, there are two different configurations. Any description with the words Approach or Parallel indicate that the aircraft is fully configured for arrival (landing gear down, flaps set, etc.). All other descriptions in the profile indicate the aircraft is not fully configured for arrival.

C.2.3.1 Based Aircraft Representative Flight Profiles

Flight Profiles for 64 AGRS F-16Cs

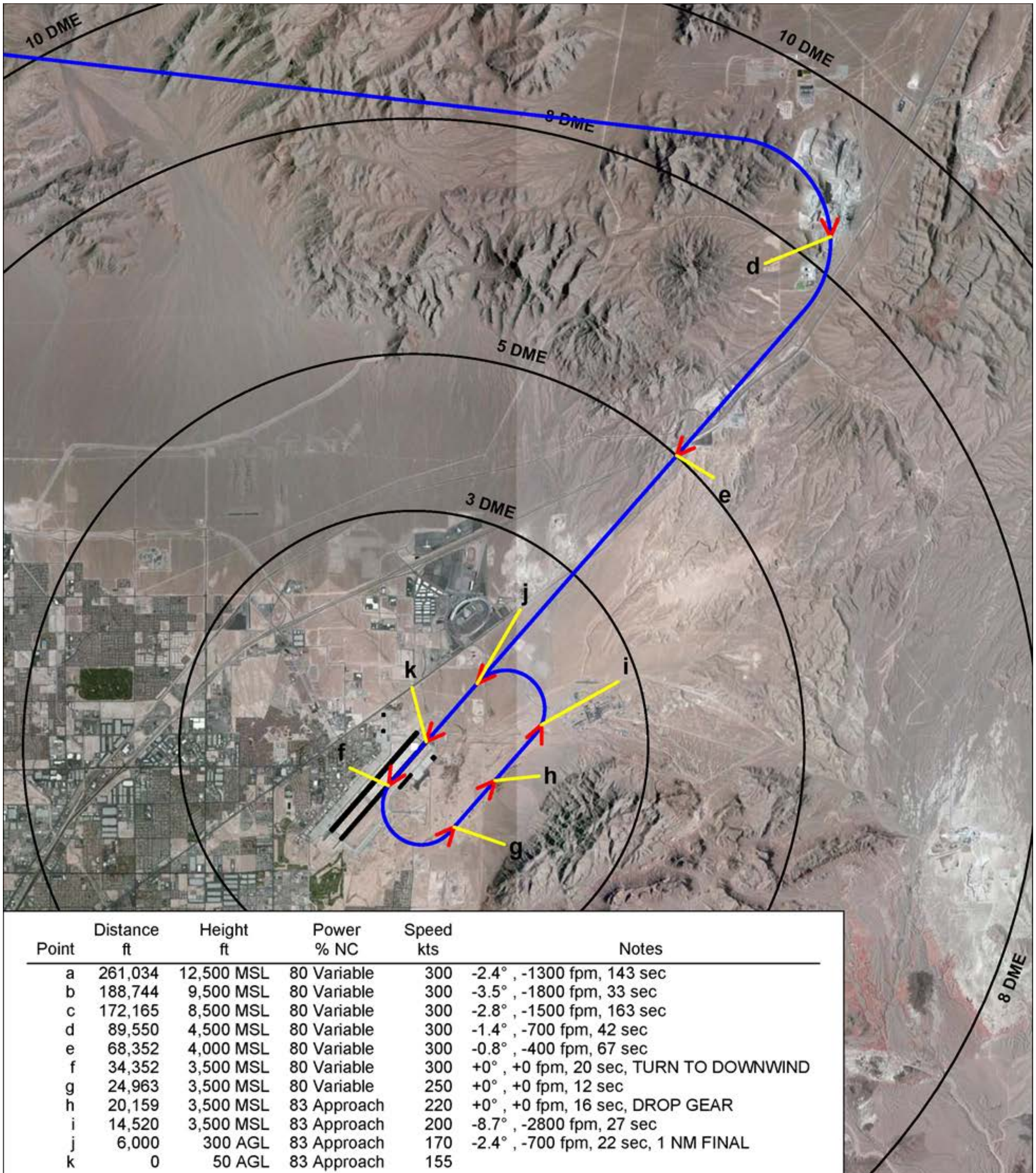


Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	224,381	12,500 MSL	80 Variable	300	-2.1° , -1100 fpm, 150 sec
b	148,530	9,500 MSL	80 Variable	300	-3.1° , -1500 fpm, 39 sec
c	130,206	8,500 MSL	80 Variable	300	-2.9° , -1200 fpm, 208 sec
d	51,216	4,500 MSL	80 Variable	300	-3.9° , -1300 fpm, 68 sec
e	29,385	3,000 MSL	83 Approach	250	-2° , -600 fpm, 79 sec, GEAR DOWN
f	6,000	300 AGL	83 Approach	170	-2.4° , -700 fpm, 22 sec
g	0	50 AGL	83 Approach	160	

Nellis AFB (1,868 ft MSL), Non-Break Arrivals Flight Profile 21A21
PW220 RECOVERY STRYK/GASS/APEX TO VFR ST-IN
Based F-16C (F100-PW-220)
Runway 21R, Flight Track 21RA05 - STRYK RECOVERY TO VFR ST-IN

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000
Scale in Feet 1:110,000 (1 inch = 9,160 feet)

N

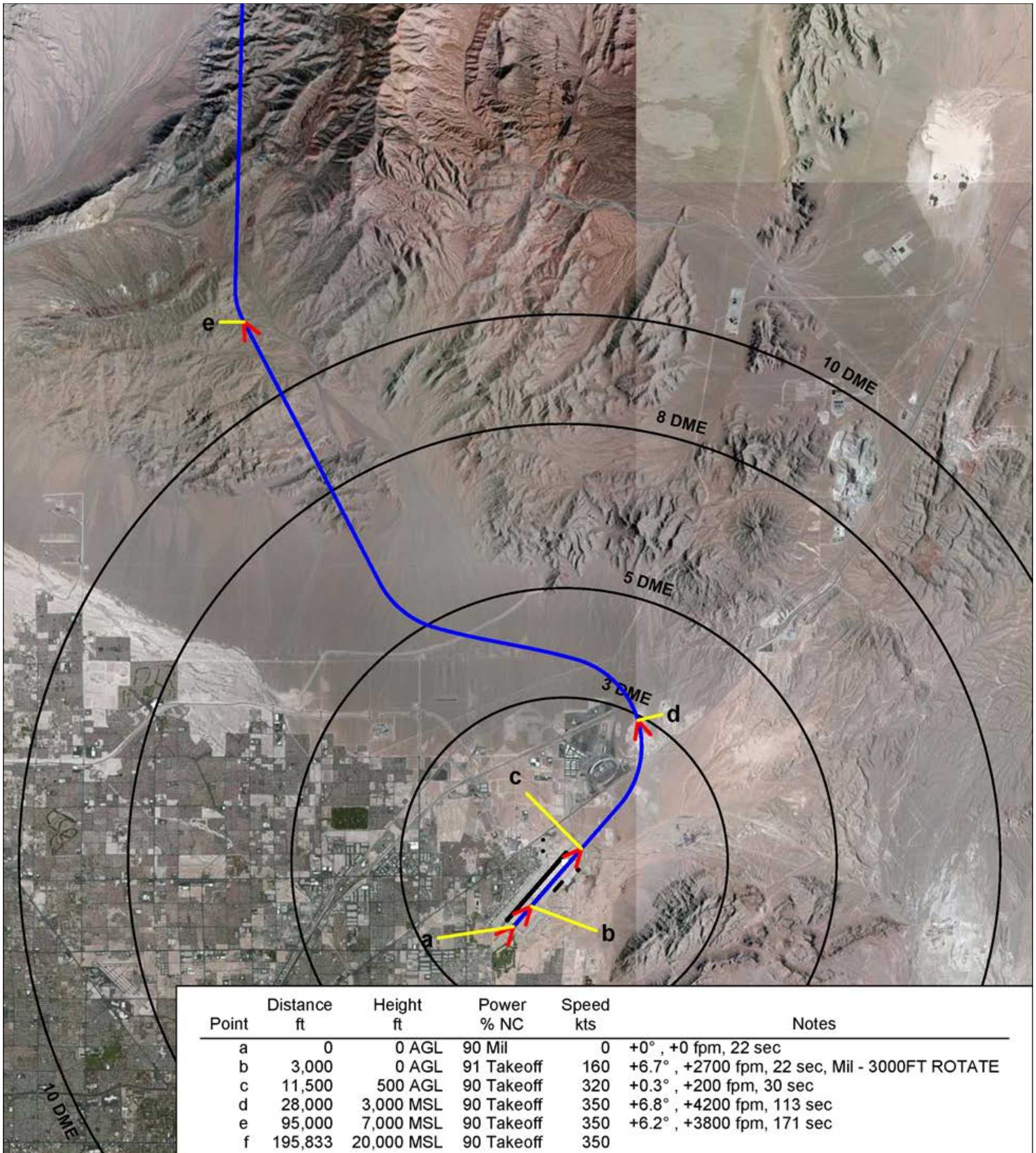


Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	261,034	12,500 MSL	80 Variable	300	-2.4° , -1300 fpm, 143 sec
b	188,744	9,500 MSL	80 Variable	300	-3.5° , -1800 fpm, 33 sec
c	172,165	8,500 MSL	80 Variable	300	-2.8° , -1500 fpm, 163 sec
d	89,550	4,500 MSL	80 Variable	300	-1.4° , -700 fpm, 42 sec
e	68,352	4,000 MSL	80 Variable	300	-0.8° , -400 fpm, 67 sec
f	34,352	3,500 MSL	80 Variable	300	+0° , +0 fpm, 20 sec, TURN TO DOWNWIND
g	24,963	3,500 MSL	80 Variable	250	+0° , +0 fpm, 12 sec
h	20,159	3,500 MSL	83 Approach	220	+0° , +0 fpm, 16 sec, DROP GEAR
i	14,520	3,500 MSL	83 Approach	200	-8.7° , -2800 fpm, 27 sec
j	6,000	300 AGL	83 Approach	170	-2.4° , -700 fpm, 22 sec, 1 NM FINAL
k	0	50 AGL	83 Approach	155	

Nellis AFB (1,868 ft MSL), Break Arrivals Flight Profile 21B40
PW220 RECOVERY FROM STRYK/GASS/APEX BREAK 4000' DOWN RWY
Based F-16C (F100-PW-220)
Runway 21L, Flight Track 21LB07 - STRYK RECOVERY TO INITIAL BREAK 4000' DOWN RWY

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 = 9,420 feet)

N



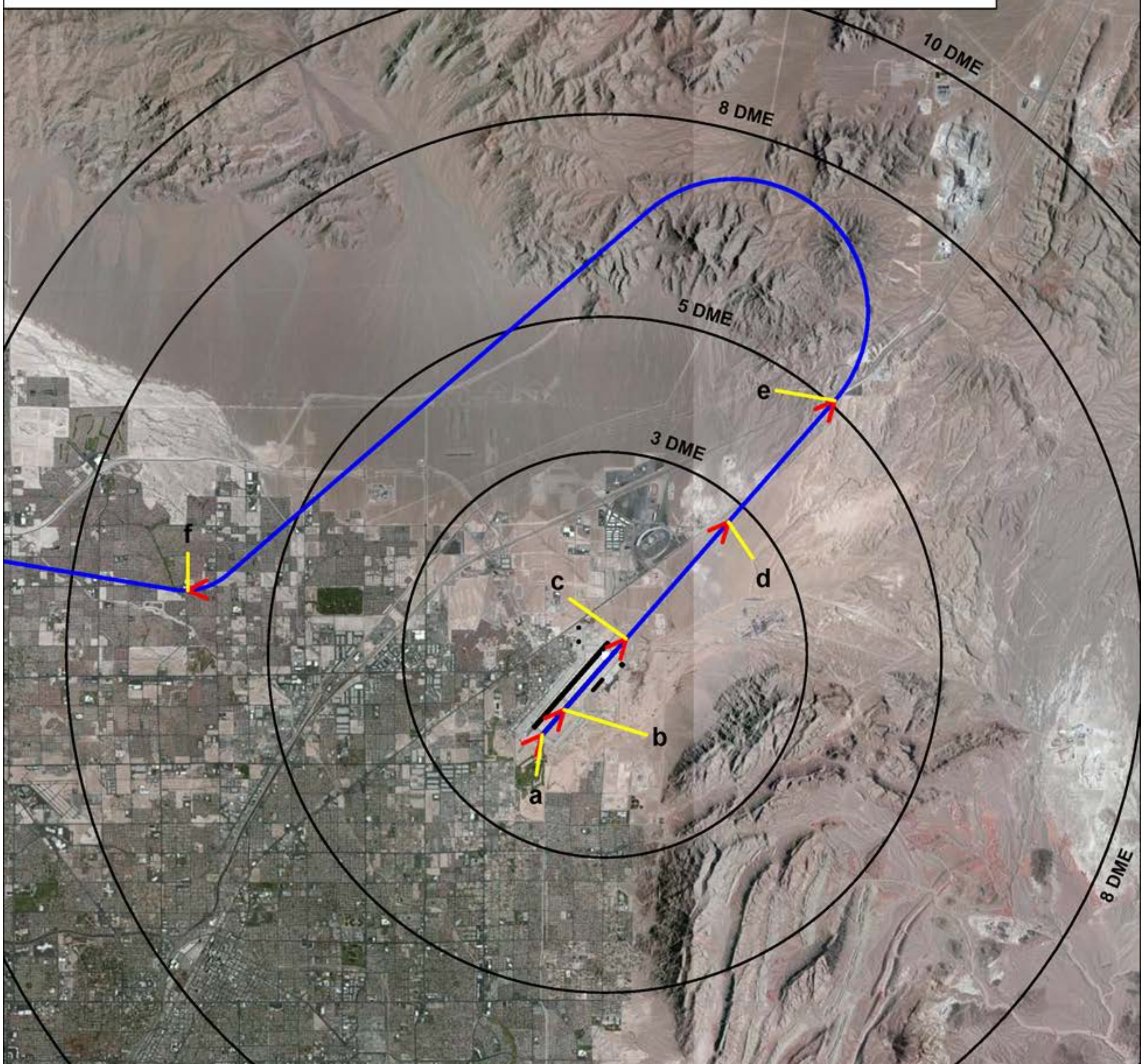
Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	0	0 AGL	90 Mil	0	+0° , +0 fpm, 22 sec
b	3,000	0 AGL	91 Takeoff	160	+6.7° , +2700 fpm, 22 sec, Mil - 3000FT ROTATE
c	11,500	500 AGL	90 Takeoff	320	+0.3° , +200 fpm, 30 sec
d	28,000	3,000 MSL	90 Takeoff	350	+6.8° , +4200 fpm, 113 sec
e	95,000	7,000 MSL	90 Takeoff	350	+6.2° , +3800 fpm, 171 sec
f	195,833	20,000 MSL	90 Takeoff	350	

Nellis AFB (1,868 ft MSL), Departure Flight Profile 21D12M
PW220 DREAM DEPARTURE FLEX TURNOUT MIL PROFILE
Based F-16C (F100-PW-220)
Runway 03R, Flight Track 03RD02 - DREAM 4 FLEX TURNOUT ONLY USED WHEN 21 IS ACTIVE
Prior to brake release, aircraft sits at 90 % NC Mil for 1 sec

0 10,000 20,000 30,000 40,000 50,000
Scale in Feet 1:162,000 (1 inch = 13,500 feet)

N

Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	0	0 AGL	92 Max A/B	0	+0° , +0 fpm, 22 sec, A/B POWER
b	3,000	0 AGL	92 Afterburner	160	+6.7° , +2700 fpm, 22 sec, A/B - ROTATE 3000 FT
c	11,500	1,000 AGL	90 Takeoff	300	+0.4° , +200 fpm, 25 sec, CUT A/B
d	25,472	3,000 MSL	90 Takeoff	350	+10.9° , +6700 fpm, 25 sec
e	39,992	5,800 MSL	90 Takeoff	350	+5° , +3100 fpm, 102 sec
f	130,000	11,000 MSL	90 Takeoff	350	+3.5° , +2200 fpm, 303 sec
g	279,247	20,000 MSL	90 Takeoff	350	

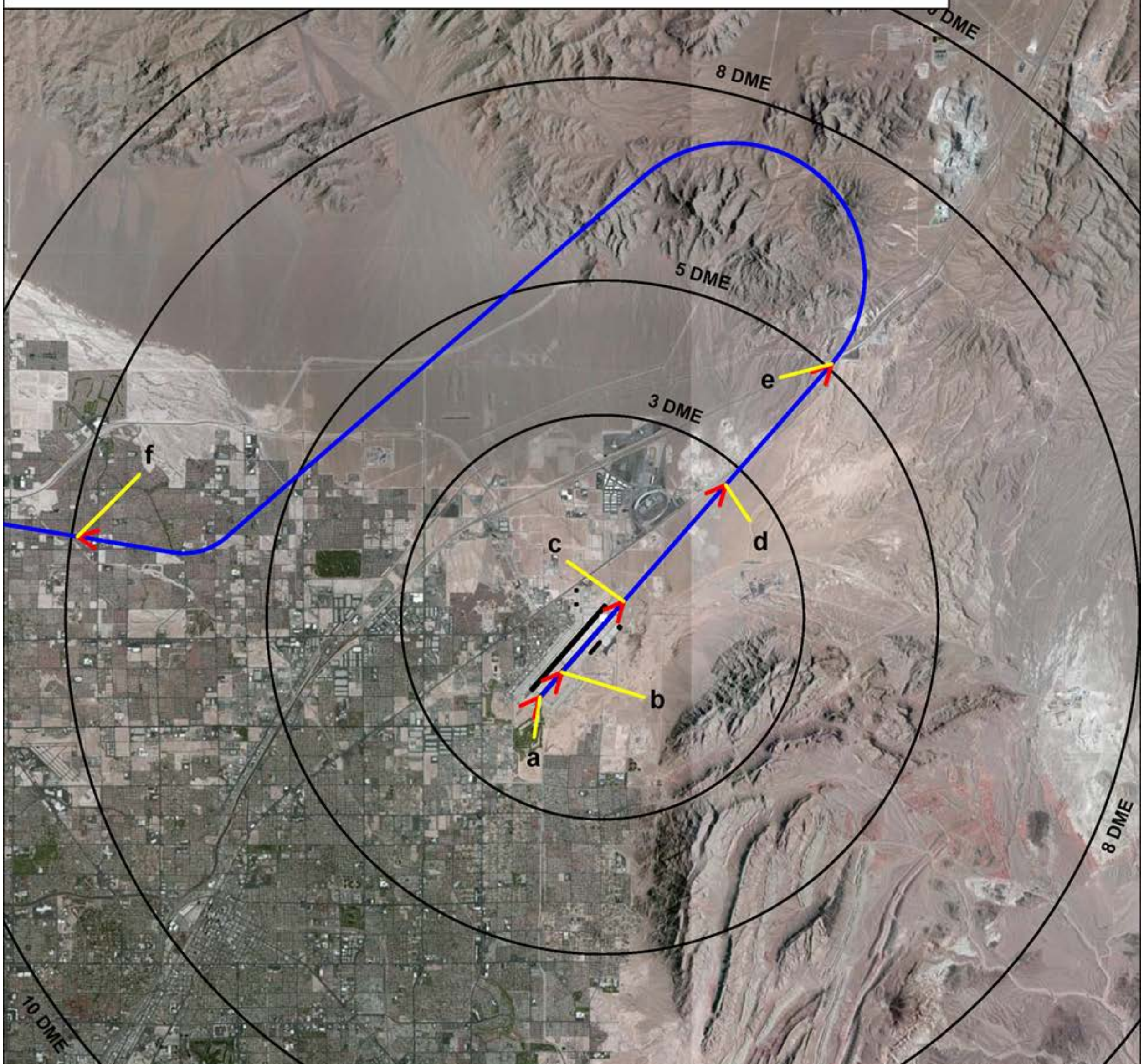


Nellis AFB (1,868 ft MSL), Departure Flight Profile 21D15AB
PW220 FYTTR ONE A/B PROFILE
Based F-16C (F100-PW-220)
Runway 03R, Flight Track 03RD05 - FYTTR THREE (CLIMB TO 5800 MLS BEFORE TURN TO WEST)
Prior to brake release, aircraft sits at 92 % NC Max A/B for 1 sec

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 1:145,000 (1 inch = 12,100 feet)

N

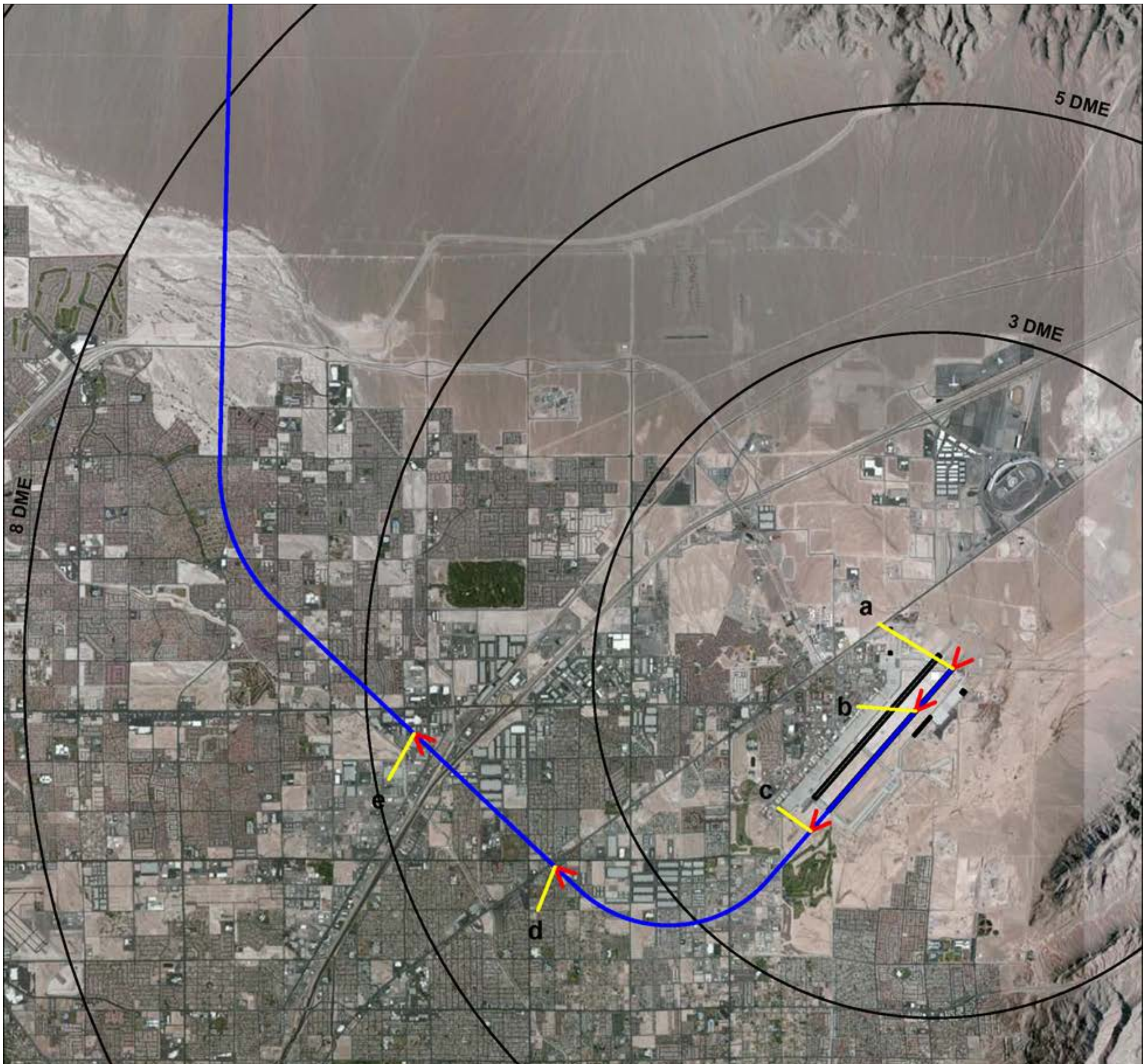
Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	0	0 AGL	92 Mil	0	+0° , +0 fpm, 22 sec
b	3,000	0 AGL	92 Takeoff	160	+6.7° , +2700 fpm, 22 sec, Mil - 3000FT ROTATE
c	11,500	500 AGL	90 Takeoff	320	+0.4° , +200 fpm, 25 sec
d	25,472	3,000 MSL	90 Takeoff	350	+10.9° , +6700 fpm, 25 sec
e	39,992	5,800 MSL	90 Takeoff	350	+5° , +3100 fpm, 102 sec
f	140,000	11,000 MSL	90 Takeoff	350	+3.5° , +2200 fpm, 303 sec
g	279,247	20,000 MSL	90 Takeoff	350	



Nellis AFB (1,868 ft MSL), Departure Flight Profile 21D15M
PW220 FYTTR ONE MIL PROFILE
Based F-16C (F100-PW-220)
Runway 03R, Flight Track 03RD05 - FYTTR THREE (CLIMB TO 5800 MLS BEFORE TURN TO WEST)
Prior to brake release, aircraft sits at 92 % NC Mil for 1 sec

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 1:145,000 (1 inch = 12,100 feet)

N



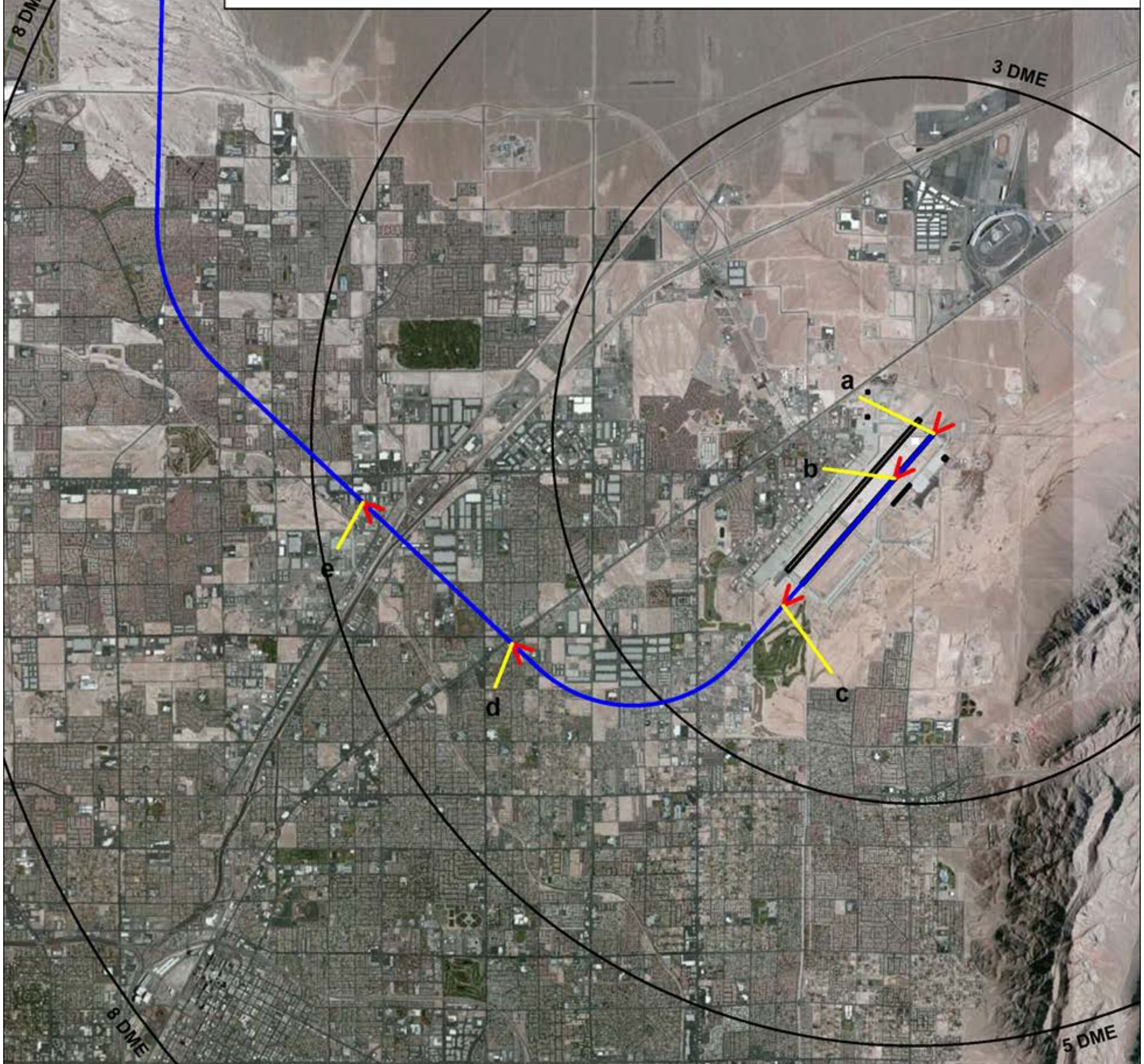
Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	0	0 AGL	92 Max A/B	0	+0° , +0 fpm, 22 sec, A/B POWER
b	3,000	0 AGL	92 Afterburner	160	+6.7° , +2700 fpm, 22 sec, 3000 FT A/B ROTATE
c	11,500	1,000 AGL	90 Takeoff	320	+0.3° , +200 fpm, 30 sec, CUT A/B
d	28,000	3,000 MSL	90 Takeoff	350	+13.6° , +8300 fpm, 17 sec
e	38,326	5,500 MSL	90 Takeoff	350	+5.7° , +3500 fpm, 110 sec
f	103,123	12,000 MSL	90 Takeoff	350	+5.9° , +3600 fpm, 164 sec
g	200,000	20,000 MSL	90 Takeoff	350	

Nellis AFB (1,868 ft MSL), Departure Flight Profile 21D26AB
PW220 DREAM DEPARTURE NOISE ABATEMENT A/B PROFILE
Based F-16C (F100-PW-220)
Runway 21L, Flight Track 21LD01 - DREAM 4 DEPARTURE NOISE ABATEMENT PROCEDURE
Prior to brake release, aircraft sits at 92 % NC Max A/B for 1 sec

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000
Scale in Feet 1:85,800 (1 inch = 7,150 feet)

N

Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	0	0 AGL	92 Mil	0	+0° , +0 fpm, 22 sec
b	3,000	0 AGL	92 Takeoff	160	+6.7° , +2700 fpm, 22 sec, 3000 FT ROTATE
c	11,500	500 AGL	92 Takeoff	320	+0.3° , +200 fpm, 30 sec
d	28,000	3,000 MSL	90 Takeoff	350	+13.6° , +8300 fpm, 17 sec
e	38,326	5,500 MSL	90 Takeoff	350	+5.7° , +3500 fpm, 110 sec
f	103,123	7,000 MSL	90 Takeoff	350	+5.9° , +3600 fpm, 164 sec
g	200,000	20,000 MSL	90 Takeoff	350	

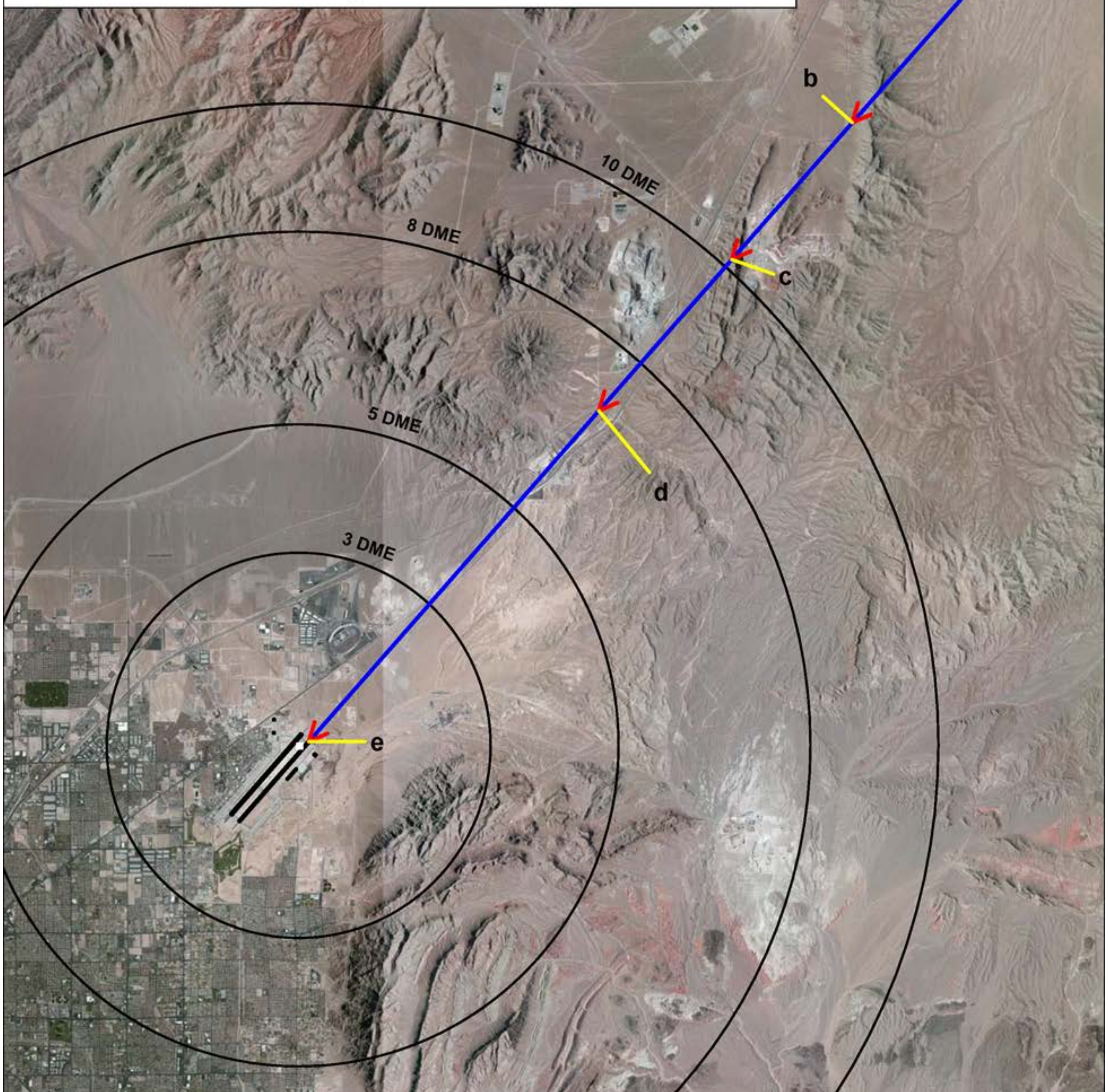


Nellis AFB (1,868 ft MSL), Departure Flight Profile 21D26M
PW220 DREAM DEPARTURE NOISE ABATEMENT MIL PROFILE
Based F-16C (F100-PW-220)
Runway 21L, Flight Track 21LD01 - DREAM 4 DEPARTURE NOISE ABATEMENT PROCEDURE
Prior to brake release, aircraft sits at 92 % NC Mil for 1 sec

0 4,000 8,000 12,000 16,000 20,000 24,000
Scale in Feet 1:80,800 (1 inch = 6,730 feet)

N

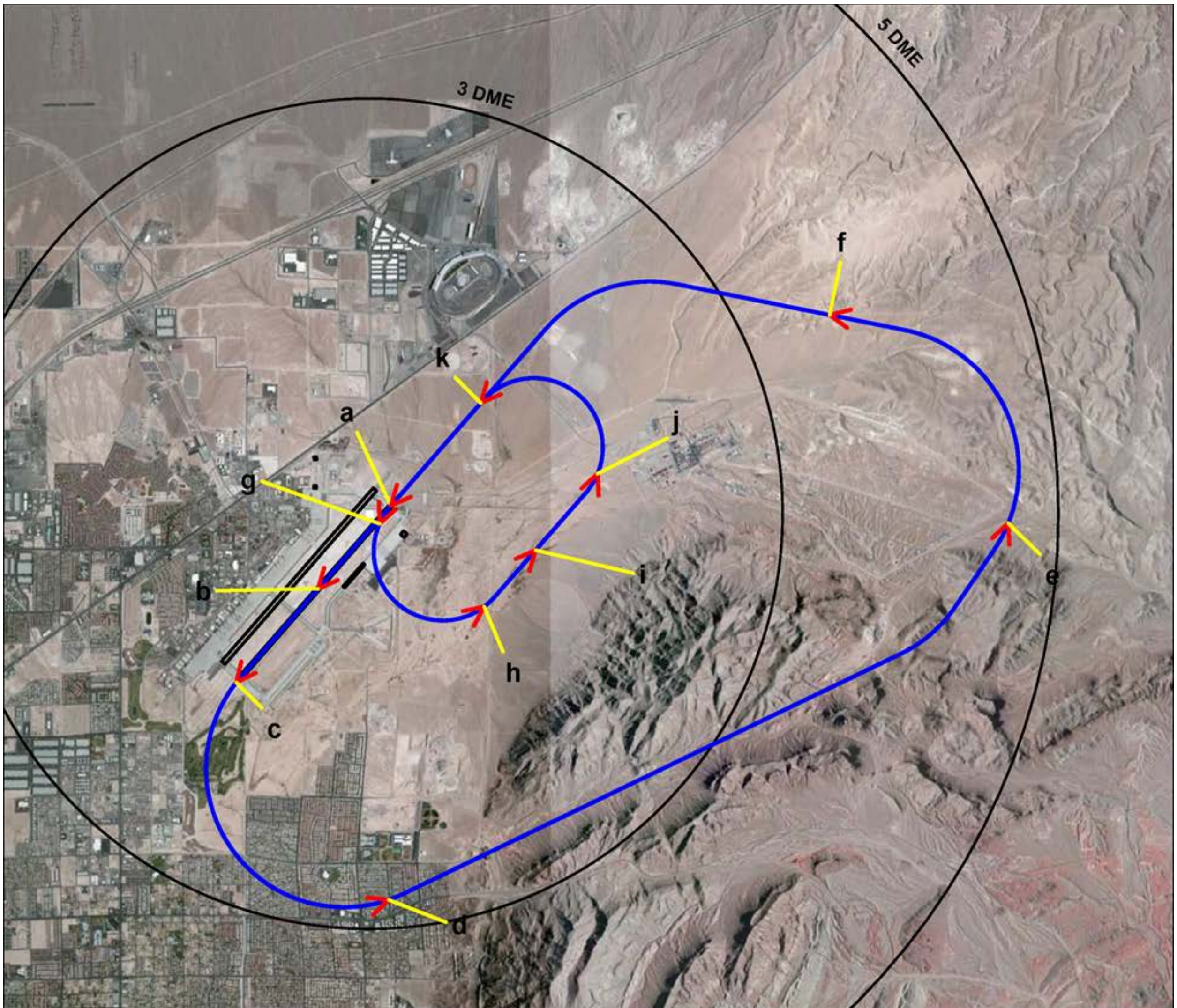
Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	150,000	10,000 MSL	80 Variable	250	-4° , -1800 fpm, 171 sec
b	78,041	5,000 MSL	80 Variable	250	-2.7° , -1000 fpm, 48 sec
c	60,761	4,200 MSL	83 Approach	180	+0° , +0 fpm, 63 sec, Drop Gear
d	41,679	4,200 MSL	83 Approach	180	-3.1° , -1000 fpm, 141 sec, FAF
e	0	50 AGL	83 Approach	155	



Nellis AFB (1,868 ft MSL), Instrument Arrivals Flight Profile 21I01
PW220 ILS PROCEDURE
Based F-16C (F100-PW-220)
Runway 21L, Flight Track 21LI01 - USED FOR IFR ARRIVALS

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000 48,000 52,000
Scale in Feet 1:148,000 (1 inch = 12,300 feet)

N

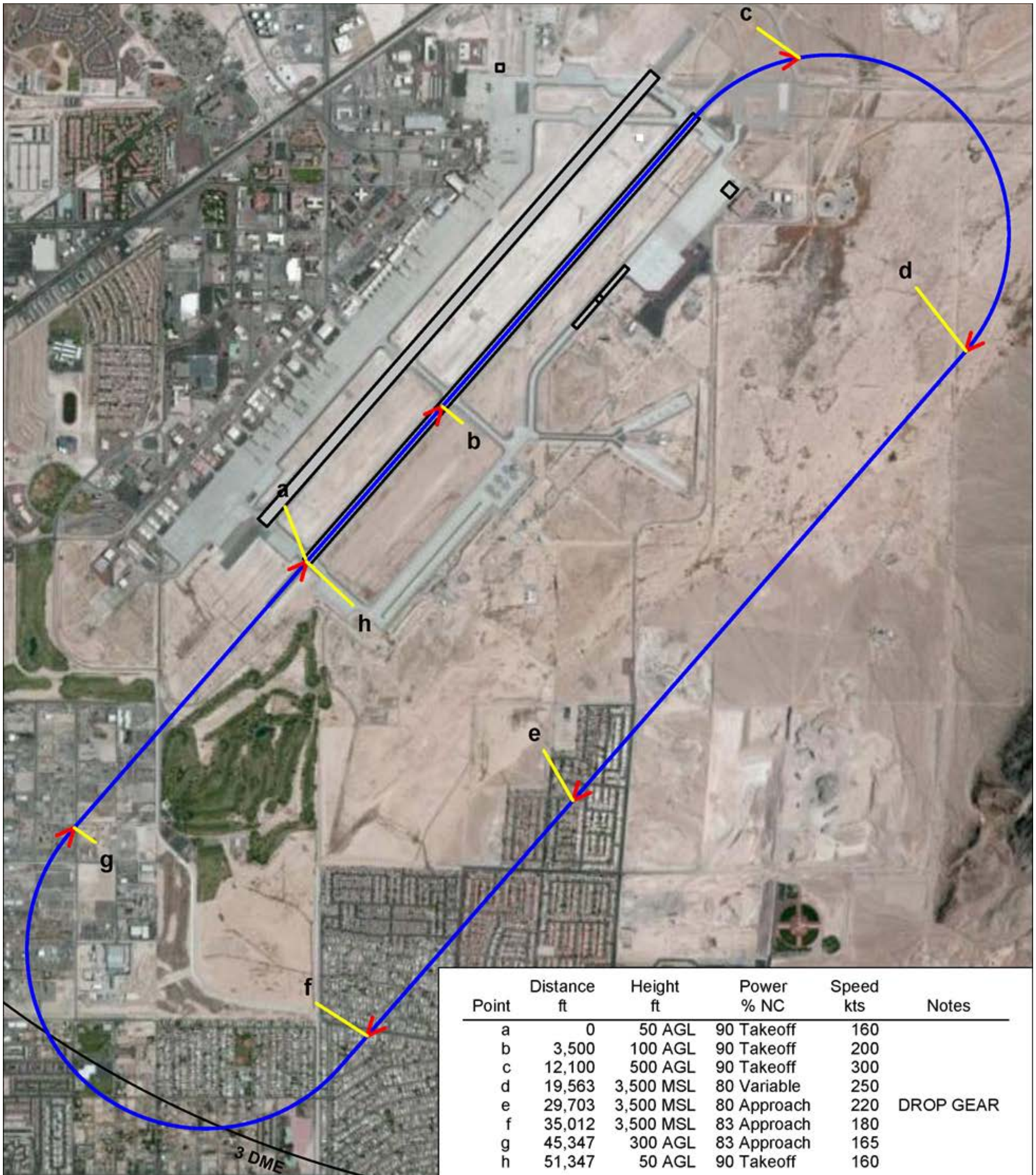


Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	0	50 AGL	90 Takeoff	160	+0.6° , +200 fpm, 16 sec
b	4,861	100 AGL	90 Takeoff	200	+0° , +0 fpm, 13 sec
c	10,329	1,000 AGL	90 Takeoff	300	+15.4° , +8100 fpm, 31 sec
d	25,973	4,400 MSL	80 Variable	300	+0° , +0 fpm, 64 sec
e	58,550	4,400 MSL	80 Variable	300	-3.6° , -1900 fpm, 28 sec
f	72,913	3,500 MSL	80 Variable	300	+0° , +0 fpm, 48 sec
g	97,436	3,500 MSL	80 Variable	300	+0° , +0 fpm, 17 sec, TURN TO DOWNWIND
h	105,417	3,500 MSL	80 Variable	250	+0° , +0 fpm, 8 sec
i	108,782	3,500 MSL	80 Approach	220	+0° , +0 fpm, 12 sec, DROP GEAR
j	113,123	3,500 MSL	83 Approach	200	-20.4° , -6500 fpm, 28 sec
k	121,738	300 AGL	83 Approach	170	-2.4° , -700 fpm, 22 sec
l	127,738	50 AGL	90 Takeoff	160	

Nellis AFB (1,868 ft MSL), Visual ReEntry Pattern Flight Profile 21RE02
PW220 DUCK REENTRY
Based F-16C (F100-PW-229)
Runway 21L, Flight Track 21LR01 - VFR (DUCK) Re-entry

0 4,000 8,000 12,000 16,000 20,000
Scale in Feet 1:72,700 (1 inch = 6,060 feet)

N



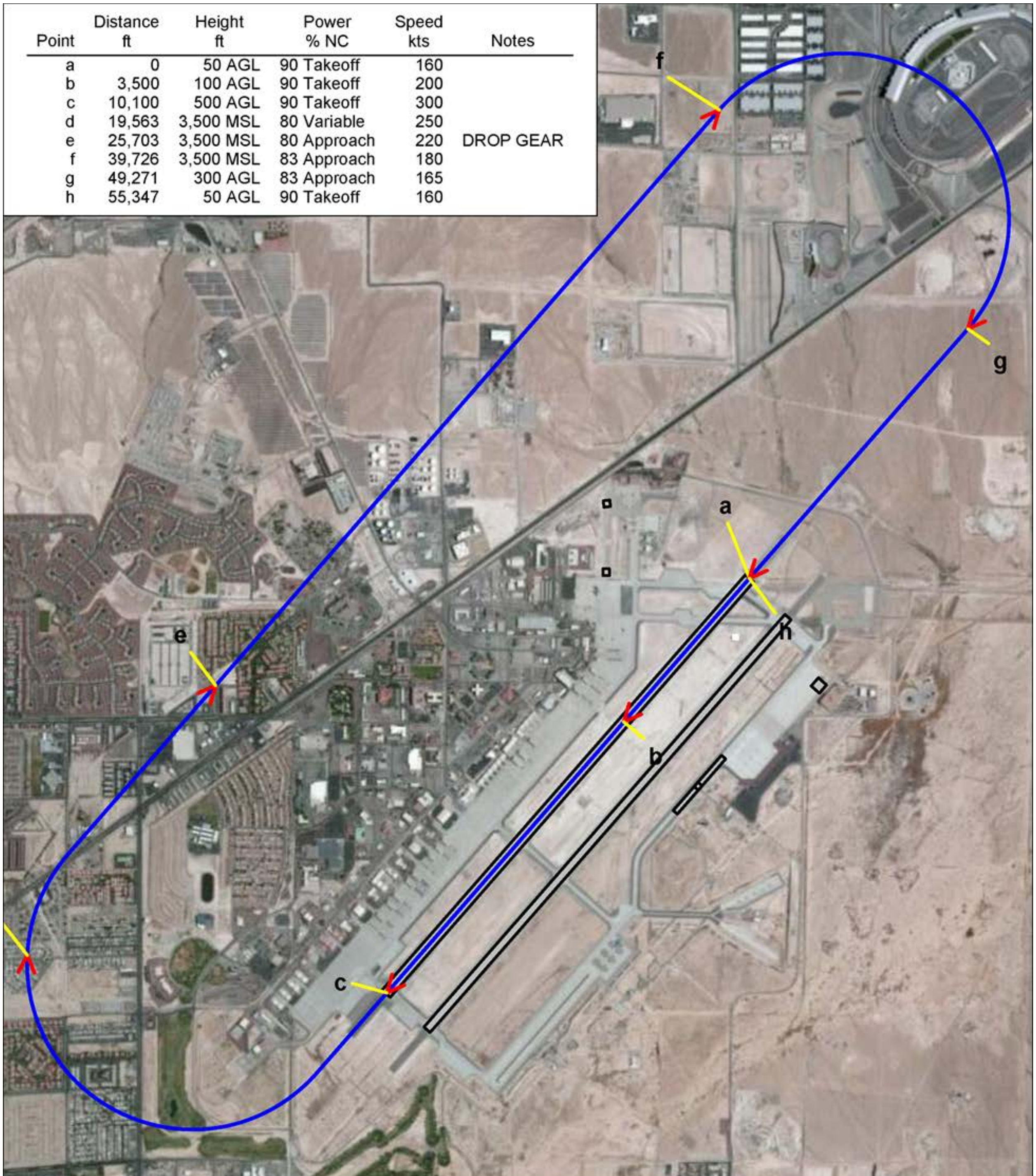
Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	0	50 AGL	90 Takeoff	160	
b	3,500	100 AGL	90 Takeoff	200	
c	12,100	500 AGL	90 Takeoff	300	
d	19,563	3,500 MSL	80 Variable	250	
e	29,703	3,500 MSL	80 Approach	220	DROP GEAR
f	35,012	3,500 MSL	83 Approach	180	
g	45,347	300 AGL	83 Approach	165	
h	51,347	50 AGL	90 Takeoff	160	

Nellis AFB (1,868 ft MSL), Visual Pattern Flight Profile 21V02
PW220 VFR INSIDE DOWNWIND
Based F-16C (F100-PW-220)
Runway 03R, Flight Track 03RV01 - Sunrise closed

0 1,000 2,000 3,000 4,000 5,000 6,000 7,000 8,000
Scale in Feet 1:24,700 (1 inch = 2,060 feet)

N

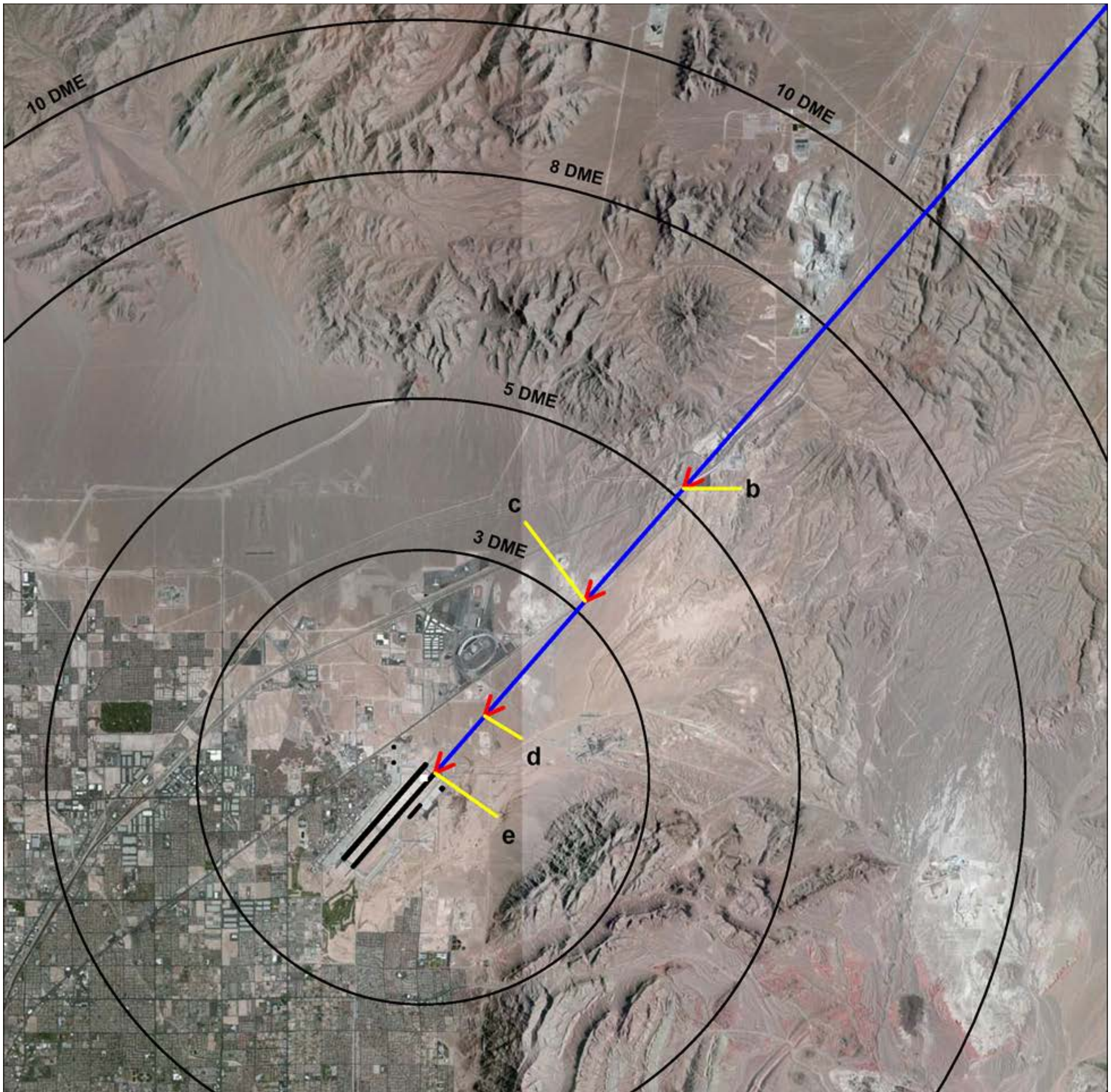
Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	0	50 AGL	90 Takeoff	160	
b	3,500	100 AGL	90 Takeoff	200	
c	10,100	500 AGL	90 Takeoff	300	
d	19,563	3,500 MSL	80 Variable	250	
e	25,703	3,500 MSL	80 Approach	220	DROP GEAR
f	39,726	3,500 MSL	83 Approach	180	
g	49,271	300 AGL	83 Approach	165	
h	55,347	50 AGL	90 Takeoff	160	



Nellis AFB (1,868 ft MSL), Visual Pattern Flight Profile 21V06
PW220 VFR INSIDE DOWNWIND
Based F-16C (F100-PW-220)
Runway 21R, Flight Track 21RV01_2 - Standard closed

Scale in Feet 1:26,700 (1 inch = 2,220 feet)

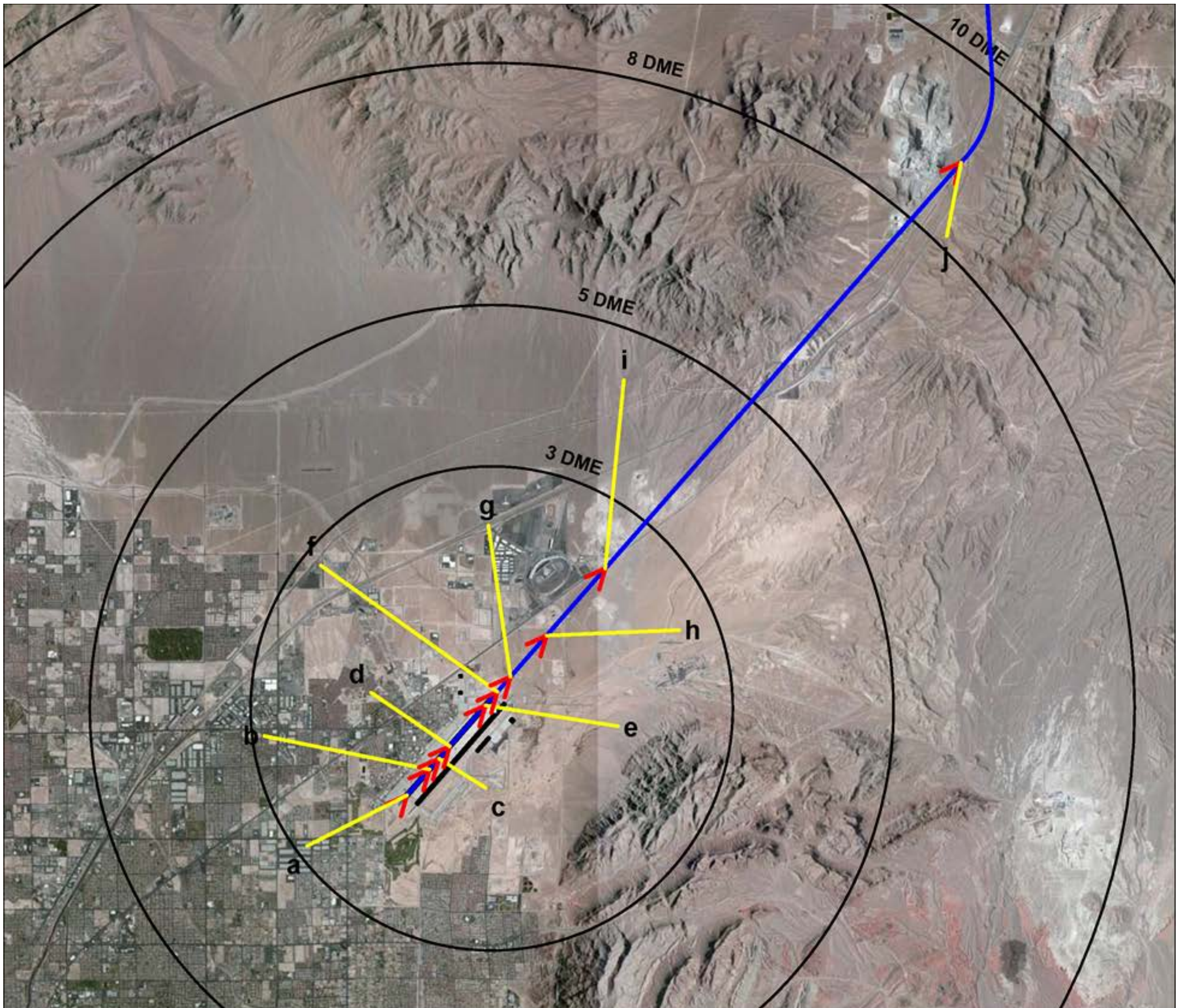
Flight Profiles for 65th Aggressor Squadron and 422nd TES F-35s



Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	200,000	15,000 MSL	15 Variable	350	-3.7° , -1900 fpm, 370 sec, Change to legacy elevation
b	30,380	3,400 MSL	45 Parallel	225	-2.4° , -800 fpm, 36 sec, Initial 5nm, 3400 feet Gear down
c	18,350	2,889 MSL	45 Parallel	170	-3.2° , -900 fpm, 43 sec, 3 degree glide slope
d	6,080	2,168 MSL	45 Parallel	170	-2.6° , -700 fpm, 23 sec, Converted to MSL from here on per course rules
e	0	50 AGL	45 Parallel	150	Threshold crossing, approx. 1200 feet from touchdown point

Nellis AFB (1,868 ft MSL), Instrument Arrivals Flight Profile 22I01
ILS APPROACH P14
Based F-35A (F-135-PW-100)
Runway 21L, Flight Track 21LI01 - USED FOR IFR ARRIVALS

Scale in Feet 1:126,000 (1 inch = 10,500 feet)

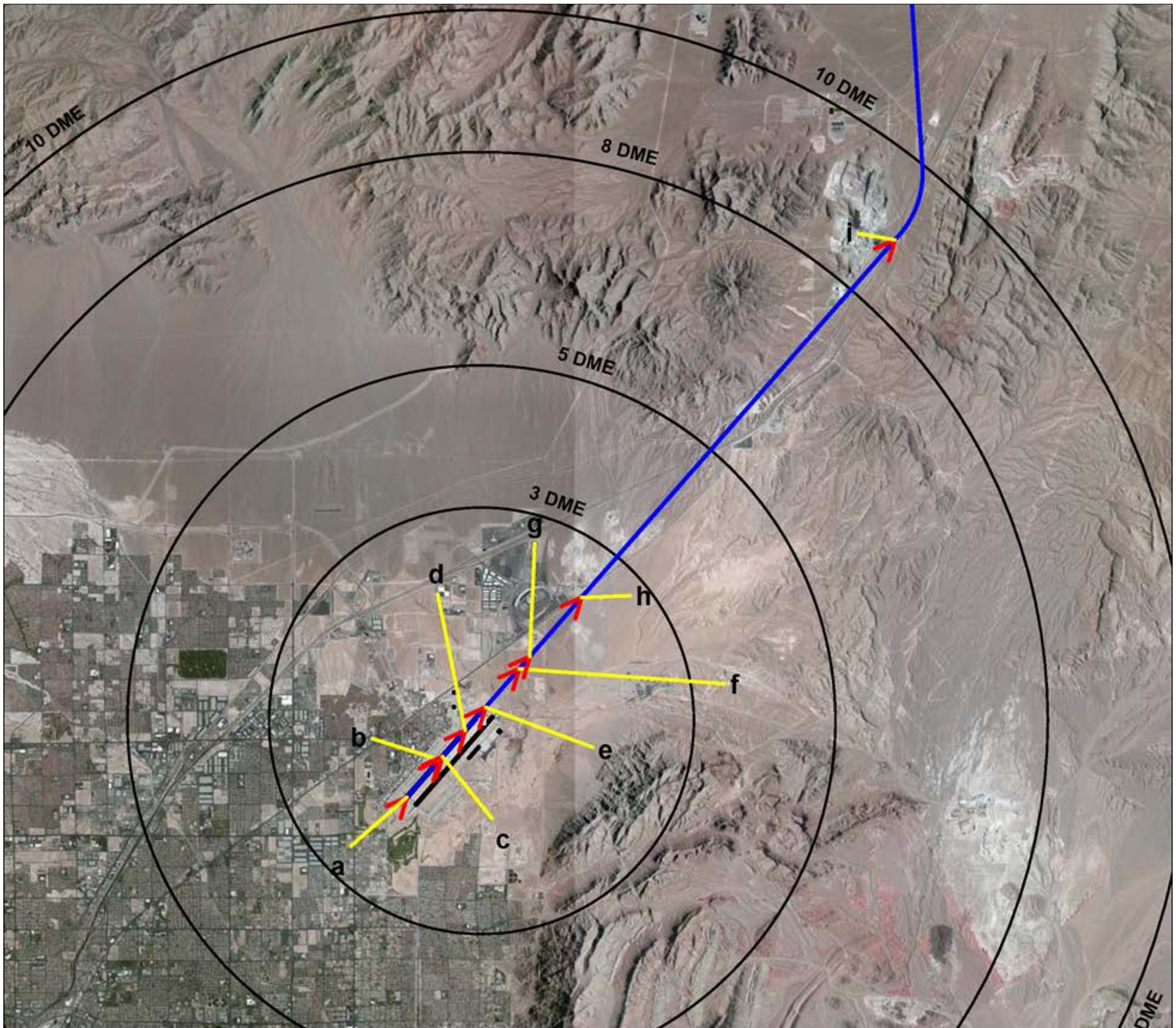


Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	0	0 AGL	12 50% ETR	0	+0° , +0 fpm, 16 sec, 1 second @ 50%ETR before brake release
b	2,585	0 AGL	150 Afterburner	190	+0.9° , +300 fpm, 3 sec, lift-off; initiate gear up
c	3,676	18 AGL	150 Afterburner	200	+3.5° , +1400 fpm, 3 sec
d	4,908	93 AGL	150 Afterburner	251	+3.8° , +1800 fpm, 9 sec
e	9,000	362 AGL	150 Afterburner	287	+3.8° , +2000 fpm, 3 sec
f	10,364	452 AGL	100 Variable	300	+10.6° , +5600 fpm, 3 sec
g	11,871	2,622 MSL	100 Variable	300	+38.4° , +20400 fpm, 8 sec, Converted to MSL from hereon per course r
h	16,000	3,900 MSL	100 Variable	350	-4.3° , -2600 fpm, 11 sec, resume Nellis profile except 100% ETR vice 9
i	22,725	5,400 MSL	80 Variable	350	+2.3° , +1400 fpm, 69 sec
j	63,422	7,000 MSL	80 Variable	350	+4.4° , +2700 fpm, 400 sec
k	196,000	25,000 MSL	55 Variable	350	

Nellis AFB (1,868 ft MSL), Departure Flight Profile 22D01AB
dream a/b P1
Based F-35A (F-135-PW-100)
Runway 03L, Flight Track 03LD01 - DREAM 4
Prior to brake release, aircraft sits at 12 % ETR 50% ETR for 1 sec

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000
Scale in Feet 1:125,000 (1 inch = 10,400 feet)

N



Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	0	0 AGL	12 50% ETR	0	+0° , +0 fpm, 27 sec, 1 seconds @ 50%ETR before brake release
b	4,258	0 AGL	100 Variable	190	+2.7° , +1000 fpm, 1 sec, Lift-off, initiate gear up
c	4,634	18 AGL	100 Variable	203	+2.6° , +1000 fpm, 8 sec
d	7,616	153 AGL	100 Variable	244	+6° , +2700 fpm, 6 sec
e	10,242	430 AGL	100 Variable	273	+10.1° , +5100 fpm, 9 sec
f	14,613	3,112 MSL	100 Variable	300	+29.6° , +16300 fpm, 3 sec, Converted to MSL from here on per course ru
g	16,000	3,900 MSL	80 Variable	350	+12.6° , +7700 fpm, 11 sec, Resume previous modeling
h	22,725	5,400 MSL	80 Variable	350	+2.3° , +1400 fpm, 69 sec
i	63,422	7,000 MSL	80 Variable	350	+4.4° , +2700 fpm, 400 sec
j	196,000	25,000 MSL	55 Variable	350	

Nellis AFB (1,868 ft MSL), Departure Flight Profile 22D01M
dream1 MIL P2
Based F-35A (F-135-PW-100)
Runway 03L, Flight Track 03LD01 - DREAM 4
Prior to brake release, aircraft sits at 12 % ETR 50% ETR for 1 sec

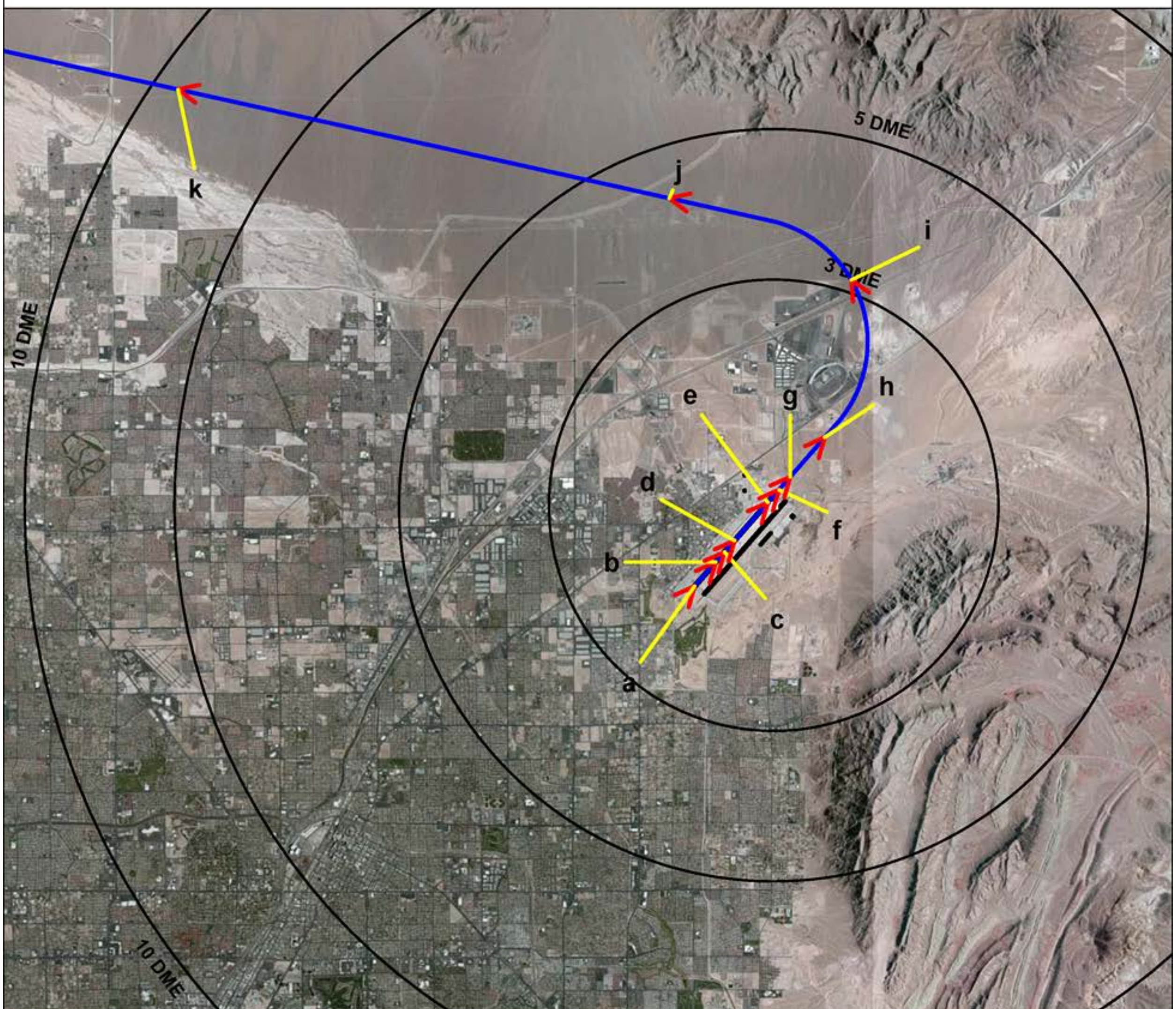
0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000 48,000

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

N

COC

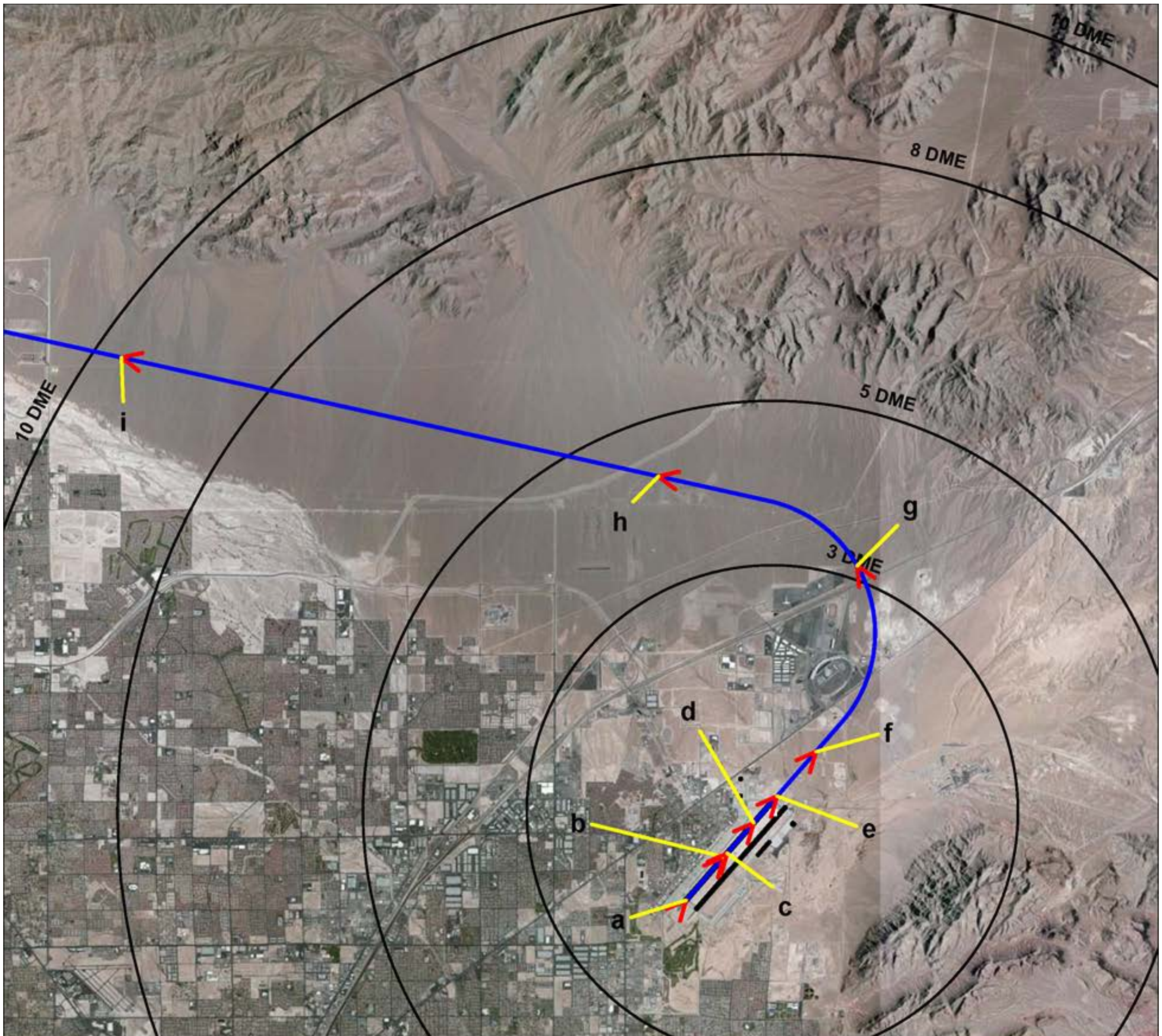
Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	0	0 AGL	12 50% ETR	0	+0° , +0 fpm, 16 sec, 1 second @ 50%ETR before brake release
b	2,585	0 AGL	150 Afterburner	190	+0.9° , +300 fpm, 3 sec, lift-off; initiate gear up
c	3,676	18 AGL	150 Afterburner	200	+3.5° , +1400 fpm, 3 sec
d	4,908	93 AGL	150 Afterburner	251	+3.8° , +1800 fpm, 9 sec
e	9,000	362 AGL	150 Afterburner	287	+3.8° , +2000 fpm, 3 sec
f	10,364	452 AGL	100 Variable	300	+11° , +5800 fpm, 3 sec
g	11,754	2,622 MSL	100 Variable	300	+5.1° , +2900 fpm, 8 sec, Converted to MSL from here on per course rule
h	16,000	3,000 MSL	100 Variable	350	+2.1° , +1300 fpm, 24 sec, resume Nellis profile except 100% ETR vice 9
i	29,924	3,500 MSL	45 Variable	350	+8.5° , +5200 fpm, 28 sec
j	46,672	6,000 MSL	80 Variable	350	+1.4° , +900 fpm, 69 sec
k	87,428	7,000 MSL	80 Variable	350	+0.7° , +400 fpm, 360 sec
l	236,000	2,500 MSL	55 Variable	350	



Nellis AFB (1,868 ft MSL), Departure Flight Profile 22D04AB
Based F-35A (F-135-PW-100)
Runway 03L, Flight Track 03LD04 - FYTTR FLEX TURNOUT THEN DIRECT
Prior to brake release, aircraft sits at 12 % ETR 50% ETR for 1 sec

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 1:134,000 (1 inch = 11,100 feet)

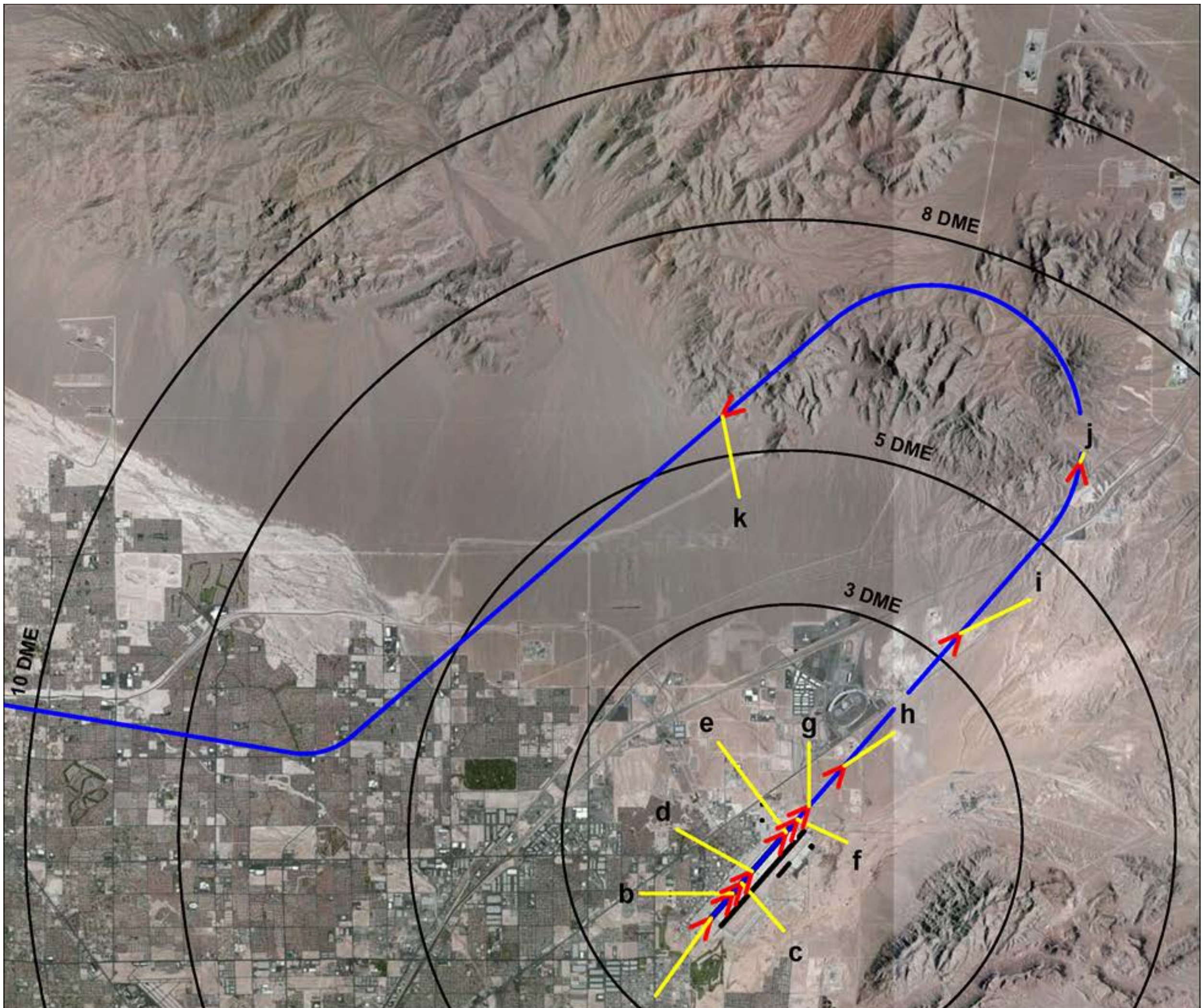
N



Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	0	0 AGL	12 50% ETR	0	+0° , +0 fpm, 27 sec, 1 seconds @ 50%ETR before brake release
b	4,258	0 AGL	100 Variable	190	+2.7° , +1000 fpm, 1 sec, Lift-off, initiate gear up
c	4,634	18 AGL	100 Variable	203	+2.6° , +1000 fpm, 8 sec
d	7,616	153 AGL	100 Variable	244	+6° , +2700 fpm, 6 sec
e	10,242	430 AGL	100 Variable	273	+10° , +5000 fpm, 9 sec
f	14,613	3,102 MSL	100 Variable	300	+1.5° , +900 fpm, 28 sec, Converted to MSL from here on per course rules
g	29,924	3,500 MSL	45 Variable	350	+8.5° , +5200 fpm, 28 sec, Ressume previous modeling
h	46,672	6,000 MSL	80 Variable	350	+1.4° , +900 fpm, 69 sec
i	87,428	7,000 MSL	80 Variable	350	+0.7° , +400 fpm, 360 sec
j	236,000	25,000 MSL	55 Variable	350	

Nellis AFB (1,868 ft MSL), Departure Flight Profile 22D04M
Based F-35A (F-135-PW-100)
Runway 03L, Flight Track 03LD04 - FYTTR FLEX TURNOUT THEN DIRECT
Prior to brake release, aircraft sits at 12 % ETR 50% ETR for 1 sec

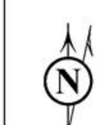
Scale in Feet 1:121,000 (1 inch = 10,100 feet)

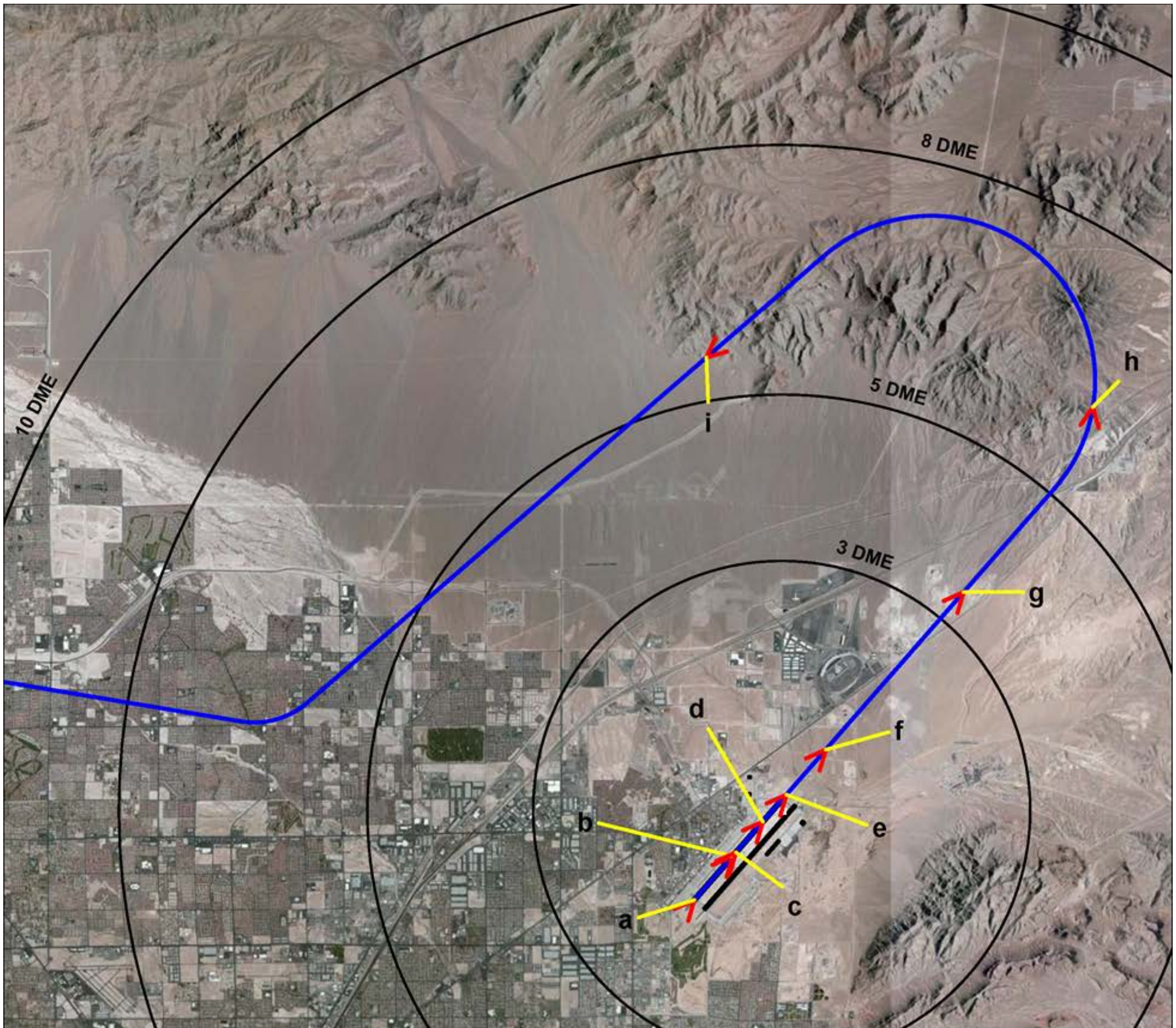


Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	0	0 AGL	12 50% ETR	0	+0° , +0 fpm, 16 sec, 1 second @ 50%ETR before brake release
b	2,585	0 AGL	150 Afterburner	190	+0.9° , +300 fpm, 3 sec, lift-off; initiate gear up
c	3,676	18 AGL	150 Afterburner	200	+3.5° , +1400 fpm, 3 sec
d	4,908	93 AGL	150 Afterburner	251	+3.8° , +1800 fpm, 9 sec
e	9,000	362 AGL	150 Afterburner	287	+3.8° , +2000 fpm, 3 sec
f	10,364	452 AGL	100 Variable	300	+11° , +5800 fpm, 3 sec
g	11,754	2,622 MSL	100 Variable	300	+5.1° , +2900 fpm, 8 sec, Converted to MSL from here on per course rule
h	16,000	3,000 MSL	100 Variable	350	+2.1° , +1300 fpm, 24 sec, resume Nellis profile except 100% ETR vice 9
i	29,924	3,500 MSL	45 Variable	350	+8.5° , +5200 fpm, 28 sec
j	46,672	6,000 MSL	80 Variable	350	+1.4° , +900 fpm, 69 sec
k	87,428	7,000 MSL	80 Variable	350	+0.7° , +400 fpm, 360 sec
l	236,000	2,500 MSL	55 Variable	350	

Nellis AFB (1,868 ft MSL), Departure Flight Profile 22D05AB
hiway2 flex turnout a/b P1
Based F-35A (F-135-PW-100)
Runway 03L, Flight Track 03LD05 - FYTTR THREE (CLIMB TO 5800 MSL BEFORE TURN TO WEST)
Prior to brake release, aircraft sits at 12 % ETR 50% ETR for 1 sec

Scale in Feet 1:134,000 (1 inch = 11,100 feet)



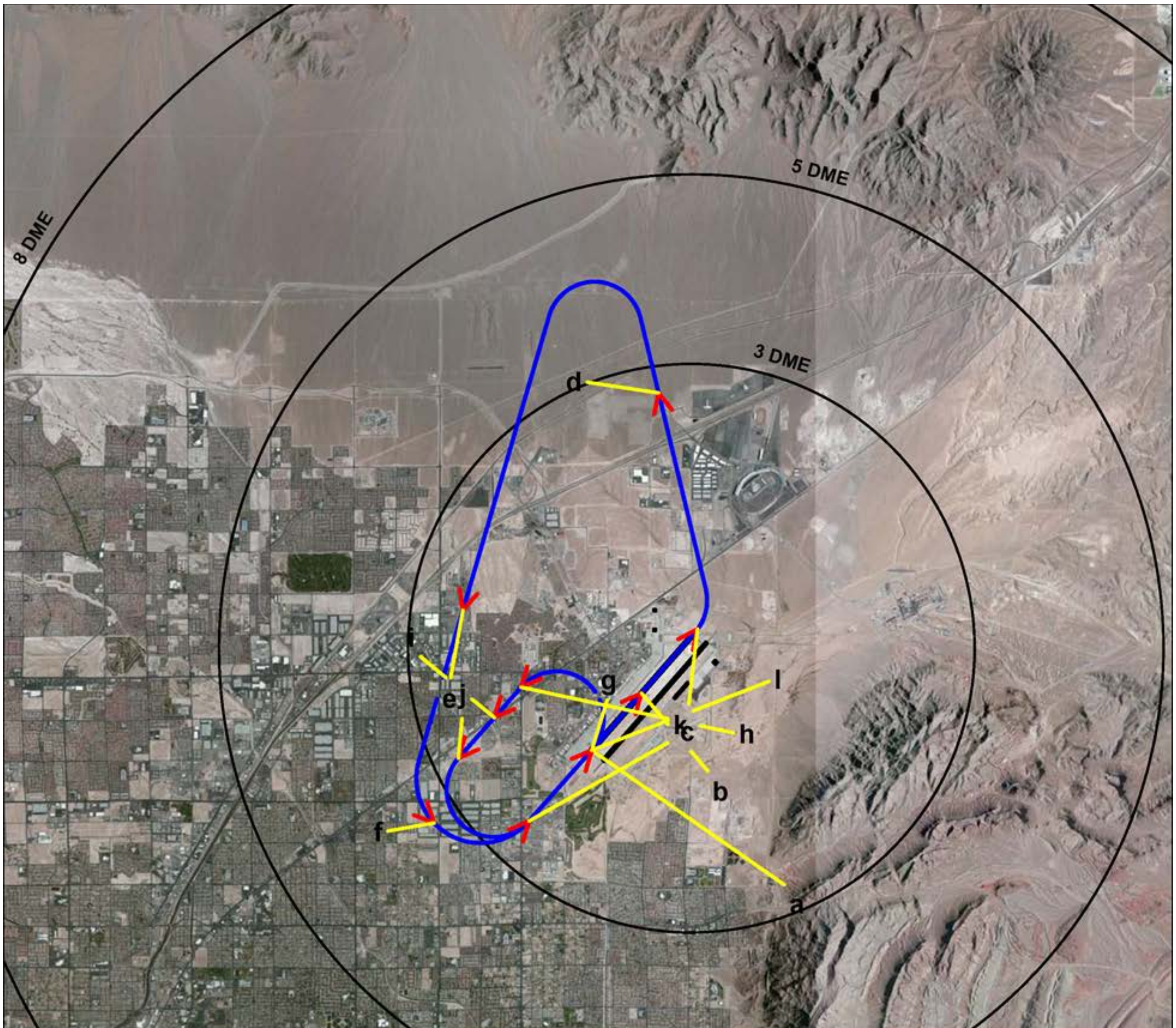


Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	0	0 AGL	12 50% ETR	0	+0° , +0 fpm, 27 sec, 1 seconds @ 50%ETR before brake release
b	4,258	0 AGL	100 Variable	190	+2.7° , +1000 fpm, 1 sec, Lift-off, initiate gear up
c	4,634	18 AGL	100 Variable	203	+2.6° , +1000 fpm, 8 sec
d	7,616	153 AGL	100 Variable	244	+6° , +2700 fpm, 6 sec
e	10,242	430 AGL	100 Variable	273	+10° , +5000 fpm, 9 sec
f	14,613	3,102 MSL	100 Variable	300	+1.5° , +900 fpm, 28 sec, Converted to MSL from here on per course rules
g	29,924	3,500 MSL	45 Variable	350	+8.5° , +5200 fpm, 28 sec, Ressume previous modeling
h	46,672	6,000 MSL	80 Variable	350	+1.4° , +900 fpm, 69 sec
i	87,428	7,000 MSL	80 Variable	350	+0.7° , +400 fpm, 360 sec
j	236,000	25,000 MSL	55 Variable	350	

Nellis AFB (1,868 ft MSL), Departure Flight Profile 22D05M
hiway2 flex turnout MIL P2
Based F-35A (F-135-PW-100)
Runway 03L, Flight Track 03LD05 - FYTTR THREE (CLIMB TO 5800 MSL BEFORE TURN TO WEST)
Prior to brake release, aircraft sits at 12 % ETR 50% ETR for 1 sec

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000
Scale in Feet 1:121,000 (1 inch = 10,100 feet)

N

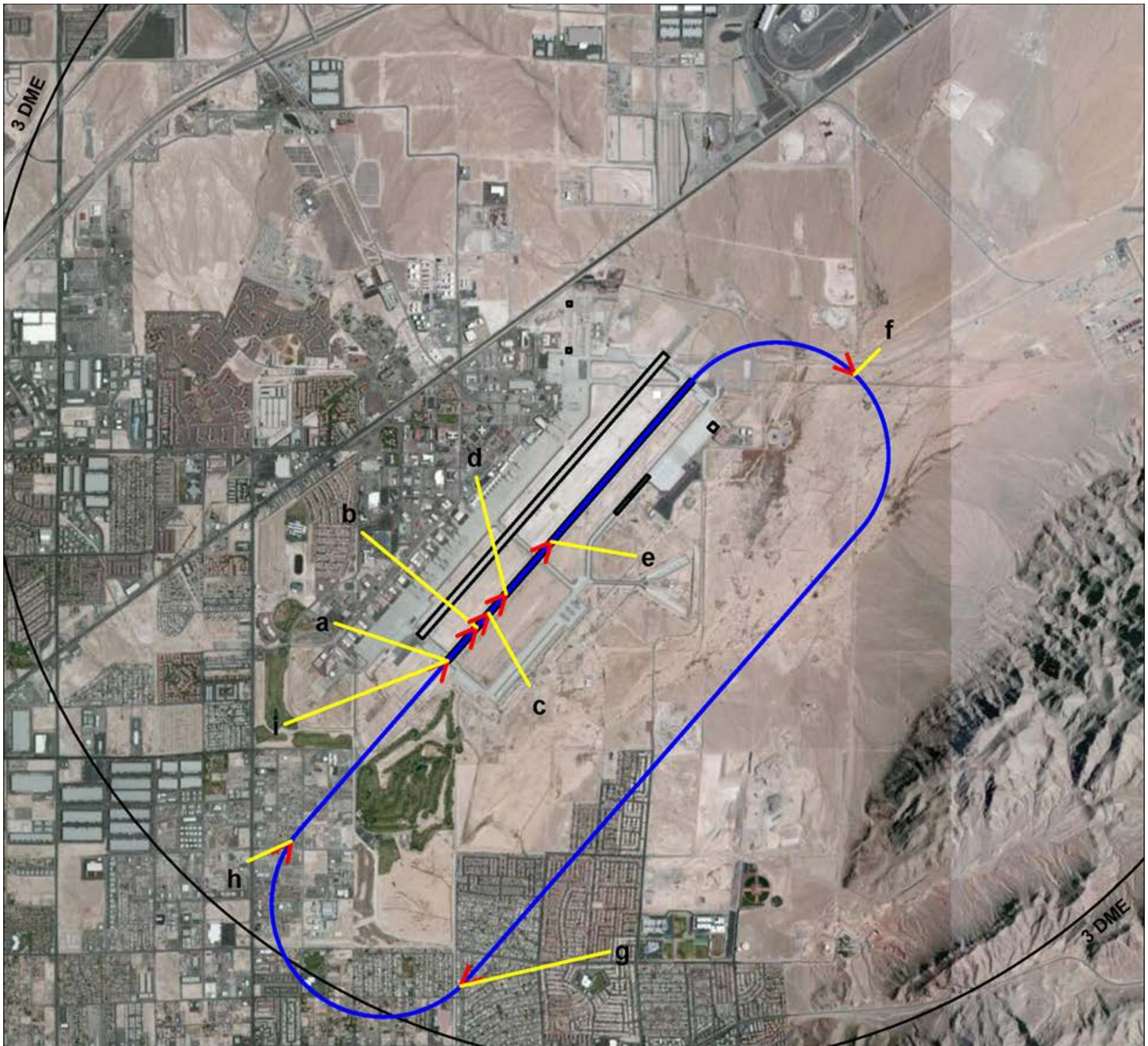


Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	0	50 AGL	100 Variable	150	Threshold crossing, no touchdown
b	4,860	50 AGL	100 Variable	150	begin to climb
c	10,329	75 AGL	100 Variable	170	
d	25,972	153 AGL	100 Variable	250	
e	58,550	4,900 MSL	80 Variable	300	
f	72,913	4,900 MSL	45 Variable	300	
g	85,859	4,900 MSL	35 Variable	250	Resume Nellis P9 Profile
h	95,404	1,500 AGL	35 Variable	225	Break point approach end of runway, power between idle and 35% in break
i	98,000	1,500 AGL	35 Parallel	225	
j	101,480	1,500 AGL	35 Parallel	170	45 degrees off of point of intended landing, start turn final ~ 6080 feet
k	111,024	325 AGL	55 Parallel	170	
l	117,100	50 AGL	100 Variable	150	Threshold crossing, approx. 1200 feet from thouchdown point and approx 15

Nellis AFB (1,868 ft MSL), Visual ReEntry Pattern Flight Profile 22RE01
Based F-35A (F-135-PW-100)
Runway 03L, Flight Track 03LR01 - VFR FLEX Re-entry (Outside Closed)

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000
Scale in Feet 1:106,000 (1 inch = 8,840 feet)

N



Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	0	50 AGL	45 Parallel	150	-2.4° , -600 fpm, 5 sec, -Threshold Crossing
b	1,200	0 AGL	100 Variable	150	+0° , +0 fpm, 2 sec, Touchdown speed and Mil Power
c	1,700	0 AGL	100 Variable	150	+2° , +600 fpm, 3 sec
d	2,405	25 AGL	100 Variable	170	+8.4° , +2900 fpm, 6 sec, Gear up
e	4,274	300 AGL	100 Variable	225	+6.4° , +2500 fpm, 28 sec
f	14,979	1,500 AGL	50 Variable	225	+0° , +0 fpm, 63 sec, Change, pattern elv to 1600 per course rules
g	36,004	1,500 AGL	35 Parallel	170	-7.7° , -2300 fpm, 31 sec, 45 degrees off of point of intended landing, start tu
h	44,887	300 AGL	55 Parallel	170	-2.2° , -600 fpm, 24 sec
i	51,347	50 AGL	45 Parallel	150	Threshold crossing, approx, 1200. 1200 feet from touchdown.

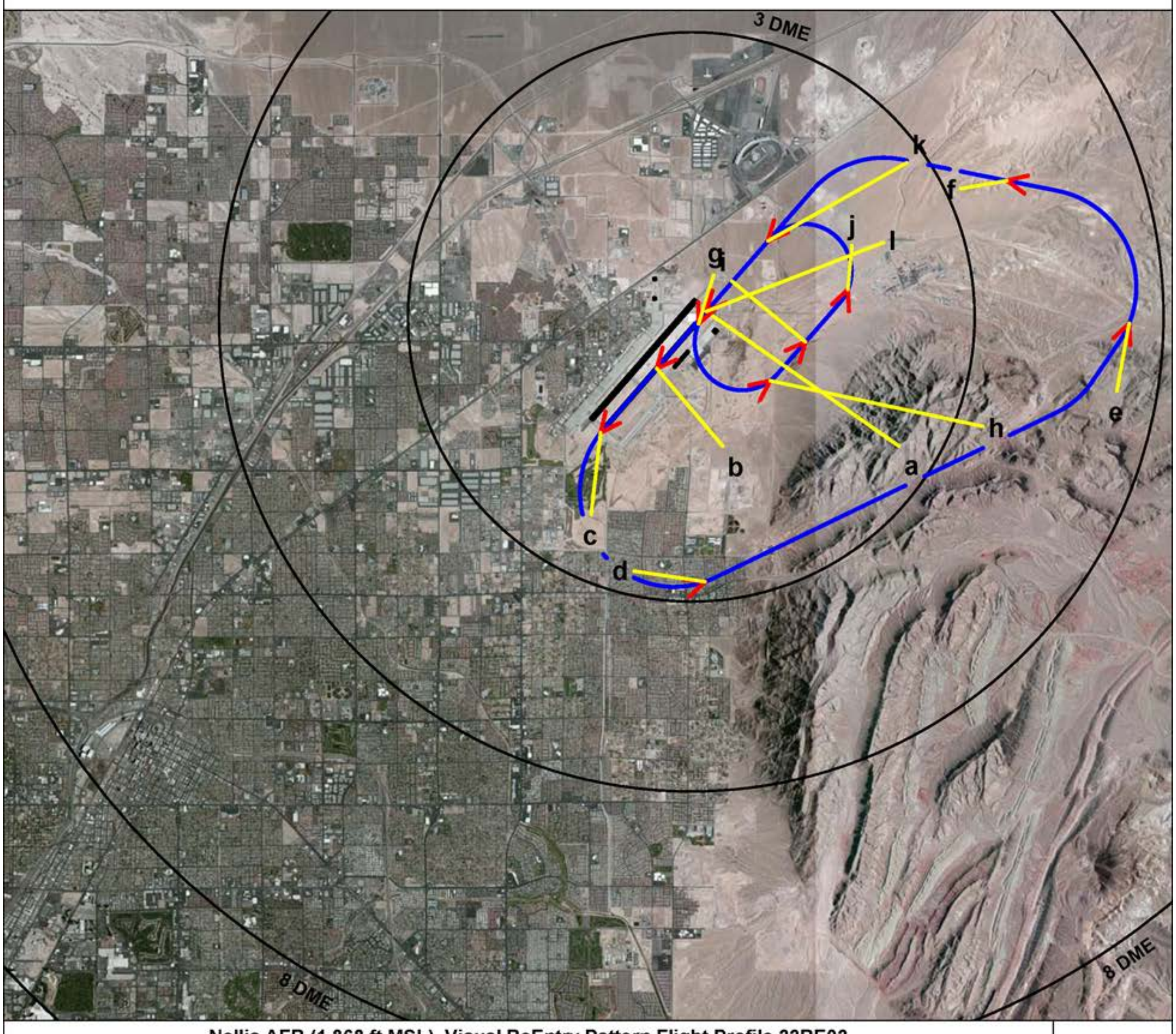
Nellis AFB (1,868 ft MSL), Visual Pattern Flight Profile 22V02
VISUAL CLOSED P21
Based F-35A (F-135-PW-100)
Runway 03R, Flight Track 03RV01 - Sunrise closed

0 2,000 4,000 6,000 8,000 10,000 12,000 14,000

Scale in Feet 1:43,600 (1 inch = 3,640 feet)

N

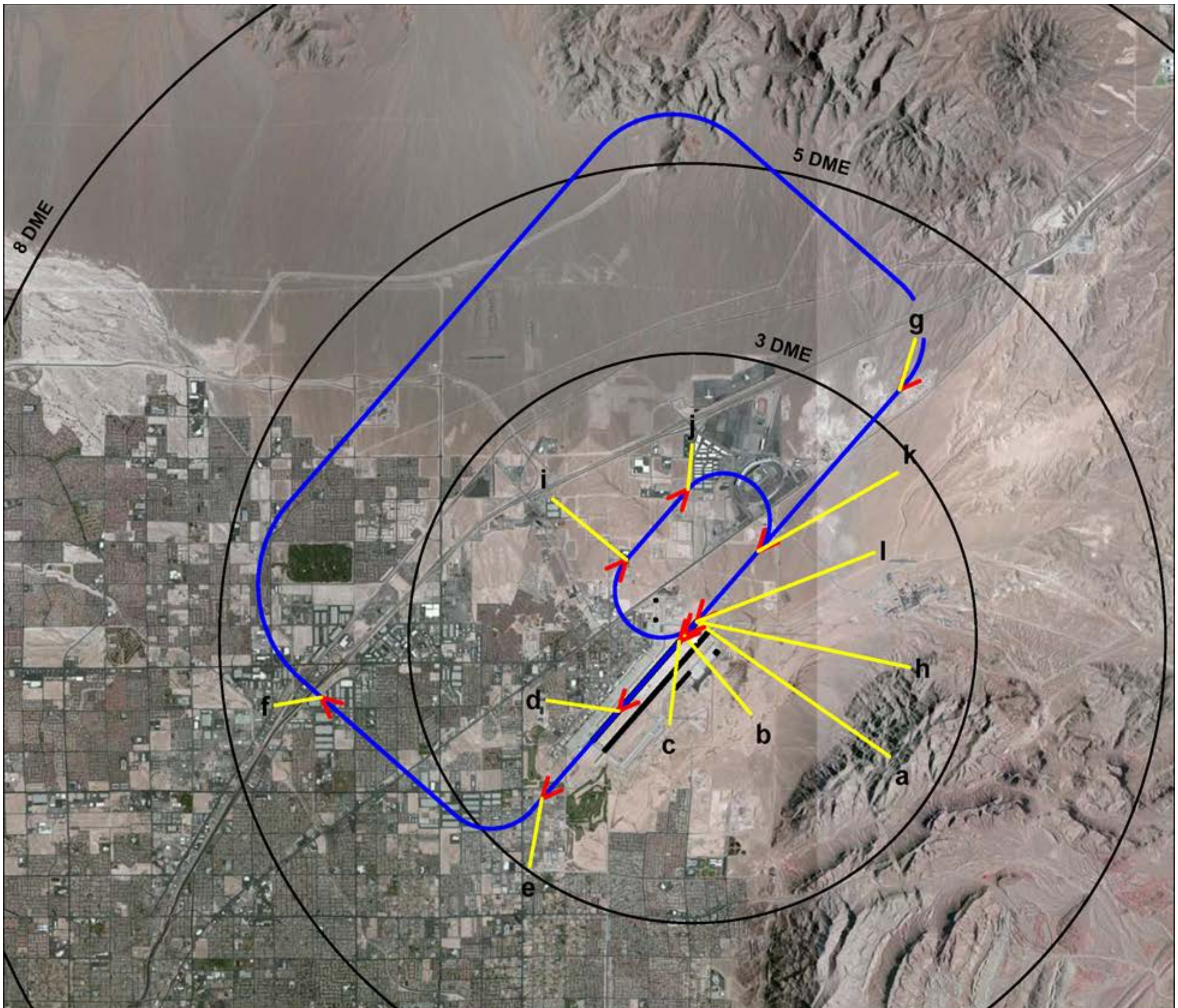
Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	0	50 AGL	100 Variable	150	Threshold crossing, no touchdown
b	4,860	50 AGL	100 Variable	150	begin to climb
c	10,329	75 AGL	100 Variable	170	
d	25,972	153 AGL	100 Variable	250	
e	58,550	4,900 MSL	80 Variable	300	
f	72,913	4,900 MSL	45 Variable	300	
g	97,435	4,900 MSL	35 Variable	250	Resume Nellis P9 Profile
h	105,416	1,500 AGL	35 Variable	225	Break point approach end of runway, power between idle and 35% in break 3
i	108,782	1,500 AGL	35 Parallel	225	
j	113,122	1,500 AGL	35 Parallel	170	45 degrees off of point of intended landing, start turn final ~ 6080 feet
k	121,738	325 AGL	45 Parallel	170	
l	127,738	50 AGL	100 Variable	150	Threshold crossing, approx. 1200 feet from thouchdown point and approx 15



Nellis AFB (1,868 ft MSL), Visual ReEntry Pattern Flight Profile 22RE02
DUCK REENRTY
Based F-35A (F-135-PW-100)
Runway 21L, Flight Track 21LR01 - VFR (DUCK) Re-entry

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000
Scale in Feet 1:106,000 (1 inch = 8,840 feet)

N



Point	Distance ft	Height ft	Power % ETR	Speed kts	Notes
a	0	50 AGL	100 Variable	150	+0° , +0 fpm, 5 sec, Threshold crossing, no touchdown
b	1,200	50 AGL	100 Variable	150	+2.9° , +800 fpm, 2 sec, begin to climb
c	1,700	75 AGL	100 Variable	170	+0.8° , +300 fpm, 17 sec
d	7,616	153 AGL	100 Variable	250	+20.9° , +9900 fpm, 16 sec
e	15,070	4,900 MSL	80 Variable	300	+0° , +0 fpm, 35 sec
f	32,966	4,900 MSL	45 Variable	300	+0° , +0 fpm, 164 sec
g	109,000	4,900 MSL	35 Variable	250	-4.3° , -1800 fpm, 49 sec, Resume Nellis P9 Profile
h	128,747	1,500 AGL	35 Variable	225	+0° , +0 fpm, 25 sec, Break point approach end of runway, power between id
i	138,172	1,500 AGL	35 Parallel	225	+0° , +0 fpm, 18 sec, gear down
j	144,172	1,500 AGL	35 Parallel	170	-7.1° , -2100 fpm, 33 sec, 45 degrees off of point of intended landing, start tu
k	153,597	325 AGL	45 Parallel	170	-2.6° , -700 fpm, 22 sec
l	159,597	50 AGL	100 Variable	150	Threshold crossing, approx. 1200 feet from thouchdown point and approx 15

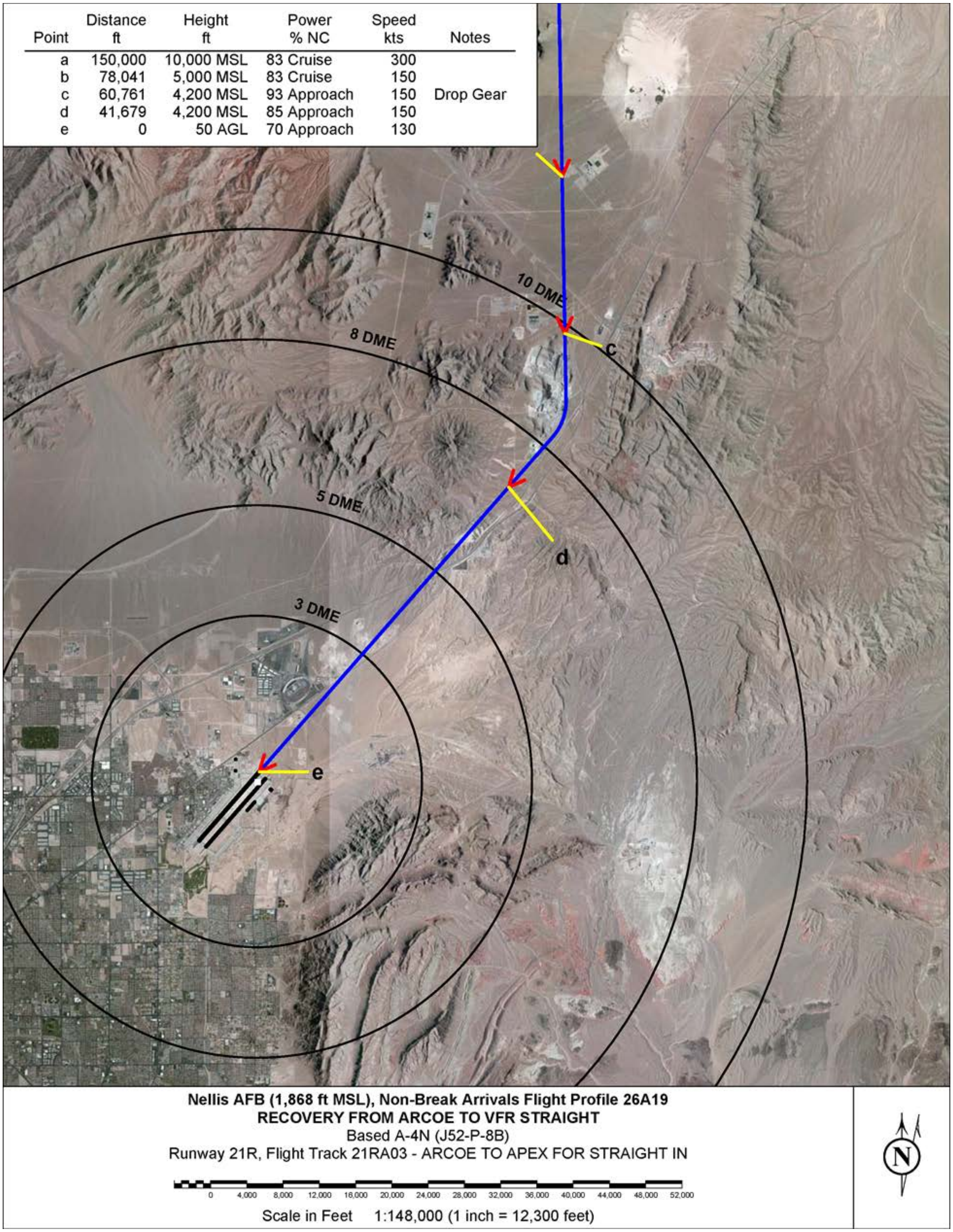
Nellis AFB (1,868 ft MSL), Visual ReEntry Pattern Flight Profile 22RE04
FLEX Re-Entry
Based F-35A (F-135-PW-100)
Runway 21R, Flight Track 21RR01 - visual re-entry

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000
Scale in Feet 1:106,000 (1 inch = 8,840 feet)

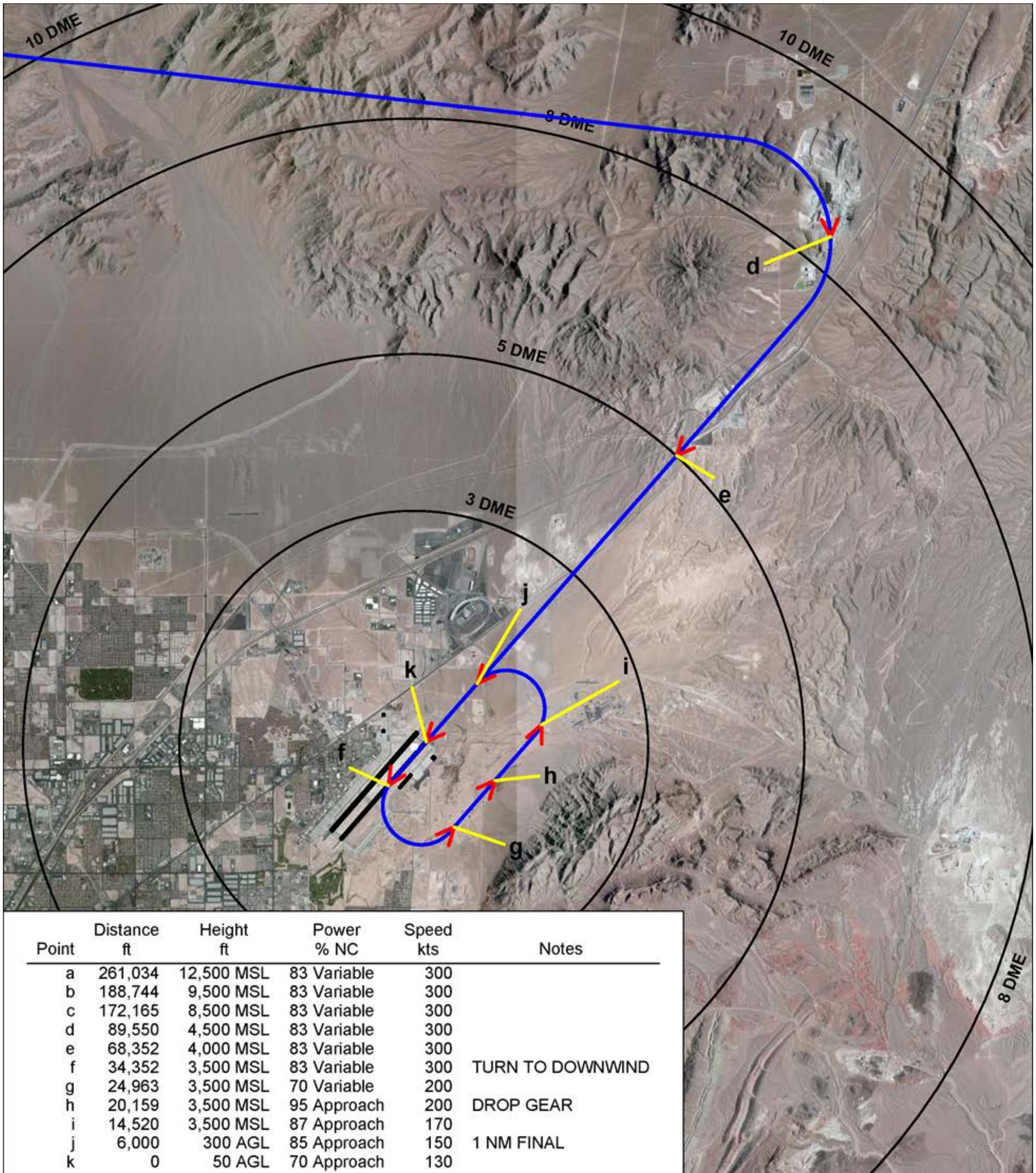
N

COCO ADAIR A-4N Flight Profiles(A-4C Surrogate)

Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	150,000	10,000 MSL	83 Cruise	300	
b	78,041	5,000 MSL	83 Cruise	150	
c	60,761	4,200 MSL	93 Approach	150	Drop Gear
d	41,679	4,200 MSL	85 Approach	150	
e	0	50 AGL	70 Approach	130	



Nellis AFB (1,868 ft MSL), Non-Break Arrivals Flight Profile 26A19
RECOVERY FROM ARCOE TO VFR STRAIGHT
Based A-4N (J52-P-8B)
Runway 21R, Flight Track 21RA03 - ARCOE TO APEX FOR STRAIGHT IN

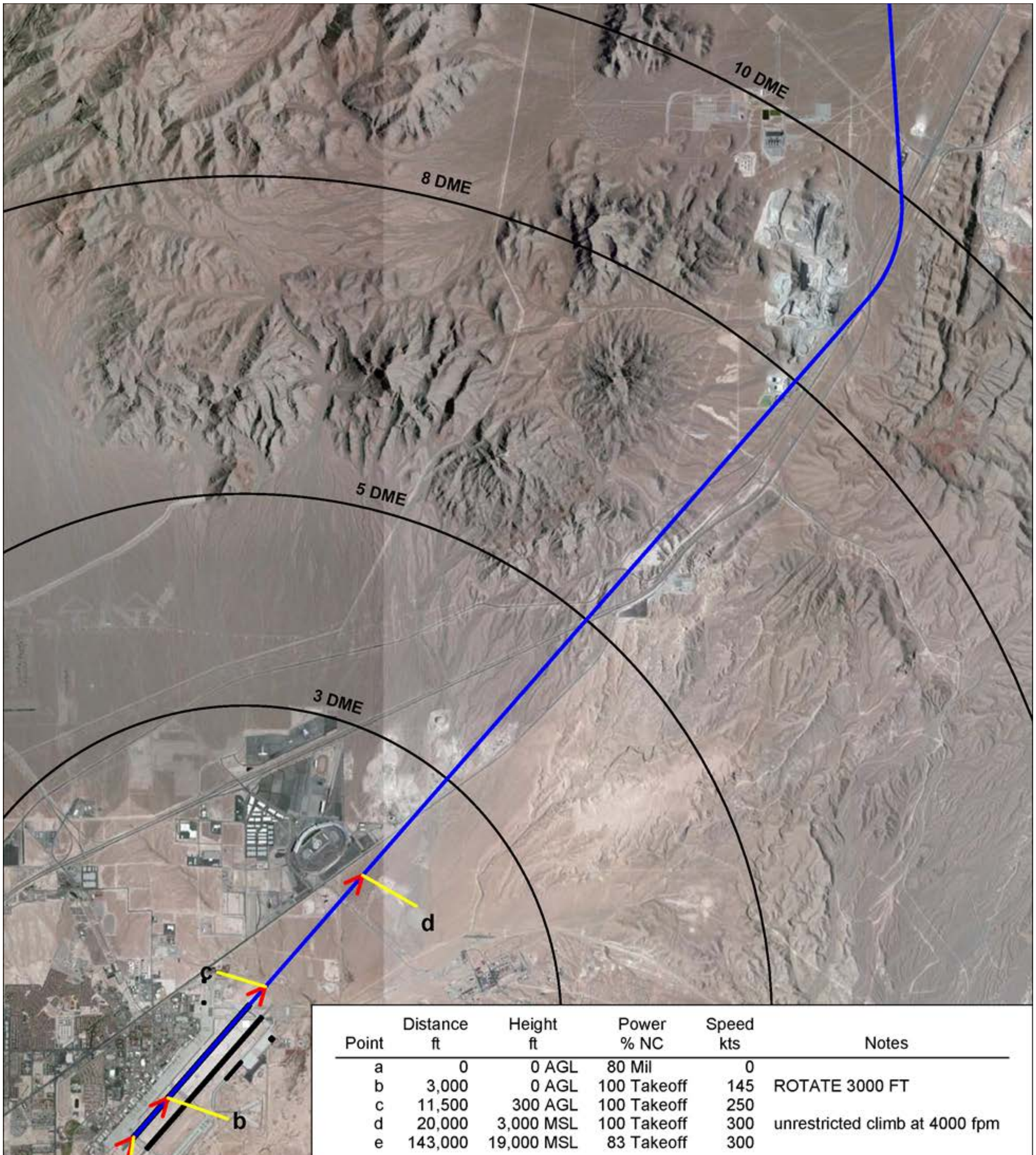


Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	261,034	12,500 MSL	83 Variable	300	
b	188,744	9,500 MSL	83 Variable	300	
c	172,165	8,500 MSL	83 Variable	300	
d	89,550	4,500 MSL	83 Variable	300	
e	68,352	4,000 MSL	83 Variable	300	
f	34,352	3,500 MSL	83 Variable	300	TURN TO DOWNWIND
g	24,963	3,500 MSL	70 Variable	200	
h	20,159	3,500 MSL	95 Approach	200	DROP GEAR
i	14,520	3,500 MSL	87 Approach	170	
j	6,000	300 AGL	85 Approach	150	1 NM FINAL
k	0	50 AGL	70 Approach	130	

Nellis AFB (1,868 ft MSL), Break Arrivals Flight Profile 26B40
RECOVERY FROM STRYK/GASS/APEX BREAK 4000' DOWN RWY
Based A-4N (J52-P-8B)
Runway 21L, Flight Track 21LB07 - STRYK RECOVERY TO INITIAL BREAK 4000' DOWN RWY

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 = 9,420 feet)

N

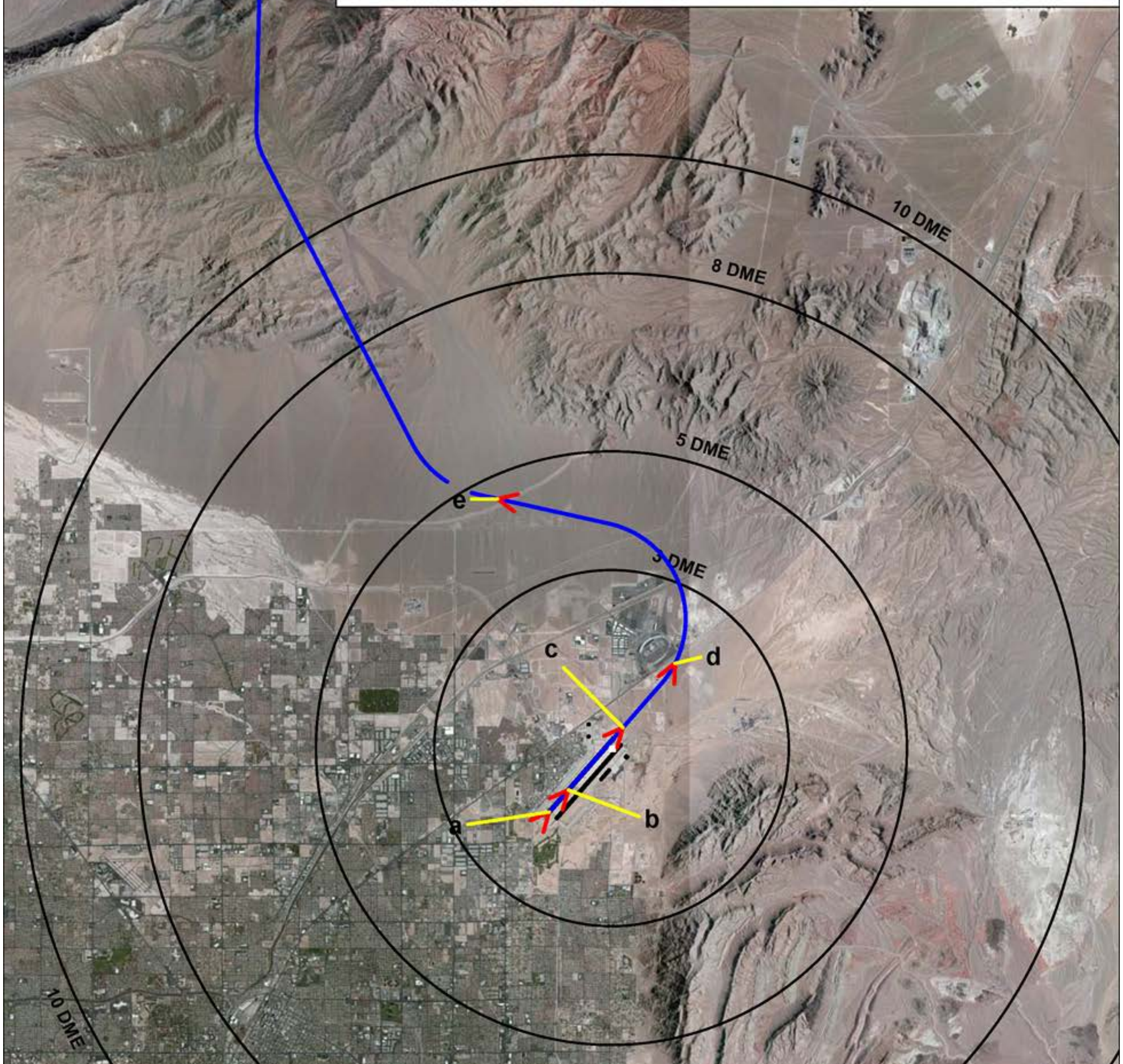


Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	0	0 AGL	80 Mil	0	
b	3,000	0 AGL	100 Takeoff	145	ROTATE 3000 FT
c	11,500	300 AGL	100 Takeoff	250	
d	20,000	3,000 MSL	100 Takeoff	300	unrestricted climb at 4000 fpm
e	143,000	19,000 MSL	83 Takeoff	300	

Nellis AFB (1,868 ft MSL), Departure Flight Profile 26D01
DREAM DEPARTURE
Based A-4N (J52-P-8B)
Runway 03L, Flight Track 03LD01 - DREAM 4
Prior to brake release, aircraft sits at 80 % NC Mil for 15 sec

Scale in Feet 1:83,700 (1 inch = 6,980 feet)

Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	0	0 AGL	80 Mil	0	Preflight run up at 80% for 15s
b	3,000	0 AGL	100 Takeoff	145	Rotate
c	11,500	300 AGL	100 Takeoff	250	
d	20,000	3,000 MSL	100 Takeoff	300	3000' MSL at speedway
e	50,000	4,000 MSL	100 Takeoff	300	4000' MSL at Flex
f	153,000	19,000 MSL	83 Takeoff	300	

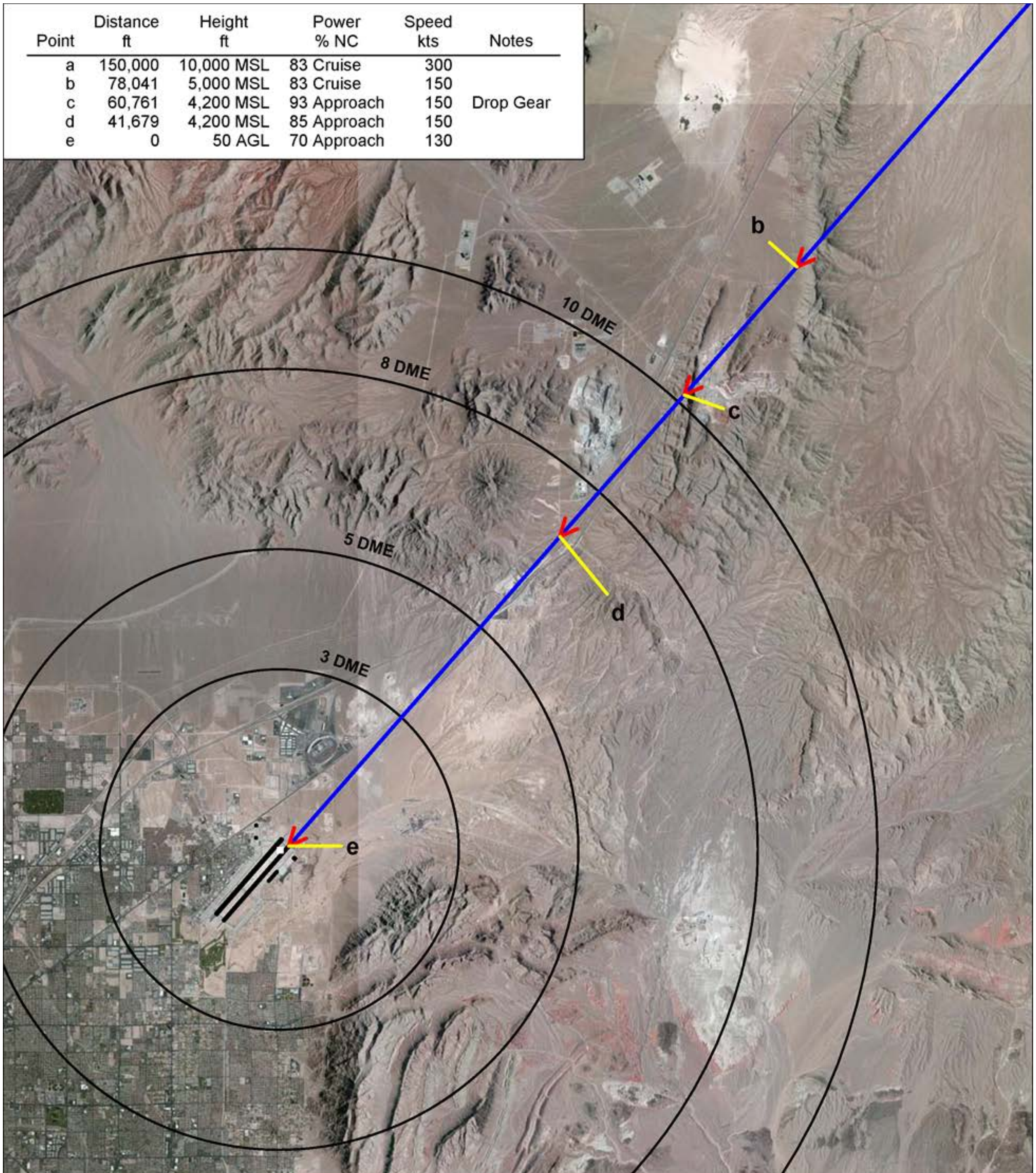


Nellis AFB (1,868 ft MSL), Departure Flight Profile 26D02
FLEX TURNOUT MIL PROFILE
Based A-4N (J52-P-8B)
Runway 03L, Flight Track 03LD02 - DREAM 4 FLEX TURNOUT ONLY USED WHEN 21 IS ACTIVE
Prior to brake release, aircraft sits at 80 % NC Mil for 15 sec

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

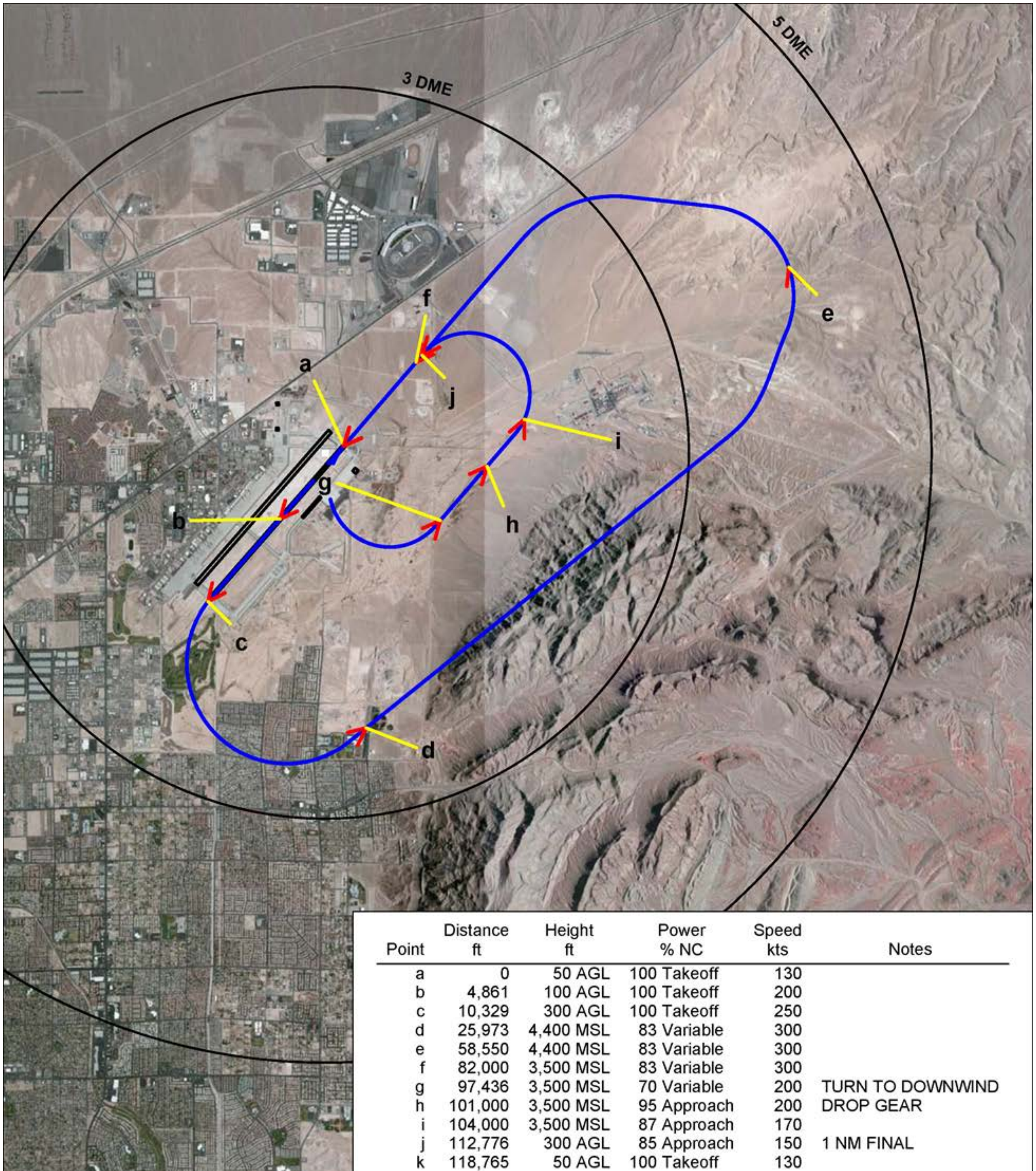
Scale in Feet 1:162,000 (1 inch = 13,500 feet)

Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	150,000	10,000 MSL	83 Cruise	300	
b	78,041	5,000 MSL	83 Cruise	150	
c	60,761	4,200 MSL	93 Approach	150	Drop Gear
d	41,679	4,200 MSL	85 Approach	150	
e	0	50 AGL	70 Approach	130	



Nellis AFB (1,868 ft MSL), Instrument Arrivals Flight Profile 26I01
ILS PROCEDURE
Based A-4N (J52-P-8B)
Runway 21L, Flight Track 21LI01 - USED FOR IFR ARRIVALS

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000 44,000 48,000 52,000
Scale in Feet 1:148,000 (1 inch = 12,300 feet)

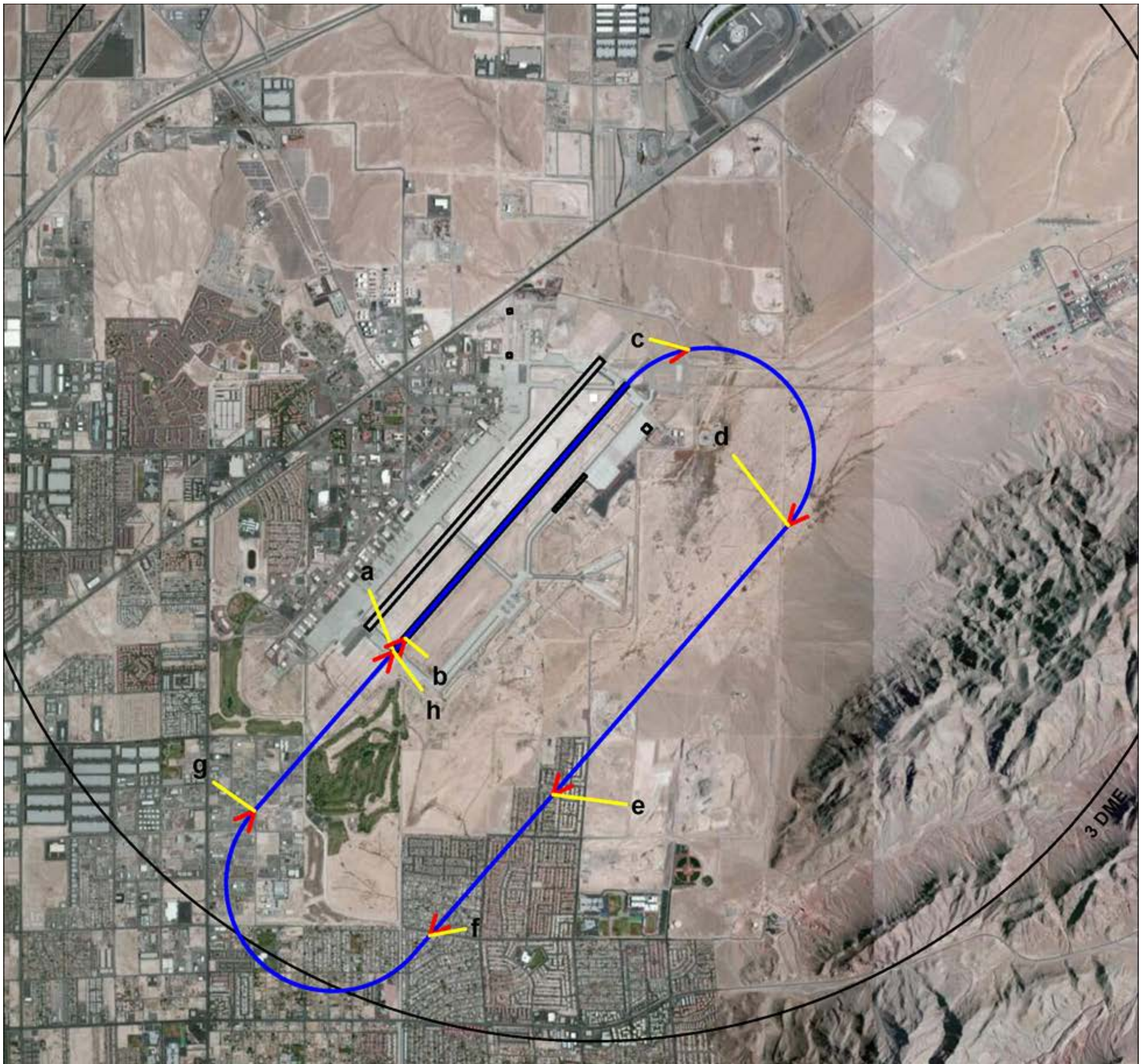


Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	0	50 AGL	100 Takeoff	130	
b	4,861	100 AGL	100 Takeoff	200	
c	10,329	300 AGL	100 Takeoff	250	
d	25,973	4,400 MSL	83 Variable	300	
e	58,550	4,400 MSL	83 Variable	300	
f	82,000	3,500 MSL	83 Variable	300	
g	97,436	3,500 MSL	70 Variable	200	TURN TO DOWNWIND
h	101,000	3,500 MSL	95 Approach	200	DROP GEAR
i	104,000	3,500 MSL	87 Approach	170	
j	112,776	300 AGL	85 Approach	150	1 NM FINAL
k	118,765	50 AGL	100 Takeoff	130	

Nellis AFB (1,868 ft MSL), Visual ReEntry Pattern Flight Profile 26RE02
DUCK REENTRY
Based A-4N (J52-P-8B)
Runway 21L, Flight Track 21LR01_2 - VFR (DUCK) Re-entry

0 4,000 8,000 12,000 16,000 20,000
Scale in Feet 1:72,700 (1 inch = 6,060 feet)

N



Point	Distance ft	Height ft	Power % NC	Speed kts	Notes
a	0	50 AGL	70 Approach	130	
b	500	0 AGL	100 Takeoff	130	
c	12,100	500 AGL	100 Takeoff	250	
d	19,563	3,500 MSL	70 Takeoff	250	
e	29,703	3,500 MSL	93 Approach	200	DROP GEAR
f	35,012	3,500 MSL	85 Approach	170	
g	45,347	300 AGL	85 Approach	150	
h	51,347	50 AGL	70 Approach	130	

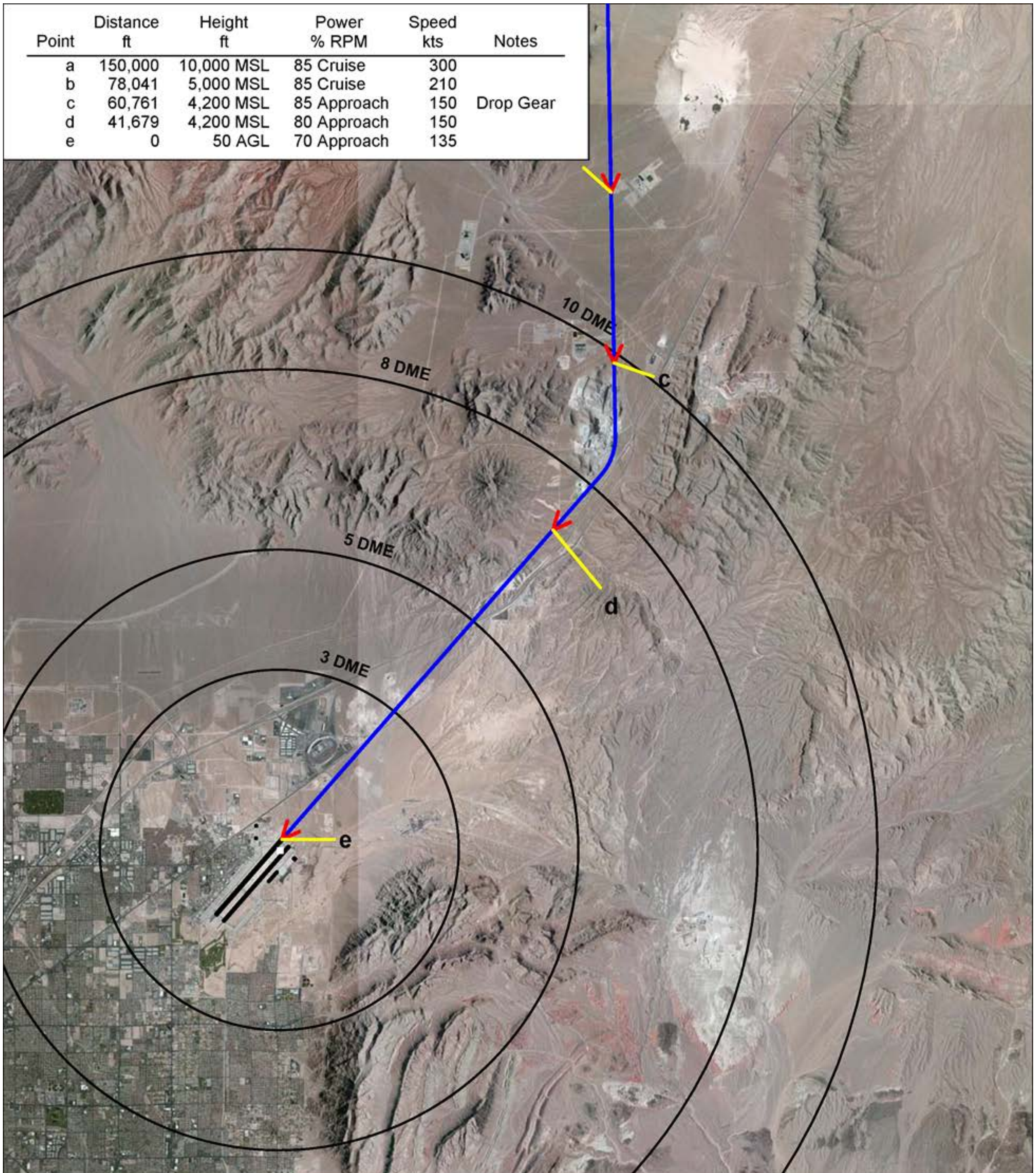
Nellis AFB (1,868 ft MSL), Visual Pattern Flight Profile 26V02
COCO ADAIR A-4N VFR INSIDE DOWNWIND
Based A-4N (J52-P-8B)
Runway 03R, Flight Track 03RV01 - Sunrise closed

0 2,000 4,000 6,000 8,000 10,000 12,000 14,000

Scale in Feet 1:45,500 (1 inch = 3,790 feet)

COCO ADAIR L-159 Flight Profiles(T-45 Surrogate)

Point	Distance ft	Height ft	Power % RPM	Speed kts	Notes
a	150,000	10,000 MSL	85 Cruise	300	
b	78,041	5,000 MSL	85 Cruise	210	
c	60,761	4,200 MSL	85 Approach	150	Drop Gear
d	41,679	4,200 MSL	80 Approach	150	
e	0	50 AGL	70 Approach	135	

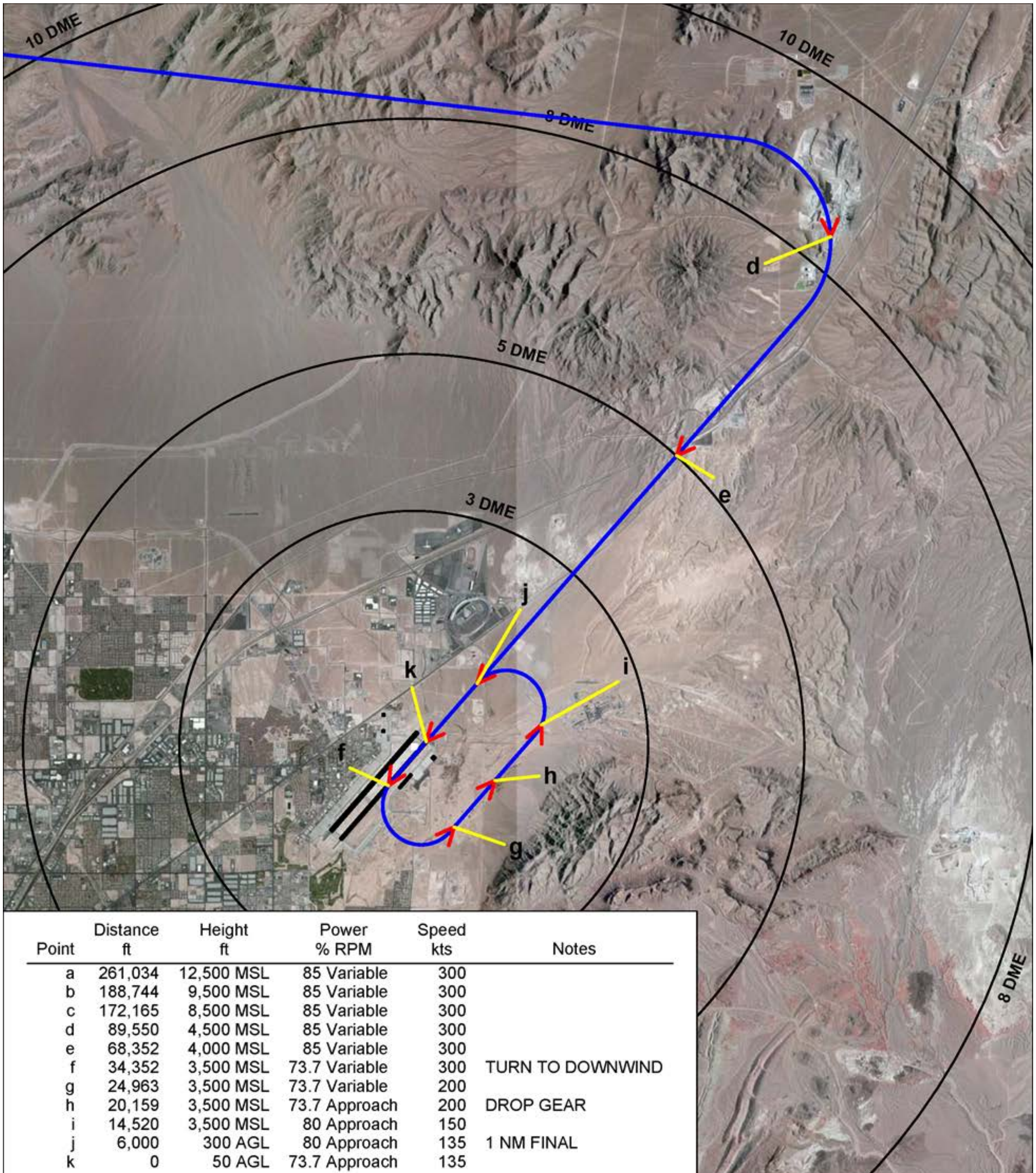


Nellis AFB (1,868 ft MSL), Non-Break Arrivals Flight Profile 27A19
RECOVERY FROM ARCOE TO VFR STRAIGHT
Based L-159 (F405-RR-401)
Runway 21R, Flight Track 21RA03 - ARCOE TO APEX FOR STRAIGHT IN

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 52,000

Scale in Feet 1:148,000 (1 inch = 12,300 feet)

N



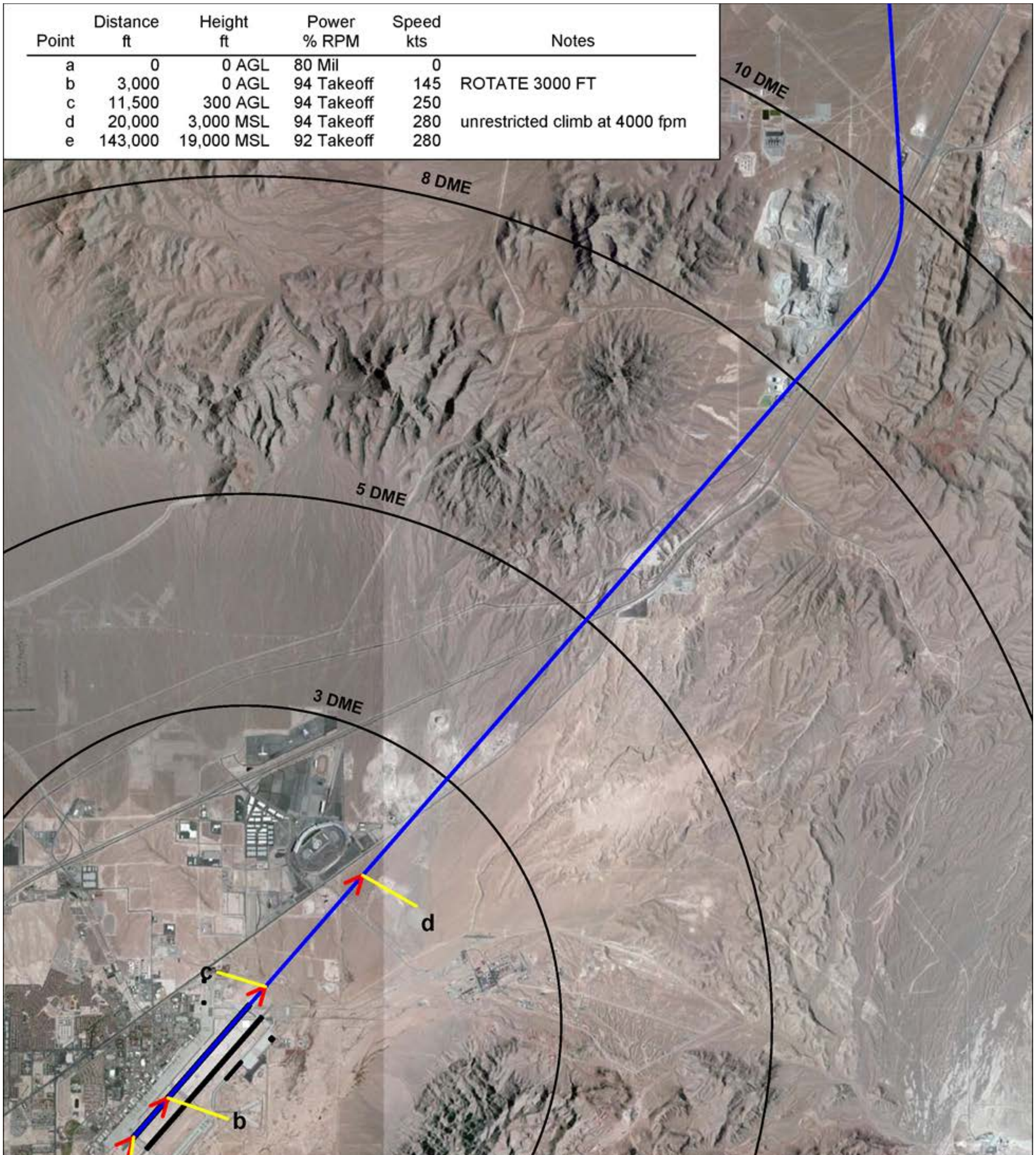
Point	Distance ft	Height ft	Power % RPM	Speed kts	Notes
a	261,034	12,500 MSL	85 Variable	300	
b	188,744	9,500 MSL	85 Variable	300	
c	172,165	8,500 MSL	85 Variable	300	
d	89,550	4,500 MSL	85 Variable	300	
e	68,352	4,000 MSL	85 Variable	300	
f	34,352	3,500 MSL	73.7 Variable	300	TURN TO DOWNWIND
g	24,963	3,500 MSL	73.7 Variable	200	
h	20,159	3,500 MSL	73.7 Approach	200	DROP GEAR
i	14,520	3,500 MSL	80 Approach	150	
j	6,000	300 AGL	80 Approach	135	1 NM FINAL
k	0	50 AGL	73.7 Approach	135	

Nellis AFB (1,868 ft MSL), Break Arrivals Flight Profile 27B40
RECOVERY FROM STRYK/GASS/APEX BREAK 4000' DOWN RWY
Based L-159 (F405-RR-401)
Runway 21L, Flight Track 21LB07 - STRYK RECOVERY TO INITIAL BREAK 4000' DOWN RWY

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 = 9,420 feet)

N

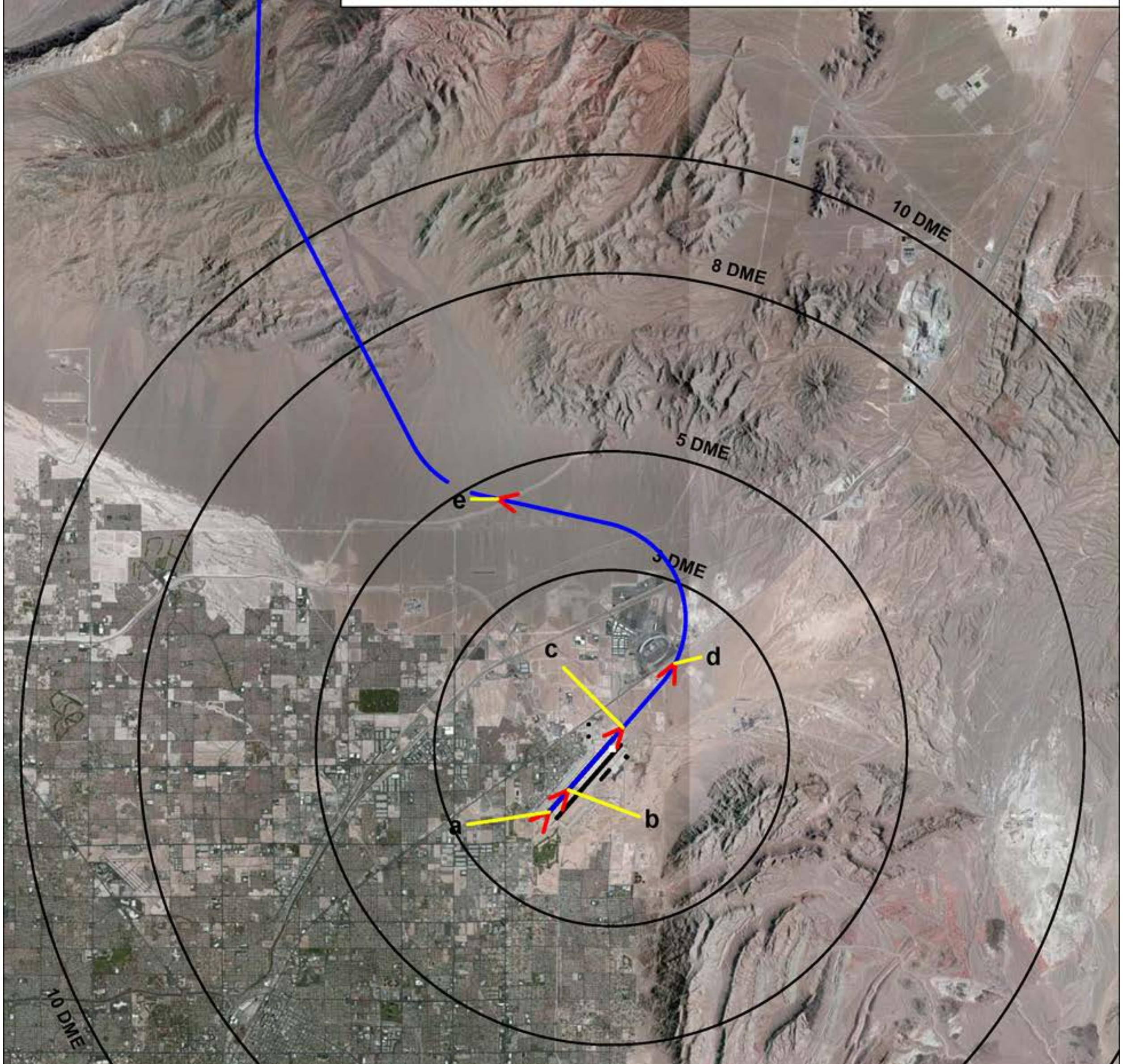
Point	Distance ft	Height ft	Power % RPM	Speed kts	Notes
a	0	0 AGL	80 Mil	0	
b	3,000	0 AGL	94 Takeoff	145	ROTATE 3000 FT
c	11,500	300 AGL	94 Takeoff	250	
d	20,000	3,000 MSL	94 Takeoff	280	unrestricted climb at 4000 fpm
e	143,000	19,000 MSL	92 Takeoff	280	



Nellis AFB (1,868 ft MSL), Departure Flight Profile 27D01
DREAM DEPARTURE
Based L-159 (F405-RR-401)
Runway 03L, Flight Track 03LD01 - DREAM 4
Prior to brake release, aircraft sits at 80 % RPM Mil for 15 sec

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000
Scale in Feet 1:83,700 (1 inch = 6,980 feet)

Point	Distance ft	Height ft	Power % RPM	Speed kts	Notes
a	0	0 AGL	80 Mil	0	Preflight run up at 80% for 15s
b	3,000	0 AGL	94 Takeoff	145	Rotate
c	11,500	300 AGL	94 Takeoff	250	
d	20,000	3,000 MSL	94 Takeoff	280	3000' MSL at speedway
e	50,000	4,000 MSL	94 Takeoff	280	4000' MSL at Flex
f	153,000	19,000 MSL	92 Takeoff	280	

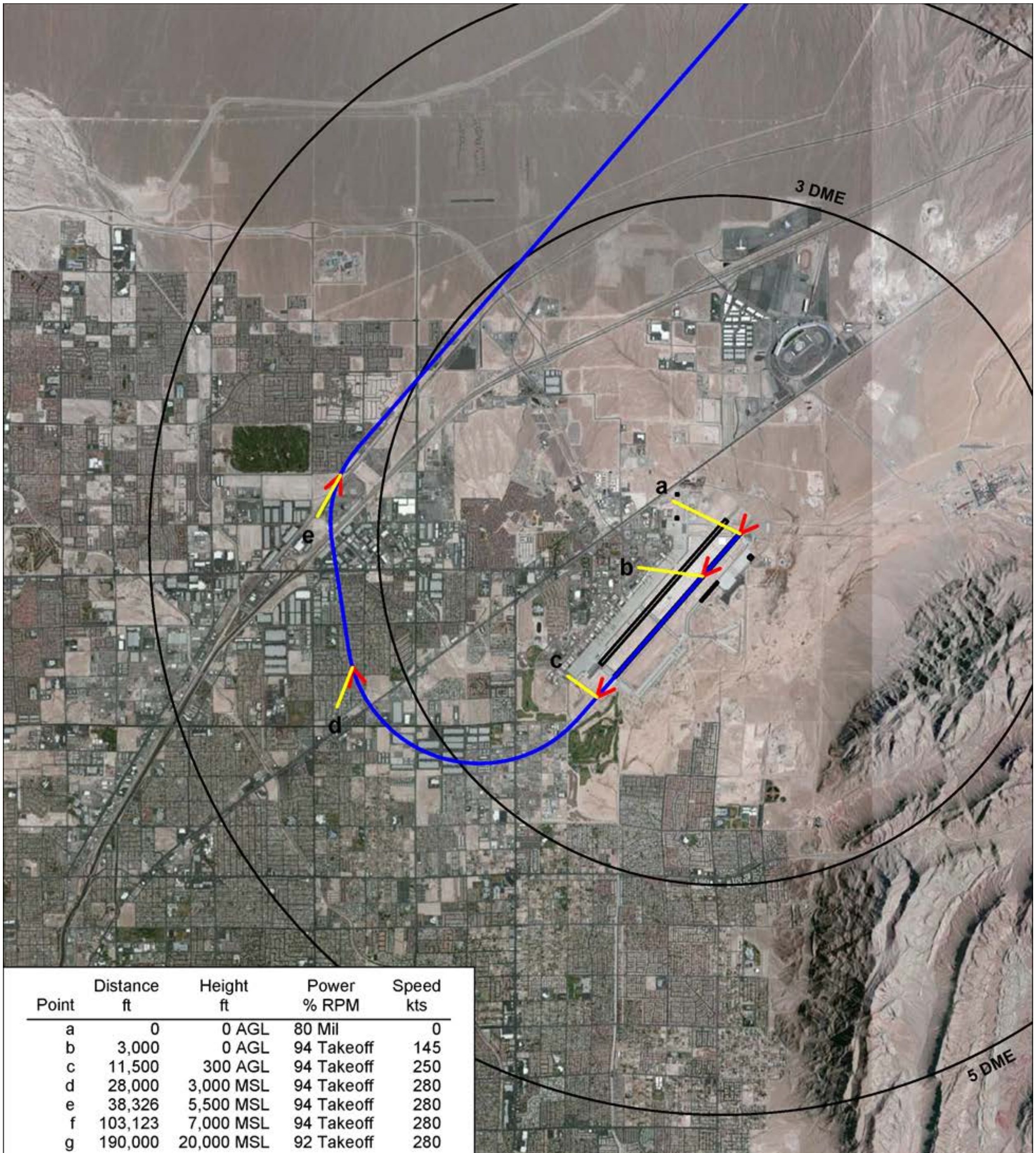


Nellis AFB (1,868 ft MSL), Departure Flight Profile 27D02
FLEX TURNOUT MIL PROFILE
Based L-159 (F405-RR-401)
Runway 03L, Flight Track 03LD02 - DREAM 4 FLEX TURNOUT ONLY USED WHEN 21 IS ACTIVE
Prior to brake release, aircraft sits at 80 % RPM Mil for 15 sec

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

Scale in Feet 1:162,000 (1 inch = 13,500 feet)

N



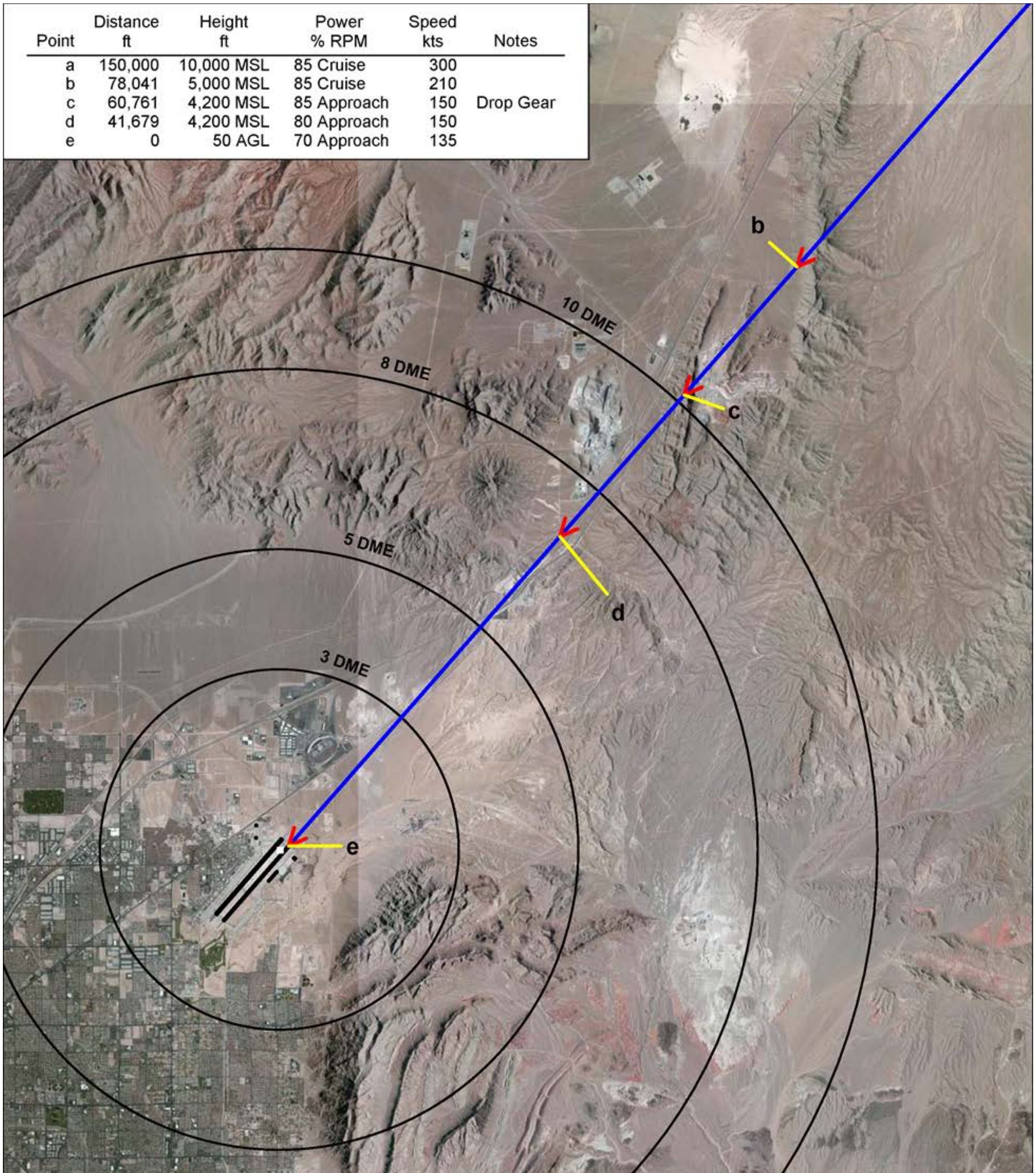
Point	Distance ft	Height ft	Power % RPM	Speed kts
a	0	0 AGL	80 Mil	0
b	3,000	0 AGL	94 Takeoff	145
c	11,500	300 AGL	94 Takeoff	250
d	28,000	3,000 MSL	94 Takeoff	280
e	38,326	5,500 MSL	94 Takeoff	280
f	103,123	7,000 MSL	94 Takeoff	280
g	190,000	20,000 MSL	92 Takeoff	280

Nellis AFB (1,868 ft MSL), Departure Flight Profile 27D27
DOE CLASS B NORTHEAST DEPARTURE MIL PROFILE
Based L-159 (F405-RR-401)
Runway 21L, Flight Track 21LD02 - DOE CLASS B NORTHEAST DEPARTURE
Prior to brake release, aircraft sits at 80 % RPM Mil for 15 sec

0 4,000 8,000 12,000 16,000 20,000 24,000
Scale in Feet 1:77,100 (1 inch = 6,430 feet)

N

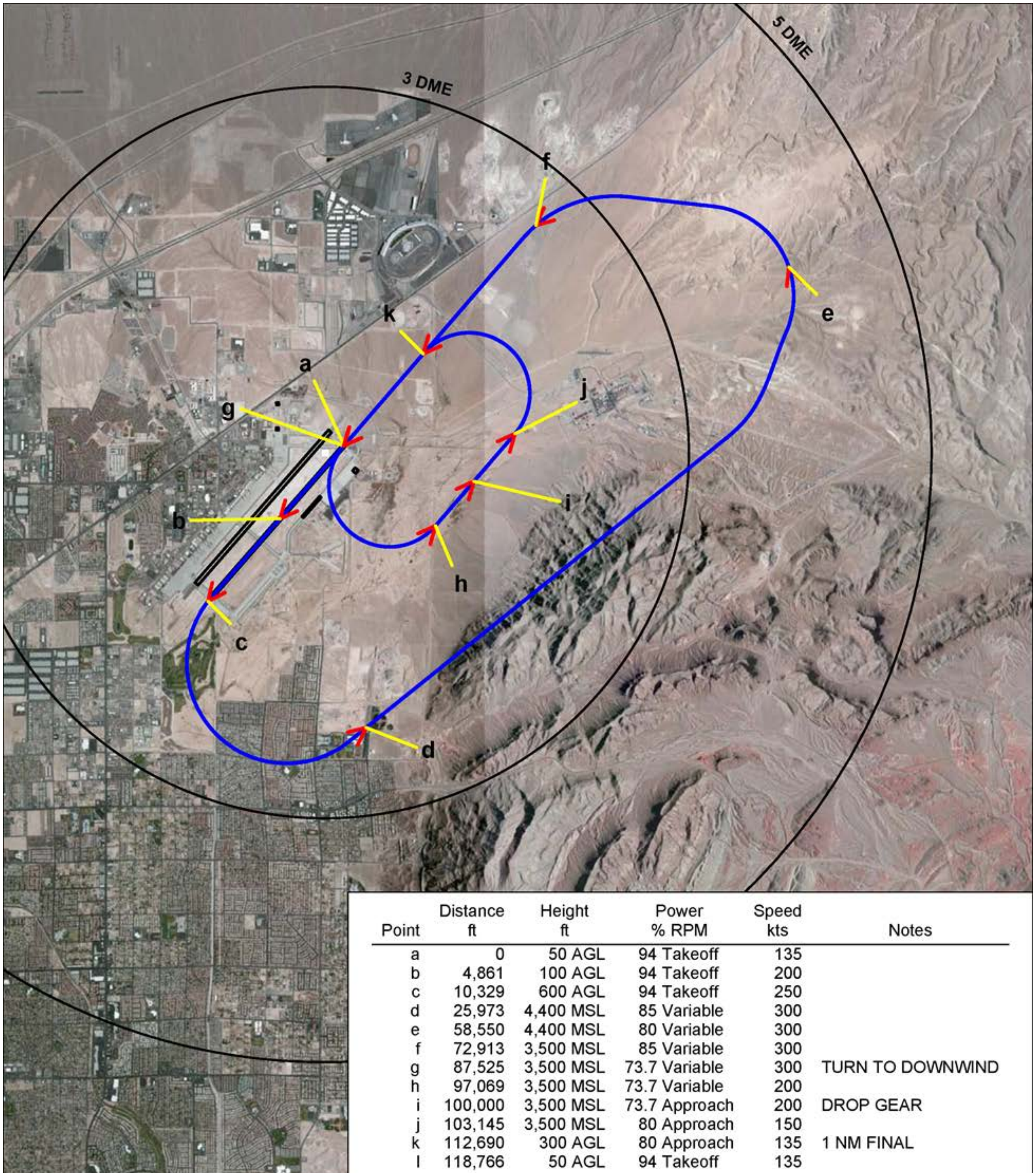
Point	Distance ft	Height ft	Power % RPM	Speed kts	Notes
a	150,000	10,000 MSL	85 Cruise	300	
b	78,041	5,000 MSL	85 Cruise	210	
c	60,761	4,200 MSL	85 Approach	150	Drop Gear
d	41,679	4,200 MSL	80 Approach	150	
e	0	50 AGL	70 Approach	135	



Nellis AFB (1,868 ft MSL), Instrument Arrivals Flight Profile 27I01
ILS PROCEDURE
Based L-159 (F405-RR-401)
Runway 21L, Flight Track 21LI01 - USED FOR IFR ARRIVALS

Scale in Feet 1:148,000 (1 inch = 12,300 feet)

N

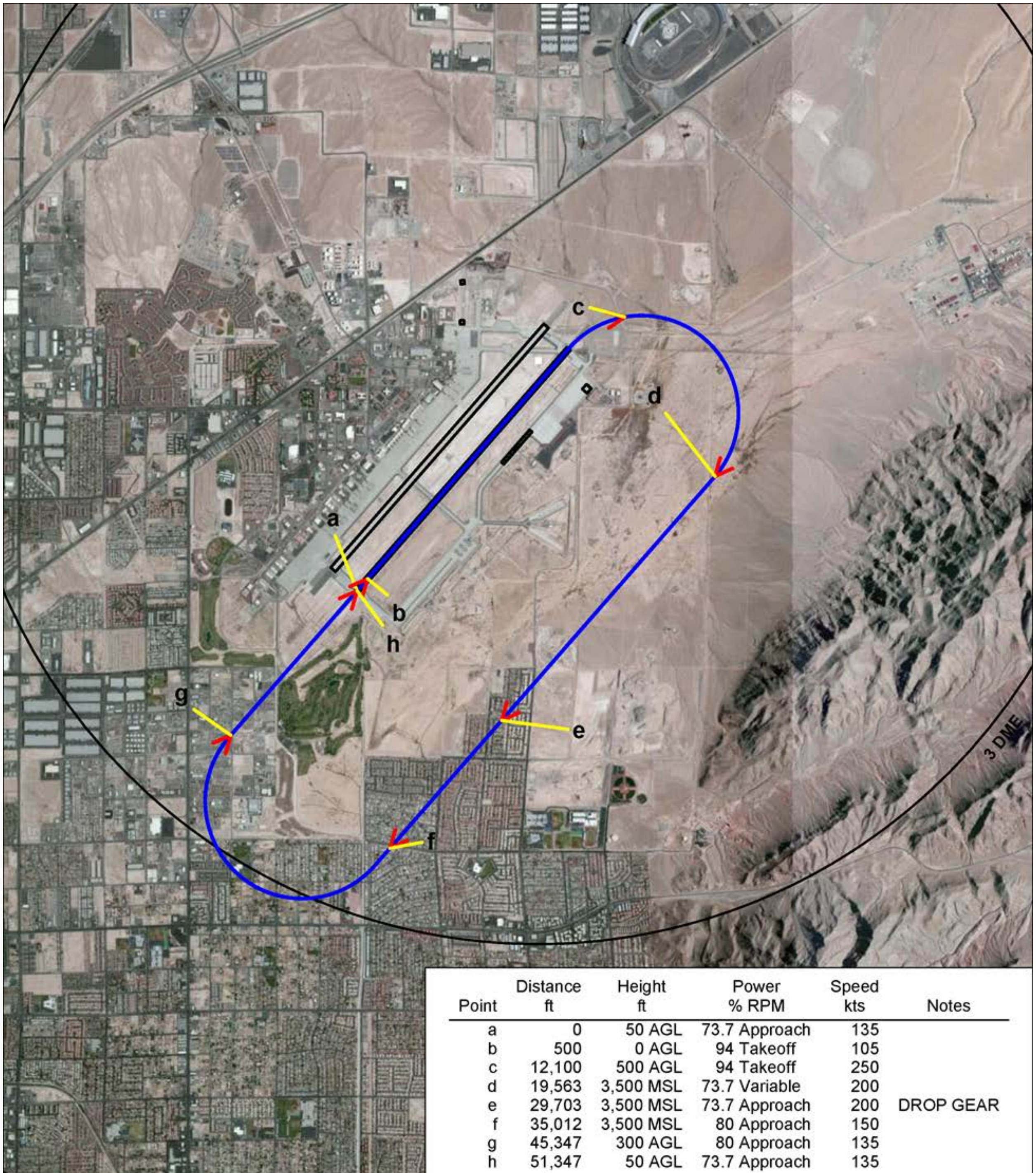


Point	Distance ft	Height ft	Power % RPM	Speed kts	Notes
a	0	50 AGL	94 Takeoff	135	
b	4,861	100 AGL	94 Takeoff	200	
c	10,329	600 AGL	94 Takeoff	250	
d	25,973	4,400 MSL	85 Variable	300	
e	58,550	4,400 MSL	80 Variable	300	
f	72,913	3,500 MSL	85 Variable	300	
g	87,525	3,500 MSL	73.7 Variable	300	TURN TO DOWNWIND
h	97,069	3,500 MSL	73.7 Variable	200	
i	100,000	3,500 MSL	73.7 Approach	200	DROP GEAR
j	103,145	3,500 MSL	80 Approach	150	
k	112,690	300 AGL	80 Approach	135	1 NM FINAL
l	118,766	50 AGL	94 Takeoff	135	

Nellis AFB (1,868 ft MSL), Visual ReEntry Pattern Flight Profile 27RE02
DUCK REENTRY
Based L-159 (F405-RR-401)
Runway 21L, Flight Track 21LR01_2 - VFR (DUCK) Re-entry

0 4,000 8,000 12,000 16,000 20,000
Scale in Feet 1:72,700 (1 inch = 6,060 feet)

N



Point	Distance ft	Height ft	Power % RPM	Speed kts	Notes
a	0	50 AGL	73.7 Approach	135	
b	500	0 AGL	94 Takeoff	105	
c	12,100	500 AGL	94 Takeoff	250	
d	19,563	3,500 MSL	73.7 Variable	200	
e	29,703	3,500 MSL	73.7 Approach	200	DROP GEAR
f	35,012	3,500 MSL	80 Approach	150	
g	45,347	300 AGL	80 Approach	135	
h	51,347	50 AGL	73.7 Approach	135	

Nellis AFB (1,868 ft MSL), Visual Pattern Flight Profile 27V02
VFR INSIDE DOWNWIND
Based L-159 (F405-RR-401)
Runway 03R, Flight Track 03RV01 - Sunrise closed

Scale in Feet 1:45,500 (1 inch = 3,790 feet)

C.2.4 Ground/Maintenance Run-ups

This section details the number, type, and duration of the ground and maintenance engine run-up operations at the airfield. Because the COCO ADAIR aircraft would be doing major maintenance off site, the only ground operations expected to increase with the addition of COCO ADAIR aircraft would be the pre-flight run-up checks, post-flight idling, and trim tests. The addition of the F-35s will be expected to increase the maintenance of numbers of the already existing F-35 events. **Figure C-16** shows the location of all the static run-up locations at Nellis. The location for COCO ADAIR aircraft parking is Rows 1 and 2 noted on the figure. The trim pad is where trim test operations for COCO ADAIR aircraft would be performed **Table C-9** details the number, type and duration of the on-field maintenance operations. For brevity, only the changes in maintenance operations are detailed here. The recently completed AICUZ contains the full listing of baseline maintenance operations.

Figure C-16. Static Operations Locations

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Table C-9 Proposed Action Maintenance Operations

Group	Aircraft	Engine Type	profile ID	Test Name	Location ID	Magnetic Heading (deg)	Annual Events: Events	Annual Events: % Day (0700-2200)	Annual Events: % Night (2200-0700)	Reported Power Setting (% RPM Unless Noted Otherwise)	Duration at Power Setting (Minutes) Per Event	Number of Engines Running Simul-taneously	Comments
57 MX GROUP	F-35	F135-PW-100	F35 MBIT	F-35 MAINTENANCE - Usually run Aircraft when necessary for follow-on MX. Those reasons being for Boroscopes, engine removal, IPP fails on engine start. Usual occurs 0700-2200 on rows 17-18. 22 times per aircraft per year.	F35 MBIT	30	260 - baseline +374 - proposed	95%	5%	10%ETR	10.0	1	Proposed Action will increase by 6 aircraft for 422 TES and 11 aircraft for the 65 AGRS. So increase will = 17 aircraft*22 times/aircraft = 374 more events.
COCO ADAIR	F1 Mirage (F-16C Surrogate)		COCOF1MX1	10 Trim Test Annually	Trim Pad 1	260°	10	100%	0	Idle	10	1	
										Military	10		
										Afterburner	5		
			COCOF1MX2	Typically leak and ops checks	Row 1	39	25	100%	0	Idle	10	1	
	A4-N (A-4C Surrogate)		COCOA4MX1	7 Trim Tests Annually	Trim Pad 1	260	7	100%	0	Idle	10	1	
										Military	10		
			COCOA4MX2	Typically leak and ops checks	Row 2	39	30	100%	0	Idle	10	1	
	L-159 (A-4C Surrogate)		COCOL1MX1	15 Trim Tests Annually	Trim Pad 1	260	15	100%	0	Idle	10	1	
										Military	10		
			COCOL1MX2	Typically leak and ops checks	Row 2	39	50	100%	0	Idle	10	1	

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C.2.5 Supersonic Flight Operations

Supersonic operations are allowed in the NTTR component airspaces and are modeled above 15,000 feet MSL. Airspace sorties require aircraft to exceed Mach 1.0 (supersonic) for brief periods of time for approximately 10 percent of total flight time. This is equivalent to less than 5 minutes of supersonic flight activity per sortie.

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 MOAs and Restricted Airspace used by based Nellis aircraft do not exceed 45 dB CDNL under any primary use airspace.

Single event sonic boom levels estimated for supersonic flights in the NTTR are shown in **Table C-10**. Overpressure (psf) and CSEL (decibels) were estimated directly under the flight path for the supersonic aircraft currently using the NTTR (F-15E, F-16C, F-22, and F-35) at various altitudes and Mach numbers. Overpressure levels estimated for the NTTR airspaces range from 4.8 to 0.9 psf depending on the flight conditions. Overpressure and CSEL values are shown for viable flight conditions for these aircraft.

Likewise, the single event sonic boom levels for supersonic aircraft associated with the Proposed Action (i.e., F-35, F-22, and Mirage F-1 [which was modeled using the F-16C as a surrogate]) would be the same as is reported for these aircraft in **Table C-10**. However, the number of sonic booms experienced is expected to increase with the proposed additional sorties flying in the NTTR.

Table C-10
Nevada Test and Training Range: Sonic Boom Levels Undertrack for Aircraft in Level Flight at Mach 1.2 and 1.5

	Altitude (Feet MSL)			
Aircraft	**15,000**	**25,000**	**35,000**	**50,000**
Mach 1.2				
Overpressure (psf)				
F-15E	4.7	2.5	1.7	1.2
F-16C	3.8	2.0	1.3	1.0
F-22	4.8	2.6	1.7	1.2
F-35	4.8	2.6	1.7	1.2
C-Weighted Sound Exposure Level (dB)[1]				
F-15E	115	110	106	103
F-16C	113	108	104	101
F-22	115	110	106	103
F-35	115	110	106	103
Mach 1.5				
Overpressure (psf)				
F-15E			1.8	1.2
F-16C			1.5	0.9
F-22			1.9	1.2
F-35			1.9	1.2
C-Weighted Sound Exposure Level (dB)[1]				
F-15E			107	103
F-16C			105	101
F-22			107	103
F-35			107	103

Note:
F-16C was a surrogate for the Mirage F-1.
C-weighted Sound Exposure Level (CSEL) – SEL with frequency weighting that places more emphasis on low frequencies below 1,000 hertz

When sonic booms reach the ground, they impact an area that is referred to as a “carpet.” The size of the carpet depends on the supersonic flight path and on atmospheric conditions. The width of the boom carpet beneath the aircraft is about 1 mi for each 1,000 ft of altitude (National Aeronautics and Space Administration [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 C-10** are the loudest levels computed at the center of the carpet, directly under the flight path, for the constant Mach, level flight conditions indicated. The location of these booms will vary with changing flight paths and weather conditions, so it is unlikely that any given location will experience these undertrack levels more than once over multiple events. Public reaction is expected to occur with overpressures above 1 psf, and in rare instances, damage to structures have occurred at overpressures between 2 and 5 psf (NASA, 2017). People located farther away from the supersonic flight paths, who are still within the primary boom carpet, might also be exposed to levels that may be startling or annoying, but the probability of this decreases the farther away they are from the flight path. People located beyond the edge of the boom carpet are not expected to be exposed to sonic boom although post-boom rumbling sounds may be heard.

APPENDIX D.
LISTED SPECIES POTENTIALLY OCCURRING IN THE ACTION AREA

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Table D-1
Federally and State-Listed Species with the Potential to be Affected by Alternative A or Alternative B at Nellis Air Force Base and Special Use Airspace

Species	Federal Status[a]	State Status[b]	Critical Habitat	Nellis AFB	Special Use Airspace	
					NTTR	R-2508
Birds						
California Condor (*Gymnogyps californianus*)	Endangered	CA: SE UT: SSL	Final		X	X
Greater Sage-grouse (*Centrocercus urophasianus*)		UT: SSL				X
Inyo California Towhee (*Pipilo crissalis eremophilus*)	Threatened	CA: SE	Final			X
Least Bell's Vireo (*Vireo bellii pusillus*)	Endangered	CA: SE				X
Mexican Spotted Owl (*Strix occidentalis lucida*)	Threatened	UT: SSL			X	
Southwestern Willow Flycatcher (*Empidonax traillii extimus*)	Endangered	CA: SE NV: S1B UT: SSL		X	X	X
Western Snowy Plover (*Charadrius nivosus nivosus*)	Threatened					X
Yellow-billed Cuckoo (*Coccyzus americanus*)	Threatened	CA: SE NV: S1B UT: SSL	Proposed		X	X
Yuma Clapper Rail (*Rallus logirostris yumanensis*)	Endangered	CA: ST NV: S1B		X	X	
Mammals						
Amargosa Vole (*Microtus californicus scirpensis*)	Endangered	CA: SE	Final			X
Fisher (*Pekania pennant*)	Proposed Threatened	CA: ST				X
North American Wolverine (*Gulo gulo luscus*)	Proposed Threatened	CA: ST				X
San Joaquin Kit Fox (*Vulpes macrotis mutica*)	Endangered	CA: ST				X
Sierra Nevada Bighorn Sheep (*Ovis canadensis sierrae*)	Endangered	CA: SE	Final			X
Tipton Kangaroo Rat (*Dipodomys nitratoides nitratoides*)	Endangered	CA: SE				X
Reptiles						
Blunt-nosed Leopard Lizard (*Gambelia silus*)	Endangered	CA: SE				X
Desert Tortoise (*Gopherus agassizii*)	Threatened	CA: ST	Final	X	X	X
Giant Garter Snake (*Thamnophis gigas*)	Threatened	CA: ST				X
Amphibians						
California Red-legged Frog (*Rana draytonii*)	Threatened					X
Mountain Yellow-legged Frog (*Rana muscosa*)	Endangered	CA: SE	Final			X
Sierra Nevada Yellow-legged Frog (*Rana sierra*)	Endangered	CA: ST	Final			X
Yosemite Toad (*Anaxyrus canorus*)	Threatened					X

Species	Federal Status[a]	State Status[b]	Critical Habitat	Nellis AFB	Special Use Airspace	
					NTTR	R-2508
Fish						
Big Spring Spinedace (*Lepidomeda mollispinis pratensis*)	Threatened	NV: S1	Final		X	
Delta Smelt (*Hypomesus transpacificus*)	Threatened	CA: SE				X
Hiko White River Springfish (*Crenichthys baileyi*)	Endangered	NV: S1	Final		X	
Lahontan Cutthroat Trout (*Oncorhynchus clarkia henshawi*)	Threatened	UT: SSL				X
Little Kern Golden Trout (*Oncorhynchus aguabonita white*i)	Threatened		Final			X
Moapa Dace (*Moapa coriacea*)	Endangered	NV: S1			X	
Mohave Tui Chub (*Gila bicolor mohavensis*)	Endangered	CA: SE				X
Owens Pupfish (*Cyprinodon radiosus*)	Endangered	CA: SE				X
Owens Tui Chub (*Gila bicolor snyderi*)	Endangered	CA: SE				X
Pahranagat Roundtail Chub (*Gila robusta jordani*)		NV: S1			X	
Pahrump Poolfish (*Empetrichthys latos*)	Endangered	NV: S1		X	X	
Paiute Cutthroat Trout (*Onchorhynchus clarkia seleniris*)	Threatened					X
Railroad Valley Springfish (*Crenichthys nevadae*)	Threatened	NV: S2			X	
Razorback Sucker (*Xyrauchen texanus*)	Endangered	CA: SE NV: S1		X	X	
Virgin River Chub (*Gila seminude*)	Endangered	NV: S1			X	
White River Spinedace (*Lepidomeda albivallis*)	Endangered	NV: S1			X	
White River Springfish (*Crenichthys baileyi baileyi*)	Endangered	NV: S1	Final		X	
Woundfin (*Plagopterus argentissimus*)	Endangered	NV: S1 UT: SSL			X	
Plants						
Amargosa Niterwort (*Nitrophila mohavensis*)	Endangered	CA: SE NV: S1				X
Ash Meadows Blazingstar (*Mentzelia leucophylla*)	Threatened	NV: S1			X	
Ash Meadows Gumplant (*Grindelia fraxinipratensis*)	Threatened	NV: S1			X	
Bakersfield Cactus (Opuntia treleasei)	Endangered	CA: SE				X
California Jewelflower (*Caulanthus californicus*)	Endangered	CA: SE				X
Dwarf Bear-poppy (*Arctomecon humilis*)	Endangered				X	
Holmgren Milk-vetch (*Astragalus holmgreniorum*)	Endangered				X	
Jones Cycladenia (*Cycladenia humilis* var. *jonesii*)	Threatened				X	
Keck's Checker-mallow (*Sidalcea keckii*)	Endangered		Final			X
Lane Mountain Milk-vetch (*Astragalus jaegerianus*)	Endangered		Final			X

Species	Federal Status[a]	State Status[b]	Critical Habitat	Nellis AFB	Special Use Airspace	
					NTTR	R-2508
San Joaquin Adobe Sunburst (*Pseudobahia peirsonii*)	Threatened	CA: SE				X
San Joaquin Wooly-threads (*Monolopia congdonii*)	Endangered					X
Shivwits Milk-vetch (*Astragalus ampullarioides*)	Endangered	UT: SSL			X	
Springville Clarkia (*Clarkia springvillensis*)	Threatened	CA: SE				X
Ute Ladies'-tresses (*Spiranthes diluvialis*)	Threatened	NV: S1			X	
Whitebark Pine (*Pinus albicaulis*)	Candidate					X
Crustaceans						
Vernal Pool Fairy Shrimp (*Branchinecta lynchi*)	Threatened					X
Insects						
Kern Primrose Sphinx Moth (*Euproserpinus euterpe*)	Threatened					X

Notes:
a. Source: U.S. Fish and Wildlife Service IPaC.
b. Source: California Department of Fish and Game (California Natural Diversity Database), Nevada Natural Heritage Program, State of Utah Department of Natural Resources Division of Wildlife Resources.
CA = California; IPaC = Information for Planning and Consultation; NTTR = Nevada Test and Training Range; NV = Nevada; SE = State Endangered; ST = State Threatened, S1 = Critically Imperiled; S1B = critically imperiled, breeds in the area; S2 = Imperiled; SSL = Sensitive Species List; UT = Utah

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