FINAL

Environmental Impact Statement for F-35A Wing Beddown at Tyndall AFB and MQ-9 Wing Beddown at Tyndall AFB or Vandenberg AFB

Volume I

United States Air Force
Air Force Civil Engineer Center
Air Combat Command

November 2020

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COVER SHEET

FINAL ENVIRONMENTAL IMPACT STATEMENT FOR F-35A WING BEDDOWN AT TYNDALL AFB AND MQ-9 WING BEDDOWN AT TYNDALL AFB OR VANDENBERG AFB

a. Responsible and Cooperating Agencies: United States Air Force (USAF), Air Combat Command (ACC), and Bay County, Florida.

b. Report Designation: Final Environmental Impact Statement (EIS)

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d. Abstract: This EIS has been prepared in compliance with the National Environmental Policy Act (NEPA) (42 United States Code 4331 et seq.); the regulations of the President's Council on Environmental Quality that implement NEPA procedures (40 Code of Federal Regulations [CFR] 1500–1508); and the USAF Environmental Impact Analysis Process as promulgated at 32 CFR 989. The USAF has prepared this EIS to assess the potential environmental effects resulting from the implementation of each of the Proposed Actions, which include the 1) Beddown an F-35A Wing at Tyndall Air Force Base (AFB) as a Three-Squadron F-35A Wing Alternative with 72 Primary Aerospace Vehicles Authorized (PAA) and 6 Backup Aircraft Inventory (BAI) or as a Four-Squadron F-35A Wing Alternative with 96 PAA and 8 BAI; 2) Beddown an MQ-9 Remotely Piloted Aircraft (RPA) Wing with 24 aircraft as a Tyndall AFB MQ-9 Wing Alternative or a Vandenberg AFB MQ-9 Wing Alternative; or 3) Combined F-35A Wing and MQ-9 Wing beddown alternatives at Tyndall AFB; and the No Action Alternative. Resources addressed in the EIS include airspace management and air traffic control, noise, health and safety, air quality, hazardous materials and wastes, soil and geologic resources, water resources, biological resources, cultural resources, land use and recreation, infrastructure, transportation, socioeconomics, and environmental justice.

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TABLE OF CONTENTS

List of Appendices

List of Tables

List of Figures

Acronyms and Abbreviations

Acronym	Definition
>	greater than
°C	degrees Celsius
°F	degrees Fahrenheit
325 FW	325th Fighter Wing
325 FW/SE	325th Fighter Wing Safety Office
325 FW/SEF	325th Fighter Wing Safety Office, Flight Safety
43 FS	43rd Fighter Squadron
53 WEG	53rd Weapons Evaluation Group
95 FS	95th Fighter Squadron
AB	afterburner
ACAM	Air Conformity Applicability Model
ACC	Air Combat Command
ACM	asbestos-containing material
AFB	Air Force Base
AFCEC	Air Force Civil Engineer Center
AFI	Air Force Instruction
AFMAN	Air Force Manual
AFOSH	Air Force Occupational Safety and Health
AGE	aerospace ground equipment
AGL	above ground level
AICUZ	Air Installations Compatible Use Zones
ALTRVs	Altitude Reservations
AMU	Aircraft Maintenance Unit
AOC	area of concern
AOI	Area of Interest
APE	Area of Potential Effects
APZ	Accident Potential Zone
AST	above ground storage tank
ATC	Air Traffic Control
ATCAA	Air Traffic Control Assigned Airspace
ATSDR	Agency for Toxic Substances and Disease Registry
Avg.	average
AWWTP	Advanced Wastewater Treatment Plant
BAI	Backup Aircraft Inventory
BASH	bird/wildlife aircraft strike hazard
BEBR	Bureau of Economic and Business Research
BGEPA	Bald and Golden Eagle Protection Act
BMP	best management practice
BOS	Base Operating Support
CA-1	Cabrillo Highway

Acronym	Definition
CAAQS	California Ambient Air Quality Standards
Caltrans	California Department of Transportation
CCAP	Consolidated Collection Accumulation Point
CCD	Coastal Consistency Determination
CDNL	C-weighted day-night average sound level
CE	Civil Engineering
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERL	Construction Engineering Research Laboratories
CFR	Code of Federal Regulations
CH_4	methane
CNEL	Community Noise Equivalent Level
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e (mt)	carbon dioxide equivalent in metric tons
COA	Certificate of Authorization
COC	community of comparison
CPIP	Culture Process Improvement Program
CRM	Cultural Resources Management
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
dB	decibels
dBA	A-weighted decibels
dBC	C-weighted decibels
DCPP	Diablo Canyon Nuclear Power Plant
DFE	Design Flood Elevation
DLA-DS	Defense Logistics Agency–Disposition Services
DMM	Discarded Military Munitions
DNA	deoxyribonucleic acid
DNL	day-night average sound level
DoD	Department of Defense
DODI	Department of Defense Instruction
E	enlisted
EA	Environmental Assessment
ECF	Entry Control Facility
EDR	Economic and Demographic Research
EIAP	environmental impact analysis process
EIS	Environmental Impact Statement
EO	Executive Order
EPR	engine pressure ratio
ERP	Environmental Restoration Program
ETR	engine thrust request

Acronym	Definition
FAA	Federal Aviation Administration
FDEP	Florida Department of Environmental Protection
FDOT	Florida Department of Transportation
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FL	Flight Level
FONPA	Finding of No Practicable Alternative
FS	Fighter Squadron
FTU	Formal Training Unit
FW	Fighter Wing
FWC	Florida Fish and Wildlife Conservation Commission
FY	Fiscal Year
GBU	Guided Bomb Unit
GDT	Ground Data Terminal
GHG	greenhouse gas
GMD	Ground-Based Midcourse Defense
gpd	gallons per day
GRASI	Gulf Regional Airspace Strategic Initiative
GWP	global warming potential
HAPs	hazardous air pollutants
HAZMART	Hazardous Materials Pharmacy
HQ	Headquarters
HRMA	Housing Requirement and Market Analysis
HTA	HAZMAT Tracking Activity
HW	hazardous waste
HWMP	Hazardous Waste Management Plan
ICBM	Intercontinental Ballistic Missile
ICRMP	Integrated Cultural Resources Management Plan
IFR	instrument flight rules
INRMP	Integrated Natural Resources Management Plan
IRP	Installation Restoration Program
ISWMP	Integrated Solid Waste Management Plan
JDAM	Joint Direct Attack Munition
kV	kilovolt
LBP	lead-based paint
L_{dnmr}	onset rate-adjusted monthly day-night average sound level
LEED®	Leader in Energy and Environmental Design
L_{eq}	equivalent noise level
L_{eq-8hr}	8-hour equivalent noise level
LID	Low Impact Development
L_{max}	maximum noise level
LOS	level of service

Acronym	Definition
LR	Launch and Recovery
LR Squadron	Launch and Recovery Squadron
µg/m^3	micrograms per cubic meter
MCF	million cubic feet
MGD	million gallons per day
MILCON	Military Construction
MMPA	Marine Mammal Protection Act
MMRP	Military Munitions Response Program
MOA	Military Operations Area
mph	miles per hour
MS4	Municipal Separate Storm Sewer System
MSA	munitions storage area
MSL	mean sea level
MW	megawatt
MX	Maintenance
NA	not applicable
NAAQS	National Ambient Air Quality Standards
NC	engine core revolutions per minute
ND	no data
NEPA	National Environmental Policy Act
NESHAP	National Emissions Standards for Hazardous Air Pollutants
NF	engine fan revolutions per minute
NFA	No Further Action
NHPA	National Historic Preservation Act
NIOSH	National Institute for Occupational Safety and Health
NM	nautical miles
NO_2	nitrogen dioxide
NOA	Notice of Availability
NOTAM	Notice to Airmen
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRIS	National Register Information System
O	officer
O_3	ozone
Ops	Operations
OSS	Operations Support Squadron
OWS	oil/water separator
PAA	Primary Aerospace Vehicles Authorized
PCB	polychlorinated biphenyl
PFOA	perfluorooctanoic acid

Acronym	Definition
PFOS	perfluorooctane sulfonate
PG&E	Pacific Gas and Electric Company
PL	Public Law
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
PMATS	Predator® Mission Aircrew Training System
POL	petroleum, oil, and lubricant
ppm	parts per million
PSD	prevention of significant deterioration
psi	pounds per square inch
psig	pounds per square inch gauge
Q	Quarter
RA or R-	Restricted Area
RAPCON	Radar Approach Control
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
ROI	region of influence
RPA	remotely piloted aircraft
RPM	revolutions per minute
SATCOM	Satellite Communications
SCIF	Sensitive Compartmented Information Facilities
SEA	Special Environmental Assessment
SecAF	Secretary of the Air Force
SEL	sound exposure level
sf	square feet
SHPO	State Historic Preservation Officer
SO_2	sulfur dioxide
SOC	Squadron Operations Center
SO_x	sulfur oxides
SPCCP	Spill Prevention, Control, and Countermeasures Plan
SUA	Special Use Airspace
SULMA	Special Use Land Management Areas
SWPPP	Storm Water Pollution Prevention Plan
TIM	time-in-mode
tpy	tons per year
TRACON	Terminal Radar Approach Control
U.S.	United States
U.S.C.	United States Code
UAS	unmanned aircraft system
UPBNI	Up To But Not Including
US-98	U.S. Highway 98
USACE	U.S. Army Corps of Engineers

Acronym	Definition
USAF	U.S. Air Force
USCB	U.S. Census Bureau
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGCRP	U.S. Global Change Research Program
USGS	U.S. Geological Survey
UST	underground storage tank
UXO	unexploded ordnance
V/C	volume-to-capacity
VOCs	volatile organic compounds
WA or W-	Warning Area
WAA	Waste Accumulation Area
WDR	Waste Discharge Requirement
WEG	Weapons Evaluation Group

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1. PURPOSE OF AND NEED FOR THE PROPOSED ACTIONS

1.1 INTRODUCTION

This Environmental Impact Statement (EIS) addresses two proposed independent beddowns of Air Combat Command (ACC) aircraft. The two beddowns are independent as they do not rely on each other nor does one action trigger the need for the other. The proposed beddowns are:

(1) The beddown of an F-35A Operational Wing at Tyndall Air Force Base (AFB), Florida

(2) The beddown of an MQ-9 Remotely Piloted Aircraft (RPA) Wing at either Tyndall AFB or Vandenberg AFB, California[1]

Figure 1.1-1. F-35A Aircraft

The United States (U.S.) Air Force (USAF) proposes to locate an F-35A (see Figure 1.1-1) Operational Wing, comprised of three or four squadrons with 24 aircraft each, at Tyndall AFB. This proposed beddown is to ensure the implementation of ACC objectives to efficiently and effectively maintain combat capability and mission readiness.

Figure 1.1-2. MQ-9 Reaper Aircraft

The USAF also proposes to locate an MQ-9 RPA (see Figure 1.1-2) Wing with 24 aircraft at either Tyndall AFB or Vandenberg AFB. This proposed MQ-9 Wing beddown is to achieve multiple MQ-9 operational requirements for ACC and to ensure the objectives identified in ACC's Culture Process Improvement Program (CPIP) are addressed. The CPIP strives to address concerns identified by Airmen and family members in the USAF RPA communities.

Figure 1.1-3 locates and briefly describes the missions of Tyndall AFB and Vandenberg AFB. Tyndall AFB has been identified as the proposed operational F-35A Wing beddown location because Tyndall AFB provides ACC with extensive overwater Warning Areas, regional air-to-ground ranges, and airspace for combat proficiency training.

[1] Vandenberg AFB is anticipated to be redesignated as Vandenberg Space Force Base, following establishment of the Space Force branch of the U.S. military by the 2020 National Defense Authorization Act. This would have no effect on the Proposed Action or environmental consequences.

Tyndall AFB and Vandenberg AFB were identified as alternative MQ-9 Wing beddown locations that could best achieve the mission requirements of the MQ-9 Wing while meeting CPIP objectives (see Section 1.3).

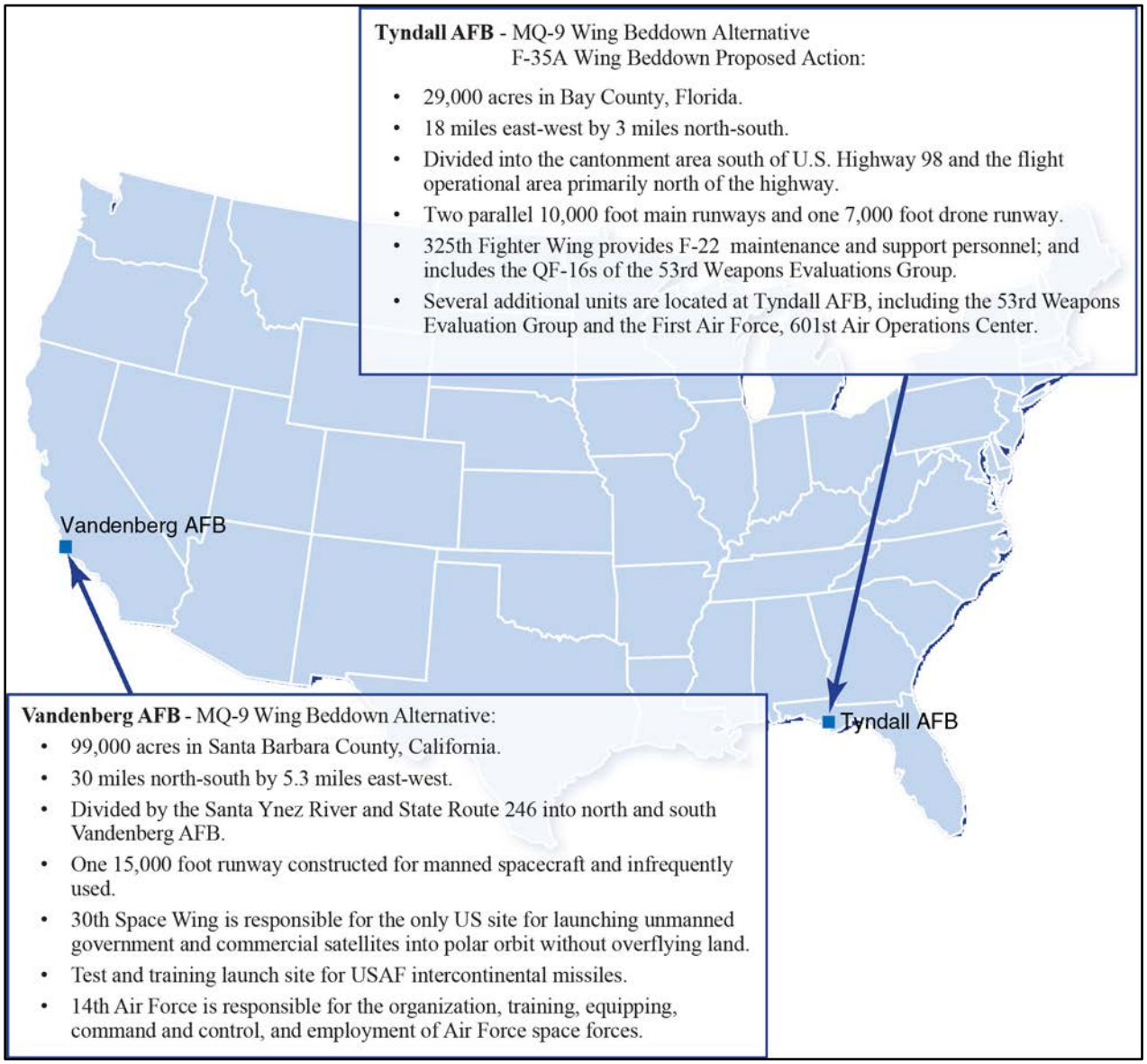

Figure 1.1-3. Tyndall AFB and Vandenberg AFB

The MQ-9 Wing beddown environmental impact analysis process (EIAP) started in the summer of 2018, but was placed on hold after Hurricane Michael while the future of the base was assessed. With the overlap of analyses at Tyndall AFB for both the F-35A Wing and MQ-9 Wing beddowns, the USAF determined that combining the F-35A and MQ-9 analyses furthers the purposes of the National Environmental Policy Act (NEPA) and was the proper thing to do per Title 40 of the Code of Federal Regulations (CFR) Section 1508.25(a)(2).

This EIS analyzes the potential environmental consequences to the human and natural environment that may result from the proposed beddown of the F-35A Operational Wing at Tyndall AFB; the

proposed beddown of the MQ-9 Wing at either base; and the potential consequences that may result if Tyndall AFB were selected for both the F-35A Wing and the MQ-9 Wing beddowns. This EIS incorporates and evaluates the two independent beddown decisions to be sure that the potential environmental consequences, of either or both Wing decisions, are documented for decisionmakers. This EIS is prepared by the USAF in accordance with NEPA (42 United States Code [U.S.C.] 4321 et seq.) and the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (40 CFR Parts 1500–1508).

Section 1.2 below presents the purpose and need for the F-35A Operational Wing beddown, and Section 1.3 presents the purpose and need for the MQ-9 Operational Wing beddown.

1.2 F-35A OPERATIONAL WING BEDDOWN

The USAF proposes to beddown F-35A operational aircraft at Tyndall AFB over a period of approximately 3 years, beginning as early as 2023. These aircraft would become part of the Combat Air Forces that defend the sovereign airspace of the United States, as well as deploy worldwide, meeting national defense requirements.

1.2.1 Background

On October 10, 2018, Tyndall AFB and the surrounding Bay County, Florida, area sustained a direct hit from Hurricane Michael, a Category 5 hurricane with wind speeds in excess of 156 miles per hour (mph). This was the strongest sustained-wind hurricane to hit the continental United States in over 25 years. Every facility on the installation sustained at least some damage with approximately 50 percent of the facilities significantly damaged. The USAF evaluated the damages and the strategic value of Tyndall AFB and decided to move forward to repair, reshape, and rebuild Tyndall AFB to resume near-term mission operations and to maximize mid- and long-term mission capabilities. With the destruction wrought by Hurricane Michael, the USAF has the unique opportunity to configure facilities and infrastructure to meet its most critical mission sets. The base is being rebuilt using the updated Installation Master Plan, and Tyndall AFB will be reconstructed in accordance with the *Hurricane Recovery Environmental Assessment* (EA) (USAF, 2020a). Tyndall AFB will have new and updated infrastructure to be what is needed for a fighter base of the future.

The USAF has evaluated ways to maximize the future mission support capacity of Tyndall AFB and its ranges and airspace.

The hurricane also required the relocation of several missions from Tyndall AFB, including the fifth-generation F-22 fighters. As part of the recovery effort, emergency actions were enacted. The USAF consulted with the CEQ to identify emergency alternative arrangements to comply with NEPA and restore training operations as quickly as possible. The alternative arrangements were approved and accepted in December 2018. The USAF made the strategic decision to relocate 95th Fighter Squadron (FS) F-22 operational aircraft from Tyndall AFB to plus-up existing F-22 operational squadrons at Joint Base Langley-Eustis in Virginia, Joint Base Elmendorf-Richardson in Alaska, Joint Base Pearl Harbor-Hickam in Hawaii, and Nellis AFB in Nevada to make the F-22 fleet more mission-capable. The only USAF F-22A Formal Training Unit (FTU), and its

associated T-38 Talon aircraft, a two-seat twinjet supersonic jet trainer in the 2d Fighter Training Squadron, was temporarily relocated from Tyndall AFB to Eglin AFB under a Special EA (SEA) (USAF, 2019a). The USAF has proposed to permanently relocate the F-22A FTU and its associated T-38 Talon aircraft to Joint Base Langley-Eustis with existing F-22 operations; that proposed action will be analyzed under a separate EIS. The potential reassignment of the F-22 FTU and 95th FS missions allows the USAF to consider other missions for Tyndall AFB.

The USAF considers the F-35A to be one of its most important air combat capabilities now and into the coming decades. These fifth-generation aircraft employ advanced electronics and require an increased battlespace to properly train. In the coming decade, the USAF anticipates that 50 percent of its fighter fleet will be F-35 aircraft. These aircraft require more sophisticated range infrastructure and greater numbers of advanced threats to replicate a realistic contemporary operating environment. The necessary battlespace and range infrastructure is available at ranges that support Tyndall AFB, and the USAF is therefore proposing to utilize Tyndall AFB to support a full Wing of F-35A aircraft to best meet its future needs.

1.2.2 Purpose of the F-35A Operational Wing Beddown

The purpose of the proposed F-35A Operational Wing beddown action is to beddown an F-35A Operational Wing at Tyndall AFB. Hurricane Michael forced the USAF to move the Tyndall F-22A and supporting T-38 missions. The USAF was already considering restructuring the F-22A fleet to improve fleet health and efficiency and the hurricane provided the impetus and opportunity to carry out that restructuring, which would not include moving F-22As back to Tyndall. Tyndall AFB needs to be retained as a fighter aircraft base due to its unique location with regard to premier training airspace. Base reconstruction will require several years to re-establish facilities and infrastructure to a support fighter aircraft mission, and the timing of reconstruction of the base directly corresponds with manufacture and delivery of the F-35A. These combined factors led the USAF to determine that only Tyndall AFB would address the need for beddown of an additional active duty Continental U.S.-based F-35A Wing and backfill for aircraft realigned as a result of Hurricane Michael.

The proposed F-35A Operational Wing beddown at Tyndall AFB would provide combat capability and mission readiness for combat ready pilots as the USAF faces deployments across a spectrum of conflicts, while also providing for homeland defense.

1.2.3 Need for the F-35A Operational Wing Beddown

The USAF recognizes a need to optimize its fifth-generation operational fighter fleets to ensure they have adequate training ranges, facilities, and airspace necessary to effectively produce qualified combat pilots. At the same time, the USAF must retain Tyndall AFB due to its unique location in proximity to premier airspace for fifth-generation fighter training. The combined timing of rebuilding Tyndall AFB, restructuring the F-22A fleet and the F-35A manufacturing and delivery schedule make Tyndall AFB the obvious, and only, choice for another Continental U.S. active duty F-35A Wing. Eventually, the USAF will need to operate and maintain more than 1,700 F-35A aircraft at locations that provide necessary facilities and have optimal access to modern ranges and sufficient airspace.

1.2.4 F-35A Aircraft Characteristics and Mission

The F-35 is a supersonic, single-seat, single-engine, all-weather fighter aircraft capable of performing and surviving lethal strike warfare missions. The USAF has designated the F-35A to fulfill a wide range of roles and missions, including Attack Operations/Air Interdiction, Offensive Counter Air, Close Air Support, Strategic Attack, Suppression of Enemy Air Defenses, Destruction of Enemy Air Defenses, and Defensive Counter Air. Additional F-35A missions would include Armed Reconnaissance, Forward Air Controller (airborne), and Combat Search and Rescue. The USAF variant (i.e., Conventional Takeoff and Landing) of the F-35, therefore, embodies critical combat capabilities to fulfill multiple mission roles and epitomizes the characteristics needed for these roles, offering a unique combination of capabilities.

The F-35A is optimized to be a multi-role fighter, with the ability to perform air-to-air; air-to-ground; and intelligence, surveillance and reconnaissance (ISR) missions.

The F-35A aircraft's unique combination of capabilities are:

- **Stealth** – Design features and radar-absorbent composite materials make the F-35A more difficult to detect than conventional aircraft of similar size.
- **Range and Supersonic Speed** – The F-35A offers an equivalent or greater combat radius than current legacy aircraft. The ability to fly at supersonic speeds makes the F-35A more effective in engaging the enemy and less vulnerable to enemy aircraft and ground-based threats.
- **Sensor Integration to Support Precision Munitions** – New F-35A computer systems, improved multi-spectral sensor technology, and networked sharing of information permit USAF pilots to detect enemy threats and deliver precision munitions at substantially greater distances than those supported by current aircraft.
- **Comprehensive Combat Information Systems** – Highly sophisticated avionics systems, including a helmet-mounted display, are integrated throughout the F-35A to provide the pilot information from many sources and produce a clear, easily understood picture of the combat situation.
- **Reduced Maintenance Costs** – Computerized self-tests of all systems, improved maintenance, and other autonomic logistics information system components reduce both maintenance time and costs.

1.3 MQ-9 RPA OPERATIONAL WING BEDDOWN

1.3.1 Background

ACC is the Combat Air Forces' lead to identify challenges and stressors that detract from mission effectiveness and/or the morale of the Airmen within the supporting RPA enterprise. This proposed MQ-9 Wing beddown is to achieve multiple MQ-9 operational requirements for ACC and to ensure the objectives identified in ACC's CPIP are addressed.

This proposed MQ-9 Wing beddown addresses MQ-9 operational requirements by:

- Providing diversity of operations by not having all of the MQ-9 assets at one location;
- Providing ability to conduct more continuity training due to varied airspace and ranges;
- Satisfying the MQ-9 requirement for operations over water; and
- Increasing leadership opportunities.

The MQ-9 enterprise lacks an overwater training capability; therefore, the need for the entire MQ-9 enterprise is for a location that would provide the enterprise and aircrews that training opportunity.

The CPIP strives to address concerns identified by Airmen and family members in the USAF RPA communities. The CPIP began August 21, 2015, and was designed to take place across 12 USAF active-duty, Reserve, and Guard bases. The program began by sending surveys to 3,366 officers and enlisted Airmen to help identify concerns and issues in the USAF RPA communities. This focus on personnel and the mission is designed to make the RPA weapons system more sustainable. The ultimate goal of the CPIP functional teams, surveys, and assessments was to identify challenges, even those that may be difficult to identify and address, and propose solutions to senior USAF leaders.

The CPIP objectives are as follows:

- Highlight the RPA community's requirement for trusted communications (re-establish Airmen's trust via clear communication between senior leadership and the RPA community)
- Recruit, develop, and retain high-quality RPA Airmen
- Enable the development of successful RPA leaders
- Eliminate obstacles to mission accomplishment and taking care of our Airmen

Applying the operational requirements and the CPIP objectives resulted in the USAF identifying two alternative bases for the MQ-9 Proposed Action. The rationale for the alternative bases is provided in Section 2.3.2. The installation selected for the MQ-9 Wing beddown must meet CPIP objectives to care for Airmen and provide improvements in work environment and overall quality of life while achieving MQ-9 mission requirements.

1.3.2 Purpose of the MQ-9 Operational Wing Beddown

The MQ-9 Proposed Action is to beddown the MQ-9 RPA Operational Wing with 24 MQ-9 aircraft at one of two alternative bases. The purpose of the beddown would be to achieve the MQ-9 Wing operational requirements while enhancing recruiting for, and developing and retaining, high-quality RPA Airmen; enabling the development of successful RPA leaders; and eliminating obstacles to mission accomplishment. The beddown location would take care of our Airmen while ensuring MQ-9 operational personnel have the capability to accomplish primary functions associated with operating and maintaining an MQ-9 Wing.

1.3.3 Need for the MQ-9 Operational Wing Beddown

ACC needs to address MQ-9 operational requirements by providing diversity of operations by not having all of the MQ-9 assets at one location, training in varied and advanced airspace and ranges, as well as over water, and by increasing leadership opportunities. Current training, which occurs either with simulators or in combat conditions, does not provide for comprehensive training of crews for system maintenance at forward locations or for diversified continuation training, which is severely lacking under current conditions. The need for the Proposed MQ-9 Wing beddown action was also identified in the CPIP, which targeted and developed methods to address concerns identified by Airmen and family members in the RPA (including the MQ-9) career fields. The CPIP identified needed improvements in the work environment, retention, readiness, and overall quality of life to prevent the strategic collapse of the USAF RPA enterprise, and enhance and grow opportunities for Airmen and their families.

1.3.4 MQ-9 Mission

The USAF MQ-9 RPA system is a response to the Department of Defense (DoD) directive to support initiatives of overseas contingency operations. The MQ-9, named the Reaper (see Figure 1.1-2), is an armed, multi-mission, medium-altitude, long-endurance RPA. The MQ-9 is employed primarily against dynamic execution targets and secondarily as an intelligence collection asset. The MQ-9 provides combat commanders a unique capability to perform strike, coordination, and reconnaissance against high-value, fleeting, and time-sensitive targets.

MQ-9s additionally perform multiple missions and tasks, which include Close Air Support, Combat Search and Rescue, Precision Strike, watching ahead of convoys for danger, using lasers and other systems to identify targets for other aircraft, and guiding weapons to targets. The MQ-9's capabilities make it uniquely qualified to conduct irregular warfare operations in support of combatant commander objectives.

1.3.5 MQ-9 Features and Operations

The MQ-9 is part of a system that supports strike aircraft and ground commanders by acquiring and tracking dynamic targets or other useful intelligence. The MQ-9 is also capable of supporting a wide range of operations such as coastal and border surveillance, weapons tracking, embargo enforcement, humanitarian/disaster assistance, peacekeeping, and counter-narcotic operations.

MQ-9 operational capabilities utilize satellite communication links and can acquire and pass real-time imagery data to ground users around the clock and beyond line-of-sight. The MQ-9 tracking system records imagery data during operational proficiency flights to review mission effectiveness.

The MQ-9 primary concept of operations is a remote split operation that employs a Launch and Recovery (LR) ground control station for take-off and landing operations at a forward operating location. The LR crew uses a line-of-sight connection to fly the aircraft to a hand-off point and give control of the aircraft to the mission crew. The mission crew, based in the continental United States, executes command and control of the remainder of the mission via beyond-line-of-sight links. After the mission is completed, the remote mission crew uses satellite links to return the

aircraft to the vicinity of the airfield where the LR crew reestablishes a line-of-sight link to the aircraft and lands the MQ-9. If the satellite link is lost and unable to be reestablished by the pilot, the MQ-9 will have pre-programmed instructions to return to the base where the LR crew uses a line-of-sight connection to control and land the aircraft.

1.3.5.1 MQ-9 General Characteristics

The MQ-9 is similar in size to a Cessna 208 Caravan single-engine turboprop, which is commonly used as a regional passenger aircraft, as a sky-diving aircraft, and for many other applications. The MQ-9 is approximately the same length, has thinner and longer wings, cruises at approximately the same speed, and is slimmer than the passenger-carrying Cessna 208.

1.4 PUBLIC AND AGENCY INVOLVEMENT

CEQ regulations for implementing the NEPA (40 CFR 1500–1508), and the USAF's implementing regulations (32 CFR 989), require the USAF to consider potential environmental consequences of its proposed action early and concurrent with the initial project planning stages. An EIS documents the detailed study of the potential environmental consequences of the proposed action, as well as cumulative impacts. When preparing an EIS, the USAF is required to invite review from other federal, state, and local agencies and from the public. When providing input on the EIS, the USAF requests that comments be substantive in nature. Generally, substantive comments are regarded as those specific comments that challenge the analysis, methodologies, or information in the EIS as being factually inaccurate or analytically inadequate; that identify impacts not analyzed or developed and evaluate reasonable alternatives or feasible mitigations not considered by the USAF; or that offer specific information that may have a bearing on the decision, such as differences in interpretations of significance, scientific, or technical conclusions, or cause changes or revisions in the proposal. Non-substantive comments, which do not require a specific USAF response, are generally considered to be those comments that are non-specific; express a conclusion, an opinion, agree, or disagree with the proposals; vote for or against the proposal itself, or some aspect of it; state a position for or against a particular alternative; or otherwise state a personal preference or opinion. All substantive comments, either written or verbal, received during the public comment period, will be given full and equal consideration in the preparation of the Final EIS.

Stages of the environmental review process are provided below.

Notice of Intent (NOI) – The USAF published an NOI to prepare the EIS in the *Federal Register* on November 25, 2019. Notices were also published in local newspapers near each of the two alternative bases. The NOI formally initiated the public scoping process. The NOI included descriptions of the alternatives and the scoping process and the dates, times, and locations of the scoping meetings. The NOI also invited affected federal, state, and local agencies; affected Indian tribe(s); and interested persons (e.g., the public) to participate in the scoping process.

Scoping – The USAF held two public scoping meetings near Tyndall AFB and Vandenberg AFB. The purpose of the public scoping meetings was to gather community-specific concerns to help focus the EIS analysis. The meetings were arranged in a "come and go," open-house format with

no formal presentation or opportunity for public testimony. Meeting attendees were asked to sign in and written comments were accepted. Poster display stations were set up and staffed approximately one-half hour prior to each meeting's scheduled start time to answer questions concerning the EIS process, the proposed actions and alternatives, and base- and mission-specific questions. Resource specialists were on hand to provide information, answer questions, facilitate the identification of issues, and encourage public involvement. Throughout the scoping period, the USAF actively solicited comments through press releases, newspaper ads, flyers, web posting, and similar communications channels.

Table 1.4-1. Public Scoping Meeting Participation

Meeting Date, Time, Description	Location	Number of Attendees	Number of Comments Received
December 10, 2019, from 5:30 – 8:30 p.m.	Gulf Coast State College, Panama City, Florida	43	13
December 12, 2019, from 5:30 – 8:30 p.m.	Allan Hancock College, Lompoc Valley Center, Lompoc, California	4	1

Table 1.4-2 presents a summary of the scoping comment topics received over the 30-day comment period. Overall, the vast majority of comments received were in support of the F-35A and MQ-9 beddowns, and a few identified concerns about Noise, Geologic and Soil Resources, Biological Resources, Cultural Resources, and Transportation. The "EIS Section" column of Table 1.4-2 lists the sections in the EIS where the response may be found.

Table 1.4-2. Summary of Comment Topics

Resource Area/Category	EIS Section
Noise	Sections 3.1.2, 3.2.2, 4.1.2, 4.2.1.3, 4.2.2.4, 4.3.2
Geologic and Soil Resources	Sections 3.1.6, 3.2.6, 4.1.6, 4.2.1.10, 4.2.2.11, 4.3.6
Biological Resources	Sections 3.1.8, 3.2.8, 4.1.8, 4.2.1.14, 4.2.2.15, 4.3.8
Cultural Resources	Sections 3.1.9, 3.2.9, 4.1.9, 4.2.1.16, 4.2.2.17, 4.3.9
Transportation	Sections 3.1.12, 3.2.12, 4.1.12, 4.2.1.22, 4.2.2.23, 4.3.12
General Support of the Proposed Actions	N/A

Draft EIS – The Draft EIS analyzed the environmental consequences of the proposed actions. It included a description of the proposed actions, the purpose of and need for the proposed actions, alternatives for implementing the proposed actions, the existing environmental conditions where the proposed actions would take place, and the potential environmental consequences of the proposed actions. The Draft EIS was supported by detailed technical studies. The Draft EIS was distributed to agencies, regional libraries, and was/is accessible for downloading on the project website.

Draft EIS Notice of Availability (NOA) and Notice of Public Hearing – On June 19, 2020, a formal notice was published in the *Federal Register* by the U.S. Environmental Protection Agency (USEPA) announcing that the Draft EIS is available at public libraries and on the project website for review by the public and federal, state, and local agencies. The NOA also included the dates, times, and locations of the public hearings near each of the two bases where one or more of the

Proposed Actions could be implemented. The NOA was also published in local newspapers near each of the two bases:

- Tyndall AFB – *Panama City News Herald,* Wednesday, June 17, 2020, and Sunday, June 21, 2020.
- Vandenberg AFB – *Lompoc Record* and *Santa Maria Times*, Wednesday, June 17, 2020, and Sunday, June 21, 2020.

Publication of the NOA initiated the 45-day public comment period, during which time the public hearings were held. Based on multiple considerations related to the COVID-19 pandemic, the USAF made the decision to shift the format of the public hearings from in-person and in a physical meeting space to a "virtual" format. The dates, locations, and number of attendees for each of the two public hearings are provided in Table 1.4-3.

Table 1.4-3. Public Hearing Dates, Locations and Attendance

Base	Date/Time	Attendance	Location/Access Information
Tyndall AFB	July 14, 2020 5:30–8:30 p.m., Central	Phone: 8 Webcast: 42	Telephone: 833-360-0875 Access Code: 2639037 Online: https://engage.vevent.com/rt/leidosinc/index.jsp?seid=294
Vandenberg AFB	July 15, 2020 5:30–8:30 p.m., Pacific	Phone: 3 Webcast: 13	Telephone: 833-360-0875, Conference ID: 6088652 Online: https://engage.vevent.com/rt/leidosinc/index.jsp?seid=298

Key: AFB = Air Force Base; ID = identification

Press releases were distributed to local media (e.g., radio, television, print) organizations prior to the public hearings. Notification letters were mailed to those on the mailing list, including everyone who signed up to be on the mailing list during scoping. Updates were posted on the project website, and each of the two bases used their media outlets to notify the general public of the Draft EIS public comment period. Appendix A of the EIS provides a list of individuals on the mailing list, as well as federal, state, and local agencies that were provided notification letters and copies of the Draft EIS.

During the public hearings, the USAF presented details about the F-35A and MQ-9 proposed actions and the NEPA process and provided attendees an opportunity to provide written and/or oral comments. The verbatim transcripts from the two public hearings are contained in Appendix A, Section A.12.8. In addition to receiving written and oral comments at the hearings, the USAF also accepted written comments from the public and agencies through U.S. mail, the website, and email. Consistent with 40 CFR 1503.4, all substantive comments received during the public comment period were fully considered and addressed in the Final EIS, as appropriate.

Final EIS – The Final EIS has been prepared following the Draft EIS public comment period. Where applicable, the Final EIS has been revised to reflect public and agency comments and includes the proponent's responses to all substantive comments. The Final EIS will provide the Secretary of the Air Force (the decision-maker) with a comprehensive review of the potential environmental consequences of selecting any of the alternatives of the F-35A and MQ-9 proposed actions. An NOA will be published in the *Federal Register* to announce availability of the Final EIS, and a 30-day waiting period will be initiated.

Record of Decision (ROD) – The USAF will prepare concise, public RODs that will address the USAF decisions on the two proposed actions, identify alternatives considered, specify the environmentally preferred alternatives, and state whether all practicable means to avoid or minimize environmental harm have been adopted (and if not, why they were not). A notice of the ROD availability will be announced in the *Federal Register* no sooner than the end of the Final EIS 30-day waiting period.

1.4.1 Consultation and Coordination Requirements

The USAF may be required to consult/coordinate with various authorities during the conduct of the EIAP. See Table 1.4-4 for anticipated consultation/coordination requirements.

Table 1.4-4. Consultation/Coordination Requirements

USAF Consultation/ Coordination	Topics	Statutory/Regulatory Authorities	Status of Consultation/ Coordination
Federally Recognized Indian Tribes	Government-to-government consultation with Federally Recognized Indian Tribes	Executive Order (EO) 13175, Consultation and Coordination with Indian Tribal Governments; DODI 4710.02, Department of Air Force Instruction 90-2002; National Historic Preservation Act, Title 54 U.S.C. 300101 et. seq.; 36 CFR Part 800	Consultation complete (see Appendix A).
Federal Aviation Administration	Certificates of Authorization (COA) for MQ-9 transit from Vandenberg AFB or Tyndall AFB airspace to training ranges	49 U.S.C. Transportation Subtitle VII – Aviation Programs Part A – Air Commerce and Safety; 49 U.S.C. 40101–40104	Coordination ongoing.
Federal Emergency Management Agency	Floodplain definition and USAF early notice of potential floodplain or wetlands impacts	EO 11988, Floodplain Management	The USAF provided early notice to the public of potential floodplain/wetlands impacts in the Notice of Intent for this EIS.
National Marine Fisheries Service	Protected species (marine mammals and other protected marine species)	Marine Mammal Protection Act, 16 U.S.C. 1361, 50 CFR Part 218; Endangered Species Act, 16 U.S.C. 1531 et seq.	Coordination initiated (see Appendix A).
State Historic Preservation Officer (SHPO)/Advisory Council on Historic Preservation	Buildings, sites, districts, structures, objects, or traditional cultural resources eligible for, or listed on the National Register of Historic Places within the area of potential effect of the undertaking	National Historic Preservation Act, Title 54 U.S.C. 300101 et seq.; 36 CFR Part 800	Consultation completed with Florida SHPO; Consultation with California SHPO closed by the SHPO until/unless Vandenberg AFB is selected as the MQ-9 beddown location (see Appendix A).

Table 1.4-4. Consultation/Coordination Requirements

USAF Consultation/ Coordination	Topics	Statutory/Regulatory Authorities	Status of Consultation/ Coordination
U.S. Army Corps of Engineers	Authorization to incur impacts to jurisdictional wetlands	Section 9, 10 Rivers and Harbors Act of 1899; Section 404 of the Clean Water Act (including Section 401 certification from the State of California and Florida) (33 CFR Parts 320–332); EO 11990, Protection of Wetlands; EO 11988, Floodplain Management	Coordination initiated and ongoing.
U.S. Fish and Wildlife Service	Protected species (threatened/endangered species; migratory birds, bald and golden eagles)	Endangered Species Act, 16 U.S.C. 1531 et seq., 50 CFR Parts 17 and 402; Migratory Bird Treaty Act; 16 U.S.C. 703–712, 50 CFR Part 21; Bald and Golden Eagle Protection Act, 16 U.S.C. 668–668c, 50 CFR Part 22	Consultation completed for both Tyndall AFB and Vandenberg AFB (see Appendix A).
Florida State Clearinghouse Coordinator California Coastal Commission	Coastal Consistency Determination/ Coastal Negative Determination; Federal activity effects to a state's coastal zone and consistency with enforceable policies of the state coastal management program.	Coastal Zone Management Act, 16 U.S.C. 1451 et seq.	Consultation completed for both Tyndall AFB and Vandenberg AFB (see Appendix A).

Key: AFB = Air Force Base; AFI = Air Force Instruction; CFR = Code of Federal Regulations; CCD = Coastal Consistency Determination; COA = Certificate of Authorization; DODI = Department of Defense Instruction; EO = Executive Order; PL = Public Law; SHPO = State Historic Preservation Officer; U.S. = United States; USAF = U.S. Air Force; U.S.C. = United States Code

1.4.1.1 Consultation with Federally Recognized Indian Tribes

In accordance with the National Historic Preservation Act (NHPA), Executive Order (EO) 13175, DoD Instruction (DODI) 4710.02, and Air Force Instruction (AFI) 90-2002, the USAF conducts government-to-government consultation with federally recognized tribes on actions with the potential to significantly affect protected tribal resources, tribal treaty rights, or Indian lands.

The USAF initiated government-to-government consultation with federally recognized Indian Tribes (Tribes) that might have an interest in the proposed actions at Tyndall AFB and Vandenberg AFB by submitting letters to federally recognized tribes informing them of the USAF's intent to prepare the EIS and inviting them to meet to discuss issues that have the potential to significantly affect protected tribal resources, tribal rights, or Indian Lands. The USAF followed up with the same Tribes prior to the release of the Draft EIS, inviting them to conduct government-to-government discussions to ensure that Tribes understand, and have the opportunity to participate

in, review of USAF activities that could have the potential to affect tribal interests. The Seminole Tribe of Florida responded that they had no further comments, and requested notification if any archaeological, historical, or burial resources are inadvertently discovered. The Santa Ynez Band of Chumash Indians (in California) responded with concerns for potentially undiscovered cultural resources in the areas of construction near the Vandenberg AFB airfield. Government-to-government consultations with potentially affected Tribes for the F-35A Wing and MQ-9 Wing beddown proposed actions at Tyndall AFB and for the MQ-9 Wing beddown proposed action at Vandenberg AFB are complete. Consultation correspondence is included in Appendix A.

1.4.1.2 NHPA Consultation with State Historic Preservation Officers

In compliance with Section 106 of the NHPA, the USAF consulted with the Florida State Historic Preservation Officer (SHPO); the California Office of Historic Preservation, which acts as the SHPO; and interested parties regarding its determination of effects to historic properties for the proposed construction and flight operations activities at Tyndall AFB and Vandenberg AFB, respectively. In a letter dated July 29, 2020, the Florida SHPO concurred with the USAF determination that the proposed F-35A Wing and MQ-9 Wing beddown undertakings will have no effect to historic properties listed or eligible for listing in the National Register of Historic Places (NRHP). In a letter dated June 3, 2020, the California SHPO closed the consultation until and unless Vandenberg AFB is selected as the MQ-9 beddown location (see Appendix A).

1.4.1.3 Section 7 Consultation with the U.S. Fish and Wildlife Service

In compliance with Section 7 of the Endangered Species Act, the USAF formally consulted with the U.S. Fish and Wildlife Service (USFWS) regarding impacts to federally listed threatened and endangered species. Biological Assessments were prepared and submitted to USFWS offices in California and Florida. In a letter dated August 3, 2020, consultation with the USFWS Panama City Field Office concluded with their concurrence with the USAF determination of *No Effect* and *not likely to adversely affect* threatened and endangered species at Tyndall AFB. On September 21, 2020, the USFWS Ventura office concurred with the USAF determination of *not likely to adversely affect* for the California least tern, western snowy plover, and southern sea otter and issued a Biological Opinion describing avoidance and minimization measures for the Lompoc yerba santa, California red-legged frog, and vernal pool fairy shrimp (see Appendix A).

1.4.2 Lead and Cooperating Agencies

A cooperating agency is defined by CEQ regulations as any federal, state, or local agency other than a lead agency having jurisdiction by law or special expertise with respect to any environmental issue involved in a proposal (40 CFR 1508.5). By execution of a Memorandum of Understanding with the USAF, Bay County is a cooperating agency for this EIS. The USAF is working with Bay County and Bay County cities (through the County) to ensure compatible future community and Tyndall AFB future mission planning as the base, county, and cities rebuild. Bay County reviewed a developmental version of the Draft EIS, whose comments were incorporated into the Draft EIS.

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2. DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

2.1 INTRODUCTION

This chapter describes the Proposed Actions and the alternatives identified to fulfill the purpose of and need for an F-35A Wing beddown at Tyndall AFB and an MQ-9 Wing beddown at either Tyndall AFB or Vandenberg AFB.

Reasonable alternatives are identified early in the NEPA process. Reasonable alternatives must satisfy the purpose of and need for the Proposed Actions as defined in Section 1.2.2, Section 1.2.3, Section 1.3.2, and Section 1.3.3.

In addition, CEQ regulations specify that an EIS must include a No Action Alternative against which the effects of taking the action are compared, to determine the significance of the impacts. The No Action Alternative for the proposed MQ-9 Operational Wing beddown represents the affected environment conditions that would continue if the MQ-9 Wing beddown did not occur at Tyndall AFB or did not occur at Vandenberg AFB. The No Action Alternative for the proposed F-35A Wing beddown represents the affected environment conditions that would continue if the F-35A Wing beddown did not occur at Tyndall AFB. The pre-hurricane conditions of 2018 are presented for some resource areas, where it would be useful as a point of comparison to provide context to the environmental impacts for the local public and decisionmakers (see Section 2.2.7).

2.2 F-35A OPERATIONAL WING BEDDOWN

The overall mission of the USAF is defense of the United States and fulfillment of directives of the President and Secretary of Defense. The United States requires fully operational, mission-ready F-35A aircraft to provide a high-threat, multi-role war-fighting capability. The USAF has the responsibility to provide operational F-35A aircraft in effective and efficient basing locations. A three-squadron Wing of F-35A fighters was identified as an efficient management and maintenance configuration in the August 31, 2009, tasking by the Deputy Assistant Secretary of the Air Force for Installations.

This proposed F-35A Operational Wing beddown at Tyndall AFB is to maintain combat capability and mission readiness as the USAF faces deployments across a spectrum of conflicts, while also providing for homeland defense. This beddown action will assure proficiency of combat-ready pilots in the most advanced fighter aircraft in the world.

2.2.1 Identification of Tyndall AFB for the Proposed F-35A Operational Wing

Multiple factors led to the identification of Tyndall AFB as a preferred beddown location for an F-35A Operational Wing. Tyndall AFB was not included as an alternative location for the initial F-35A Wing beddown, primarily because Tyndall AFB already based the fifth-generation F-22 Fighter Training Squadron and an F-22 Operational Squadron, as well as weapons evaluation systems.

In October 2018, the Strategic Basing process for the eighth operational beddown of the F-35A was in the very early stages. Damage or destruction of nearly all of Tyndall AFB facilities from Hurricane Michael in October 2018 changed everything, including the reassignment of the F-22 Squadrons to other bases due to the extensive damage to the base. Due to the extraordinary circumstances presented by the destruction of Tyndall AFB and the strategic need to reconstruct it quickly, the Secretary of the Air Force (SecAF) relied on the analysis performed by the Air Staff in response to Hurricane Michael, which considered:

- The hurricane provided the opportunity to reconstruct Tyndall AFB with the capacity for beddown of an F-35A Wing, such as the F-22 or F-35, which has been analyzed in the Hurricane Recovery EA (USAF, 2020a).
- Repair of the hurricane damage at Tyndall AFB results in Tyndall AFB meeting, or having the space to meet, all mission, capacity, environmental planning, and reasonable cost requirements for an F-35A Operational Wing. The beddown of an F-35A Wing would benefit from updated, repaired, and reconstructed facilities at Tyndall AFB, which can be efficiently used to support USAF resource and budgeting goals.
- The airspace available to Tyndall AFB permits mission training with the full complement of fifth-generation fighter capabilities. Tyndall AFB meets all the USAF military judgment factors, including total force, beddown timing, and force structure, which were used to identify preferred locations for the first F-35A Operational Wing.
- Beddown of an F-35A Wing in the 2023 through 2026 timeframe would directly mesh with the scheduling of Tyndall AFB repair and reconstruction, and with the manufacture and delivery of new F-35A aircraft.

The above Tyndall AFB features, along with management factors, were considered and documented by ACC AF/A8 and presented to the SecAF. The SecAF recognized Tyndall AFB as an excellent location for an F-35A Operational Wing.

2.2.2 Description of the Proposed F-35A Wing Beddown Action at Tyndall AFB

The F-35A Proposed Action is to beddown an F-35A Operational Wing at Tyndall AFB over a period of approximately 3 years and to train in existing airspace and ranges. The F-35A Proposed Action includes construction and/or modification of facilities on the base to support the F-35A operational aircraft, basing of personnel needed to operate and maintain the F-35A, and F-35A training flights at the airfield and in existing airspace associated with Tyndall AFB. No new airspace would be established as part of the F-35A Proposed Action.

2.2.3 Identification of the Tyndall AFB F-35A Wing Alternatives

Two broad sets of requirements were applied to the proposal to beddown the F-35A Wing at Tyndall AFB. Military judgment and mission requirements led to the identification of Tyndall AFB as the location for an F-35A Operational Wing. These requirements are as follows:

- Achieve military judgment plans and guidance, including global posture, building partnerships, total force, beddown timing in relation to available aircraft, force structure logistics supportability, resources, and budgeting.
- Achieve mission requirements, including extensive existing airspace and range capabilities to allow the full exercising of F-35A system capabilities, and base capacity for an operationally efficient F-35A Wing.

Military judgment and mission requirements include the need to ensure F-35A combat-ready active-duty aircrews and maintainers are prepared to meet USAF worldwide deployments. Review of the military judgment and mission requirements resulted in the identification of two alternative Wing squadron configurations for Tyndall AFB:

(1) Three-Squadron F-35A Wing Alternative: Beddown three F-35A Operations Squadrons, each with 24 Primary Aerospace Vehicles Authorized (PAA) and 2 Backup Aircraft Inventory (BAI) aircraft, which would result in a total of 72 PAA and 6 BAI at Tyndall AFB. Aircraft operations and maintenance would be located in the "fighter campus" area of the flight line district. A mixture of repaired and reconstructed existing facilities and new construction would support the F-35A Wing. F-35A-specific facilities would be required on the flight line. Airfield and airspace operations would occur in existing airspace. A three-squadron F-35A Wing was considered in terms of mission, capacity, environmental planning, reasonable cost, and management factors. The F-35A Wing with three squadrons met or exceeded all factors, which identified Tyndall AFB as an excellent Wing location. The three-squadron F-35A Wing is carried forward as a reasonable alternative for analysis in this EIS.

(2) Four-Squadron F-35A Wing Alternative: The hurricane provided the opportunity to reconstruct Tyndall AFB with the capacity for future growth by accommodating a fourth squadron of F-35A aircraft. The four-squadron Wing alternative is an expansion alternative that adds a fourth squadron of 24 PAA and 2 BAI to the F-35A Wing, resulting in a total of 96 PAA and 8 BAI F-35A aircraft. Flight line facilities to support the four-squadron alternative aircraft operations and maintenance could be consolidated in the same facilities built for a three-squadron alternative, and could require additional facilities within the same construction footprint identified within Figure 2.2-1. Airfield operations, personnel, airspace, and range use by a fourth squadron would be proportionate to one of the three squadrons. The four-squadron Wing was compared to factors that led to Tyndall AFB being identified for beddown of an F-35A Wing. A four-squadron F-35A Wing was considered in terms of mission, capacity, environmental planning, reasonable cost, and management factors. The F-35A Wing with four squadrons met or exceeded all factors, which identified Tyndall as an excellent Wing location. The four-squadron F-35A Wing is carried forward as a reasonable alternative for analysis in this EIS. As noted above, the analysis of this fourth squadron is intended to cover the basing of an additional squadron of F-35A. If the USAF proposes to beddown another fifth-generation aircraft type or other aircraft in lieu of the fourth F-35 squadron, this EIS could serve, in part, as the basis for NEPA compliance and decision-making.

2.2.4 Description of the Three-Squadron F-35A Wing Alternative at Tyndall AFB

This alternative of the proposed F-35A Wing would consist of three Operational Squadrons, each with 24 PAA aircraft and 2 BAI aircraft. Beddown of the Wing would include constructing and retrofitting of physical infrastructure and facilities; adding personnel to manage and perform operations, which include maintenance of the aircraft; and training in existing airspace and ranges for F-35A pilots to maintain operational proficiency. This section presents the Three-Squadron F-35A Wing Alternative, including facilities for aircraft maintenance, mission support functions, personnel to execute work related to the F-35A mission, and F-35A training in existing airspace and ranges required as part of the Wing beddown.

2.2.4.1 Facilities and Infrastructure for the F-35A Wing

Hurricane Michael damaged almost every facility on Tyndall AFB and destroyed many facilities. The flight line area was particularly affected. In order to beddown any fighter mission at Tyndall AFB, a number of facilities need to be rebuilt, and some fighter facilities that were damaged or destroyed need replacement.

As a result of anticipated climate change, all structural designs for base reconstruction and for any facilities associated with a new mission would be in alignment with the SecAF directed Severe Weather Readiness Assessment direction in the Air Force Civil Engineer Center's (AFCEC) *Severe Weather/Climate Hazard Screening and Risk Assessment Playbook* (AFCEC, 2020). The steps outlined in the Severe Weather Playbook were applied to reconstructed Tyndall facilities. Design and construction of facilities at the base will use a continuous wind load transfer from roof framing to foundation and construct with exterior envelope materials to reflect the anticipated severe weather hazards and risks. The USAF Unified Facilities Criteria for all facility designs will be combined with the best practices from the Florida Building Code High-Velocity Hurricane Zone into the USAF design guidance. Application of this new guidance will further improve Tyndall AFB facility resiliency to be more capable of withstanding future Category 5 hurricanes ranging from 165 to 186 mph (USAF, 2019b). The potential weather conditions used for the design of facilities are also being incorporated for the management of natural resources in the updated Tyndall AFB Integrated Natural Resources Management Plan (INRMP) (see Section 3.1.4.1.4).

Repaired or rebuilt facilities for Tyndall AFB's recovery, not associated directly with a specific mission, include fuel storage and distribution, fire station, Civil Engineer Squadron facility, facilities to support personnel, and multiple other facilities. Optional locations for the facilities and infrastructure on Tyndall AFB were considered in the hurricane recovery base reconstruction planning and environmental process (USAF, 2020a). The Tyndall Installation Master Plan was updated by the Recovery Plan in conjunction with the base repair and rebuild following Hurricane Michael.

The proposed F-35A Wing requires specific facilities and infrastructure, including an Operations Group, a Maintenance Group, and a Wing Headquarters (HQ). Table 2.2-1 presents F-35A-specific facility projects that are analyzed for the three-squadron F-35A beddown alternative at Tyndall AFB. Buildings and facilities from Table 2.2-1 are undergoing detailed design in 2019–2020. The expected locations for the facilities have been identified, and the environmental analysis in this EIS is based on areas, or boxes, which would encompass the actual footprint of the building or facility and the construction area that could be disturbed during construction (Figure 2.2-1).

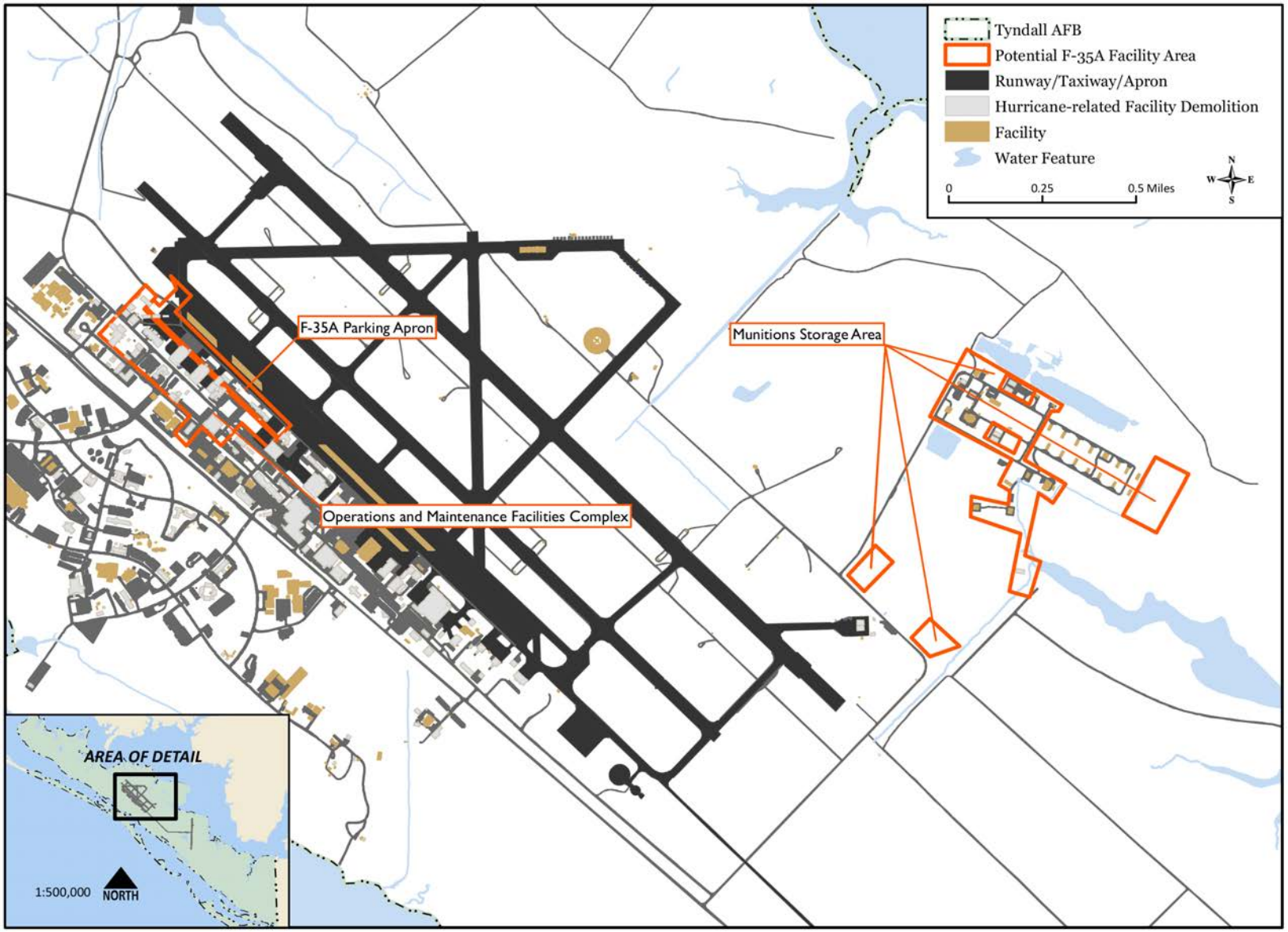

Figure 2.2-1. Tyndall AFB Facilities Locations Associated With the Proposed F-35A Beddown

Optional locations for the F-35A–specific facilities on Tyndall AFB were considered during the hurricane recovery base reconstruction planning and environmental process (USAF, 2020a). The locations for facilities needed for the F-35A Wing identified for analysis in this EIS along the flight line area and the munitions storage area (Figure 2.2-1) were determined as best meeting the overall base planning objectives. Master Plan criteria and new post-hurricane design standards were applied, with the end result being single site locations and consolidation for the proposed F-35A–specific facilities.

Table 2.2-1. F-35A Proposed Facilities at Tyndall AFB

Building	Approximate Square Feet
Squad Ops/AMU Hangar #1	83,151
Squad Ops/AMU Hangar #2	78,006
Squad Ops/AMU Hangar #3	78,006
F-35 Parking Apron	659,020
F-35 Maintenance Squadron Complex	105,605
F-35 AGE Facility	20,699
F-35 Munitions Storage	15,156
Weapons Load Training Hangar	26,522
F-35 Flight Simulator Facility	32,496
Aircraft MX Fuel Cell Hangar	29,525
Aircraft Wash Rack	15,758
Total	**1,143,944**

Key: AFB = Air Force Base; AGE = Aerospace Ground Equipment; AMU = Aircraft Maintenance Unit; HQ = Headquarters; MX = Maintenance; Ops = Operations

2.2.4.2 Personnel and Dependents for the Three-Squadron F-35A Wing Alternative

Construction activities would precede the arrival of the first aircraft, in some cases by about 2 years. The estimated expenditures to construct the F-35A-specific facilities are projected to occur over an estimated 5 years beginning in 2021. The beddown process would occur in phases associated with manufacture and delivery of F-35A operational aircraft (see Table 2.2-2). Delivery of the first F-35As to Tyndall AFB could be as early as 2023, and the last would be scheduled to be completed by the end of 2026, when the full complement of F-35A aircraft could be bedded down at Tyndall AFB.

Table 2.2-2. Projected F-35A Flow to Tyndall AFB

Squadron	FY23 Q4 Total	FY24 Q1 Total	FY24 Q2 Total	FY24 Q3 Total	FY24 Q4 Total	FY25 Q1 Total	FY25 Q2 Total	FY25 Q3 Total	FY25 Q4 Total	FY26 Q1 Total	FY26 Q2 Total	FY26 Q3 Total	FY26 Q4 Total
1	2	6	9	15	16	19	24	24	24	24	24	24	24
2								3	10	18	24	24	24
3											4	16	24

Key: AFB = Air Force Base; FY = Fiscal Year; Q = Quarter

Beddown of the F-35A operational aircraft at Tyndall AFB would require sufficient and appropriately skilled personnel to operate and maintain the aircraft and provide necessary support services. The beddown of a new F-35 Wing would bring an estimated 2,200 personnel to Tyndall AFB consisting of 2,100 active-duty USAF personnel (169 officers and 1931 enlisted), 13 DoD civilians, and an estimated 87 Base Operating Support (BOS) personnel.

A portion of the assigned USAF personnel would be accompanied by dependents. The 2,200 total Wing personnel were calculated to have 2,992 dependents, including 1,496 children, of whom approximately 1,100 would be school-aged.

The manpower build-up would be incrementally synchronized to the aircraft arrival schedule (see Table 2.2-2). The first F-35A personnel could be expected to arrive approximately 6 months prior to first aircraft arrival. This would result in F-35A personnel beginning to arrive in the spring of 2022 and continuing to build up to the 2,200 mission billets over the following 3 years.

The hurricane-induced relocation of the F-22 FTU and the 95th FS personnel resulted in the reduction of approximately 1,400 active-duty billets from Tyndall AFB. The reduction of F-22 related billets reduced the number of dependents by an estimated 1,904, including 952 children, of whom approximately 700 were estimated to be school-aged.

2.2.4.3 Airfield Operations and Airspace Use

F-35A aircrews would train to ensure combat readiness by conducting flight operations in three types of areas—the Tyndall AFB airfield and training ranges and airspace available to the F-35A Operational Wing. The training airspace and ranges are geographically separate from the airfield.

This EIS uses two terms to describe different components of flying activities: sortie and operation. The different meanings of the two terms apply to specific activities of particular airspace environment or unit and provide a means to quantify activities for the purposes of analysis. A sortie consists of a single aircraft from take-off through a landing and includes a flying mission off, summarizing the amount of flight activity from a base and can include more than a single operation. An operation comprises one action, such as a take-off or a landing. Closed pattern operations, such as "touch and go's" (practice approach followed by immediate take-off) constitutes two airfield operations.

The number of airfield operations and sorties are estimated based on the Air Force Ready Aircrew Program training requirements. These requirements are designed to provide sufficient training for aircrew to be fully combat ready. A 72 PAA F-35A Wing would execute about 33,440 airfield operations per year. Airfield operations include departures, arrivals and closed pattern flying. An estimated 1 percent of those operations could be during the hours of 10:00 p.m. to 7:00 a.m., defined as "environmental night". Environmental night receives special consideration for analysis because aircraft noise in those hours is seen as more intrusive than at other times. Activities (primarily sleeping) are more sensitive to noise at night, and the masking effect of ambient noise is reduced. The day-night average sound level (DNL) metric adds 10 dB to the noise occurring during environmental night due to its increased impact. Table 2.2-3 presents the calculated number of airfield operations that would be generated by three squadrons of F-35As.

Table 2.2-3. Proposed Three-Squadron F-35A Wing Annual Airfield Operations

Aircraft	Departures			Arrivals[4]			Closed Patterns[1]			Totals		
	Day[2]	Night[3]	Total	Day[2]	Night[3]	Total	Day[2]	Night[3]	Total	Day[2]	Night[3]	Total
F-35A	12,240	60	12,300	12,187	113	12,300	8,831	9	8,840	33,257	182	33,439

Notes:
[1] All numbers presented in this column are airfield operations, and there are two operations per Closed Pattern event.
[2] Day = 7 a.m. to 10 p.m.
[3] Night = 10 p.m. to 7 a.m. (Environmental Night)
[4] Some Night arrivals are associated with Day departures.

Aircraft operations include proficiency training for the F-35A aircrews and maintenance personnel. An operation is a portion of a sortie, such as a single departure, flight in a specific airspace, or a single arrival. A daily proficiency training sortie would typically depart and return to Tyndall AFB. Each sortie would begin with a departure from Tyndall AFB and end with an arrival at Tyndall AFB. The sortie would be the entire flight, including departure, flight operations conducted after the departure, flights to and from approved airspace, flight operations in the airspace and at the ranges, and flight operations in the airfield pattern. One sortie has at least two operations (departure and arrival) and may have multiple operations depending on the mission.

Pilots associated with the fighter missions would follow an F-35A training syllabus that has been developed by ACC. The F-35A program recognizes that combat pilots will need to conduct the full array of training activities in airspace and ranges as shown in Table 2.2-4.

The three-squadron F-35A Wing would fly an average of 47 sorties per flying day, with each mission lasting approximately 1.5 hours. Sorties would normally be conducted 5 days per week during 260 flying days per year. The total number of annual sorties is calculated to be 12,300 (see Table 2.2-5). This flying schedule, which would occur normally during 12 hours on any given day, would include daytime and nighttime operations.

Table 2.2-4. F-35A Training Mission Types

Major Mission	Training Activities	Airspace Type
Basic Fighter Maneuvers	G-force awareness, maneuverability, break turns, high angle of attack maneuvering, acceleration maneuvering, gun tracking, offensive and defensive positioning, air refueling, stall recovery	MOAs, ATCAA, and Warning Areas
Surface Attack Tactics	Single to multiple aircraft attacking a wide range of ground targets using different ingress and egress methods, delivery tactics, ordnance types, angles of attack, and combat scenarios	MOAs and RAs (over weapons delivery ranges)
Air Combat Maneuvers	Multi-aircraft formations and tactics, systems check, G-force awareness, two-versus-four and four-versus-six aircraft intercepts, combat air patrol, defense of airspace sector from composite force attack, intercept and destroy bomber aircraft, avoid adversary fighters, supersonic engagement	MOAs, ATCAA, Warning Areas, and RAs (over weapons delivery ranges)
Close Air Support	Air support for ground-based offensive and defensive operations, work with Joint Terminal Attack Controllers, use Surface Attack Tactics and Basic Surface Attack components	MOAs and RAs (over weapons delivery ranges)
Air Combat Tactics	Multi-aircraft and multi-adversary defense and combat air patrol, defense of airspace sector from composite force attack, intercept and destroy bomber aircraft, avoid adversary fighters, strike-force rendezvous and protection, supersonic engagement	MOA, ATCAA, and Warning Areas

Key: ATCAA = Air Traffic Control Assigned Airspace; MOA = Military Operations Area; RA = Restricted Area

Table 2.2-5. Annual Sorties Associated With the F-35A Proposed Action

72 PAA F-35A Fighters	Daily Sorties	Estimated Annual Sorties
Daily sorties	Approximately 47	12,300
Nighttime sorties	Normally 2 or fewer	114 (at least partially during night)
Sorties deploying inert munitions at ranges approved for the munitions	Normally 2 or fewer	100 (deploying 200 inert munitions)

Key: PAA = Primary Aerospace Vehicles Authorized

Certain F-35A operational requirements, such as the use of afterburner, are mission- and situation-dependent. Runway length, temperature, atmospheric pressure, wind conditions, and aircraft loads (e.g., avionics, fuel, weapons) are some of the factors that influence pilot decisions to use afterburner power for departures versus standard military power. AFI 11-2F-35A V3, *Flying Operations, F-35 – Aircrew Training*, guidelines state that F-35A pilots should not take off with military power if calculations, based on the relevant site conditions, indicate that the aircraft would require more than 50 percent of the available runway for take-off when using military power. In short, the primary requirement for using afterburner is safety.

ACC evaluated the requirement for afterburner use during departures, calculated take-off requirements, and determined that afterburner use would be required on approximately 5 percent of the total departures from each alternative base. While use of afterburner would be required on 5 percent of departures, rates of use are variable, depending on factors such as air density, temperature, runway length, and weight of the aircraft with equipment and munitions. Afterburner rates of units may opt to use the afterburner more than that, so usage rates of 5, 50, and 95 percent were therefore analyzed to account for this variability. The USAF evaluated three different scenarios for afterburner use: Scenario A is afterburner use on 5 percent of total take-offs, Scenario B is afterburner use on 50 percent of total takeoffs, and Scenario C is afterburner use on 95 percent of total takeoffs. Figure 2.2-2 illustrates the difference between a take-off using afterburner and a take-off using standard military power.

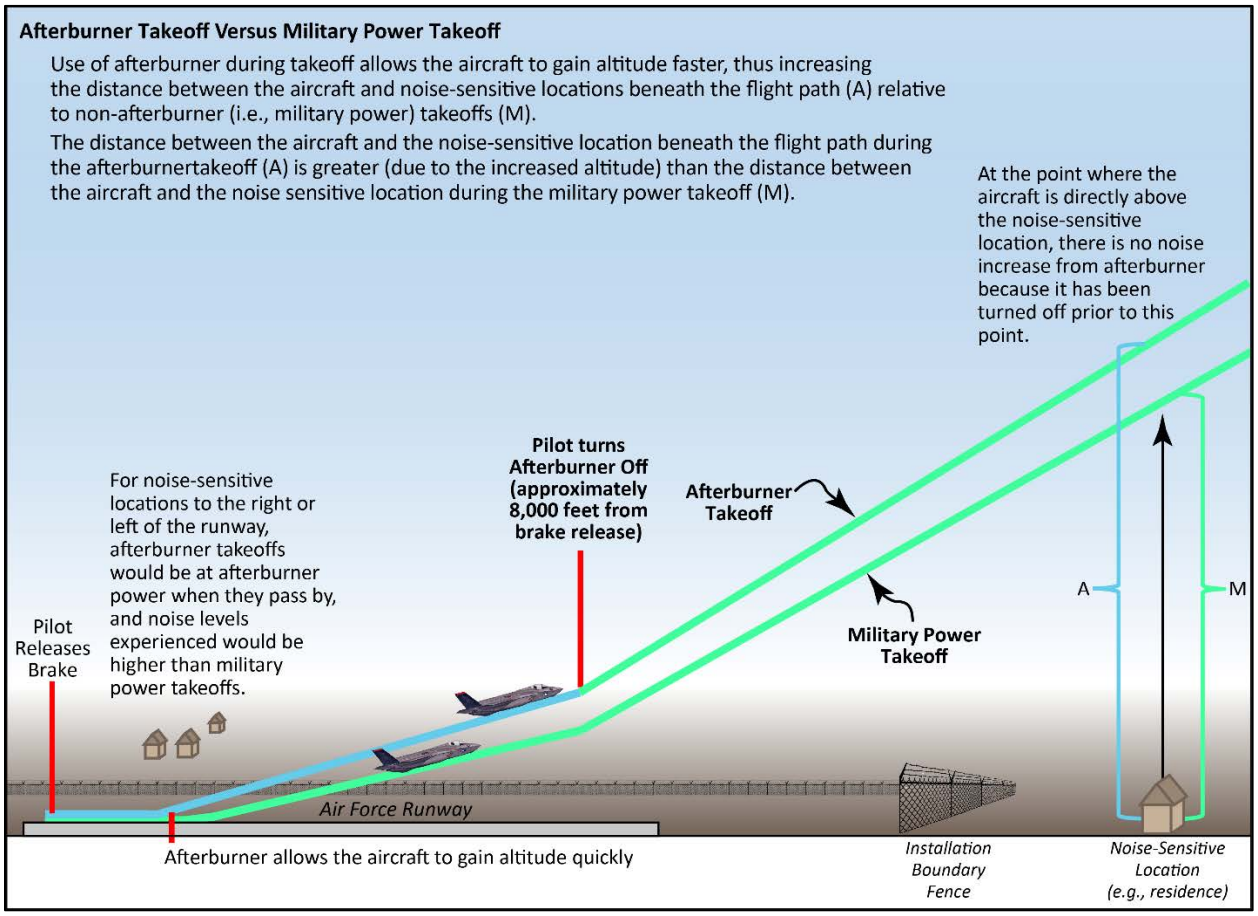

Figure 2.2-2 Afterburner Takeoff versus Military Power Takeoff

2.2.4.4 Training in Airspace and Ranges

Figure 2.2-3 conceptually summarizes the types of airspace proposed to be used by F-35A training aircraft. An estimated 25 percent of the F-35A training would occur in the Tyndall B, C/H, and E Military Operations Areas (MOAs) managed by Tyndall AFB, and the Compass Lake and Carrabelle Air Traffic Control Assigned Airspaces (ATCAAs). The Tyndall B and H MOAs and their overlying ATCAA are generally scheduled together where they constitute the Compass Lake area. The E MOA and overlying ATCAA constitute the Carabelle training area. The Special Use Airspace (SUA) proposed for the majority of F-35A training includes the Warning Areas, W-151 and W-470, managed by Eglin AFB (see Figure 2.2-4).

Table 2.2-6 lists the estimated percentage of time the F-35A pilots would train in the identified airspaces and ranges. Pilots would also train during exercises at other bases where F-35A training activities are approved.

Table 2.2-6. Estimated Airspace and Range Flight Operations Associated With the Three-Squadron F-35A Wing Alternative

Airspace	Airspace Type	Estimated Annual Hours	Percentage of Time at Altitude			
			<5,000 AGL	>5,000 AGL <18,000 MSL	>18,000 MSL <30,000 MSL	>30,000 MSL
Compass Lake Work Area[1]	MOA and ATCAA	2,230	0%	29%	65%	6%
Carrabelle Work Area[2]	MOA and ATCAA	2,277	0%	29%	65%	6%
W-470	WA	12,422	1%	30%	58%	11%
W-151	WA	1,380	1%	30%	58%	11%
Avon Park Range	RA	46	0%	29%	65%	6%
Grand Bay Bombing and Gunnery Range	RA	46	0%	29%	65%	6%
Pinecastle Impact Range	RA	46	0%	29%	65%	6%
Weighted Average of Percentage of Time at Altitude			**1%**	**29%**	**60%**	**10%**

Key: < = less than; > = greater than; AGL = above ground level; ATCAA = Air Traffic Control Assigned Airspace; FL = Flight Level; MOA = Military Operations Area; MSL = mean sea level; RA = Restricted Area; UPBNI = Up To But Not Including; W- or WA = Warning Area

Notes:

[1] The Compass Lake Work Area is composed of the Tyndall B and Tyndall H MOAs with an overlying ATCAA scheduled together and operated as a single block of airspace extending from 9,000 feet AGL up to but not including (UTBNI) 23,000 feet MSL.

[2] The Carrabelle Work Area is typically composed of a subset of the Tyndall E MOA with an overlying ATCAA, extending from 9,000 feet AGL UTBNI 37,000 feet MSL.

Figure 2.2-4 identifies the regional airspaces near Tyndall AFB. Mission training would occur in SUA, including Warning Areas, MOAs, and Airspace for Special Use ATCAAs. The MOAs provide airspace for military aircraft training and serve to warn non-participating aircraft of potential danger. Restricted Areas (RAs) over ranges and overwater Warning Areas preclude entry by non-participating instrument flight rules (IFR) aircraft when the airspace is active for military training.

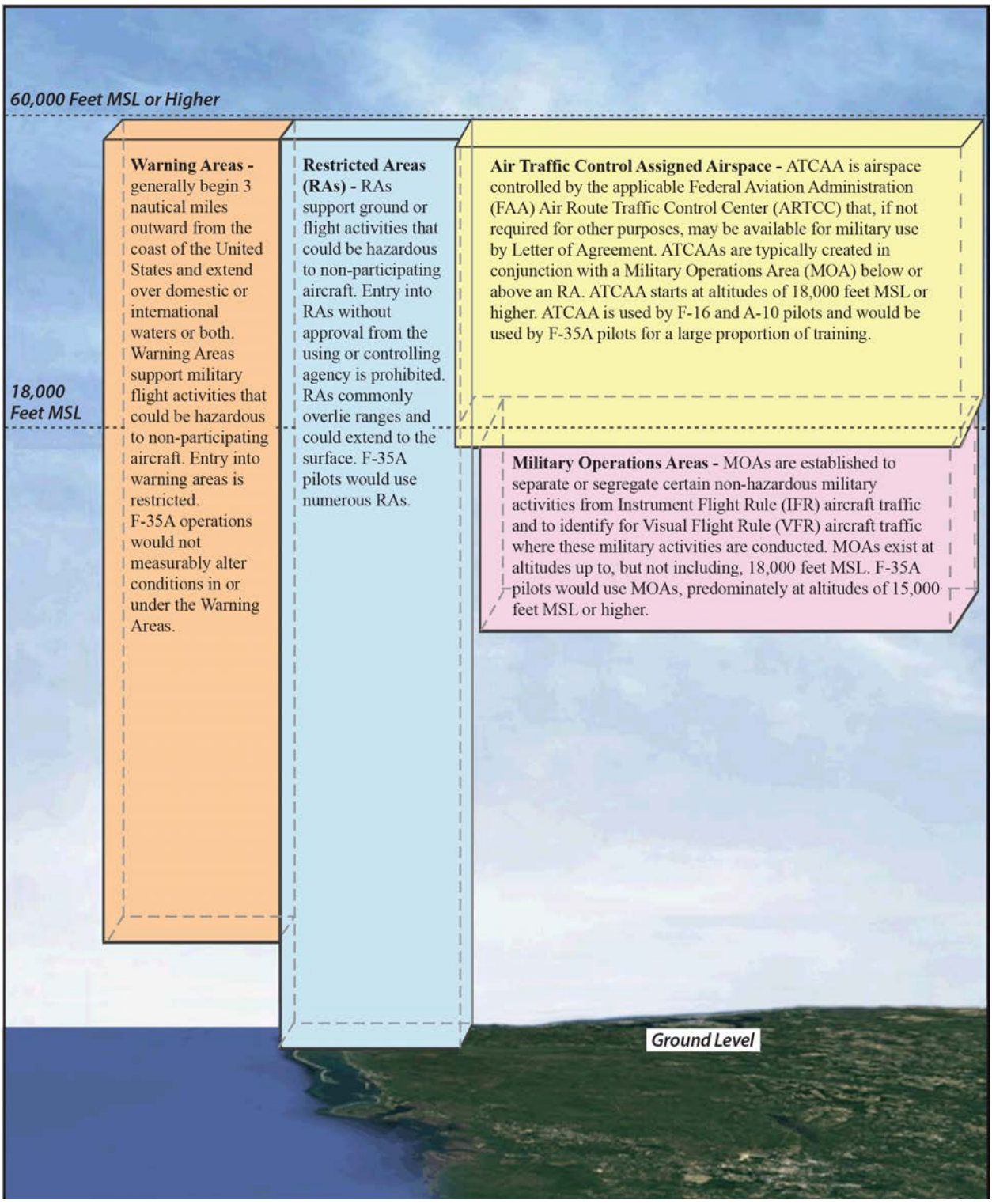

Figure 2.2-3. Types of Training Airspace

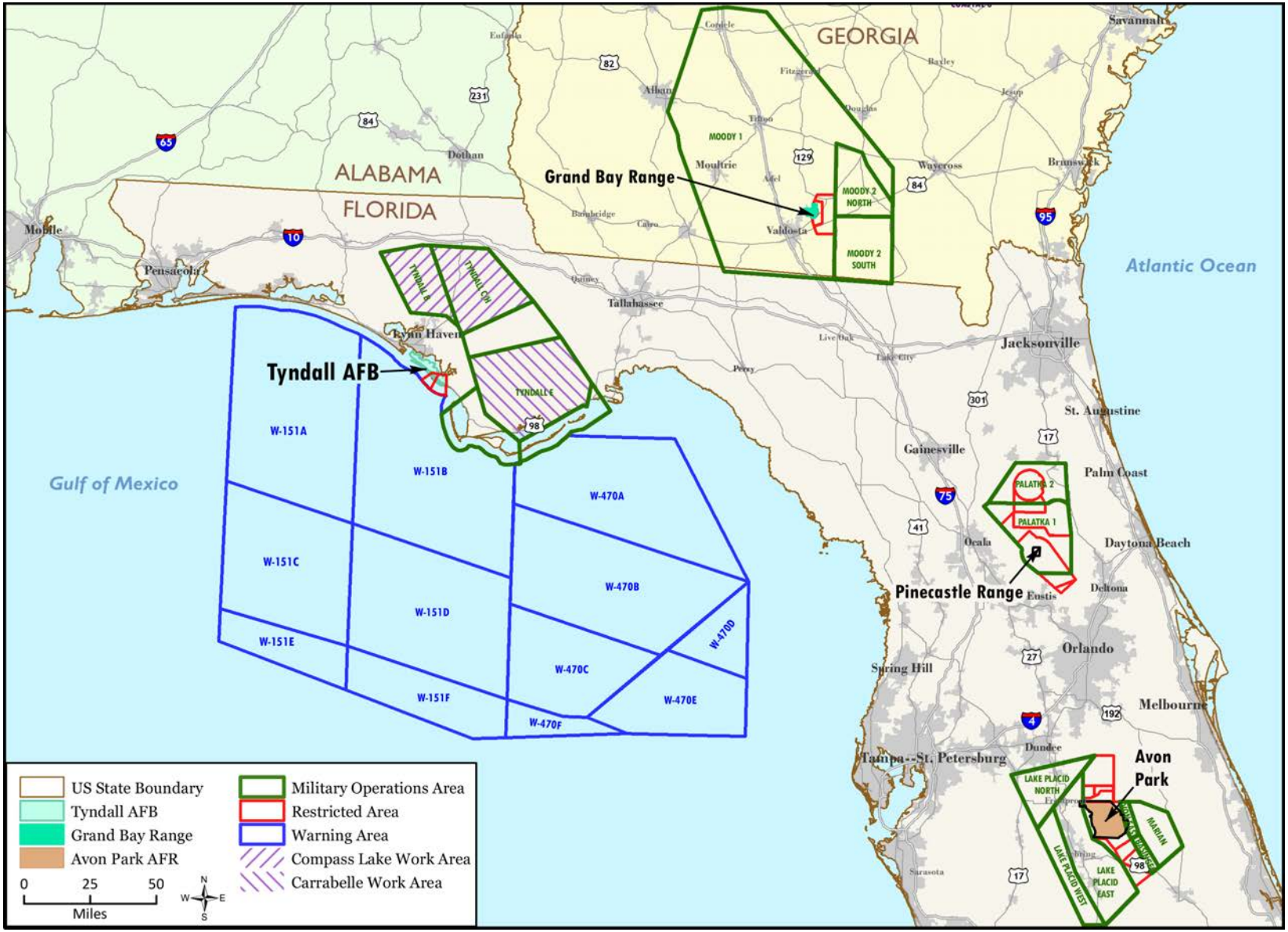

Figure 2.2-4. Regional Airspace and Ranges Proposed for F-35A Use

Training Altitude: F-35A pilots primarily train at altitudes between Flight Level 180 [FL180] (18,000 feet mean sea level [MSL]) and FL300 (30,000 feet MSL). Table 2.2-6 is the expected F-35A aircraft altitude distribution in the airspace associated with the annual training sorties.

Supersonic Flight: Use of supersonic speeds enables F-35A pilots to "close on" (fly toward) and train to set up to fire a missile. F-35A pilots also use supersonic capability defensively to evade adversary air-to-air and ground-to-air weapons. To train with the full capabilities of the aircraft, F-35A pilots would employ supersonic flight where permitted. All supersonic flight would occur at altitudes and within airspace already approved and charted by the Federal Aviation Administration (FAA) for such activities. The USAF anticipates that F-35A supersonic flight training would be conducted above 15,000 feet MSL, with 90 percent occurring above 30,000 feet MSL (Table 2.2-7). F-35A pilots would fly at supersonic speeds below 15,000 MSL only on an occasional basis.

Table 2.2-7. Average Altitude Profiles for F-35A Supersonic Flight

Altitude (feet)	Proposed F-35A
5,000 AGL – 10,000 MSL	0%
10,000 – 15,000 MSL	0%
15,000 MSL – FL300	10%
Above FL300	90%

Key: AGL = above ground level; FL = Flight Level; MSL = mean sea level

Ordnance Use: The F-35A has the requirement and capability to perform air-to-ground missions. F-35A air-to-ground training would represent about 60 percent of the training program, with the air superiority training representing air-to-air missions accounting for the remaining 40 percent. Most air-to-ground ordnance delivery and air-to-air training would be simulated where nothing is released from the aircraft and electronic scoring is used. The F-35A aircraft uses high-fidelity avionics and embedded training systems to simulate ordnance delivery on a target. This type of training could be conducted in any of the SUA, meeting the airspace training event requirements for floor, ceiling, and size.

Three squadrons of operational F-35As would conduct an estimated 100 annual sorties, deploying inert munitions on existing ranges approved for the inert munitions. The F-35A is expected to use the Guided Bomb Unit (GBU)-31 variant of the Joint Direct Attack Munition (JDAM), which is a 2,000-pound, general-purpose Mark 84 bomb, for air-to-ground ordnance delivery. JDAMs are guided to the target by an attached global positioning system receiver. These weapons, commonly released between 20,000 and 40,000 feet MSL, require no laser guidance. Each of the 100 sorties would be expected to carry 2 munitions for a total of 200 inert munitions deployed annually. Optional internal loads include a wide variety of air-to-ground ordnance—small diameter bombs, missiles, dispensers, and guided weapons.

Ordnance delivery training would occur during the times when F-35A pilots would operate in existing Restricted Areas over ranges approved for the inert munitions. One proposed range for ordnance delivery is the 106,000-acre Avon Park Air Ground Training Complex (see Figure 2.2-4). A second location would be the 5,760-acre Pinecastle Impact Range (see Figure 2.2-4). A third location would be the 5,874 acres Grand Bay Range (see Figure 2.2-4). Ordnance delivery may also be conducted at locations such as the Nevada Test and Training Range in Nevada, when pilots are deployed for major flying exercises.

Defensive Countermeasures in Approved Airspace: The F-35A deploys defensive flares during training operations. Flares are dispensed by military aircraft to avoid attack by enemy air defense systems. The F-35A would deploy MJU-61A/B flares during training in airspace already approved for such use. Current restrictions define the altitude of flare use in the approved airspaces from Figure 2.2-4 during the training missions identified in Table 2.2-4. Three squadrons of operational F-35As are estimated to deploy 31,630 flares per year. Based on the emphasis on flight at higher altitudes (see Table 2.2-6), roughly 90 percent of F-35A flare releases would occur above 15,000 feet MSL. At this altitude, most flares would be released more than 21 times higher than the minimum altitude required (700 feet) to ensure complete consumption. Section 3.1.3 explains flare composition, use, and residual materials.

Currently, there is no chaff approved for use by the F-35A. The F-35 Joint Program Office is developing RR-199 chaff cartridges for F-35A training use that may enter the inventory in 2021. The RR-199 training chaff would consist of nontoxic treated paper instead of the environmentally persistent Kapton used in standard chaff. If the RR-199 chaff cartridges become part of the F-35A inventory at Tyndall AFB, an environmental analysis of the proposed use may be necessary at that time.

2.2.5 Description of a Four-Squadron F-35A Wing Alternative

This alternative would beddown four F-35A active-duty squadrons of 24 PAA each at Tyndall AFB.

2.2.5.1 Facilities and Infrastructure

This alternative includes all facilities and infrastructure previously identified for the Three-Squadron F-35A Wing Alternative. Flight line facilities needed to support the Four-Squadron F-35A Wing Alternative aircraft operations and maintenance could include the same facilities built for a three-squadron alternative but could require additional facilities and infrastructure within the same construction footprint identified in Figure 2.2-1.

Construction activities would precede a fourth squadron. For the three squadrons, delivery of the F-35As to Tyndall are projected from 2023 through 2026. A fourth squadron of 24 PAA could result in deliveries in Fiscal Year 27, Quarter 1 through Quarter 4 (compare with Table 2.2-2).

2.2.5.2 Personnel and Dependents

Beddown of three squadrons at Tyndall AFB is estimated in Section 2.2.4.3 to require 2,200 personnel. A four squadron F-35A Wing is estimated to bring a total of 2,932 personnel to Tyndall AFB consisting of 2,799 active duty USAF (225 officers, 2,574 enlisted), 17 DoD civilians, and 116 BOS. The first F-35A personnel for a four-squadron wing could be expected to arrive at Tyndall AFB from the spring of 2022 and continue through to 2027.

The 2,932 personnel would have approximately 3,988 dependents, including 1,994 children, of whom approximately 1,466 would be expected to be school-aged. The reduction of F-22 related billets would be as described in Section 2.2.5.2.

2.2.5.3 Airfield Operations and Airspace Use

Aircraft operations and airspace use would be as described in Section 2.2.4.4. An additional 24 PAA F-35A aircraft would add an estimated 11,147 annual operations to the approximately 33,440 estimated operations associated with 72 PAA for a three-squadron F-35A Wing. Table 2.2-8 presents the calculated number of airfield operations generated by four squadrons.

Table 2.2-8. Proposed Four-Squadron F-35A Wing Annual Airfield Operations

Aircraft	Departures			Arrivals[4]			Closed Patterns[1]			Totals		
	Day[1]	Night[2]	Total	Day[1]	Night[2]	Total	Day[1]	Night[2]	Total	Day[1]	Night[2]	Total
Fighter	16,319	81	16,400	16,249	151	16,400	11,775	12	11,786	44,343	243	44,586

Notes:
[1] All numbers presented in this column are airfield operations, and there are two operations per Closed Pattern event.
[2] Day = 7 a.m. to 10 p.m.
[3] Night = 10 p.m. to 7 a.m. (Environmental Night)
[4] Some Night arrivals are associated with Day departures.

Pilots would perform training mission types as described in Table 2.2-4. The annual training sorties are presented in Table 2.2-9. The total number of annual sorties with the fourth squadron alternative is calculated to be 16,400.

Table 2.2-9. Proposed Four-Squadron F-35A Wing Annual Sorties

96 PAA Fighters	Daily Sorties	Estimated Annual Sorties
Daily sorties	Approximately 63	16,400
Nighttime sorties	Normally 2 or fewer	152 (at least partially during night)
Sorties deploying inert munitions at ranges approved for the munitions	Normally 2 or fewer	134 (deploying 268 inert munitions)

Key: PAA = Primary Aerospace Vehicles Authorized

2.2.5.4 Training in Airspace and Ranges

The airspace and ranges used, and the training use by the fourth squadron would be the same as described for the Three-Squadron F-35A Wing Alternative (see Section 2.2.4.4). The estimated proportion of time at altitude would also be the same as described for the three-squadron F-35A Wing (see Table 2.2-6). Supersonic flight at altitudes for the fourth squadron would be proportionally the same as projected for the three-squadron Wing (see Table 2.2-7). Table 2.2-10 lists the estimated percentage of time the F-35A pilots would train in the identified airspaces and ranges with a fourth squadron. Pilots would also train during exercises at other bases where F-35A training activities are approved.

Ordnance use would occur on the same ranges as described for the Three-Squadron F-35A Wing Alternative. The total number of fourth squadron alternative pilot sorties training with inert munitions is estimated to be 134. An estimated 268 inert munitions would be deployed on the same ranges identified for use by the Three-Squadron F-35A Wing Alternative (see Section 2.2.4.4).

The number of flares annually deployed during training for the four-squadron Wing alternative would be 42,174 flares. Flares would only be deployed in airspace and at altitudes approved for their use.

Table 2.2-10. Estimated Airspace and Range Flight Operations Associated With Four F-35A Squadrons

Airspace	Airspace Type	Estimated Annual Hours	Percentage of Time at Altitude			
			<5,000 AGL	>5,000 AGL <FL180	>FL180 <FL300	>FL300
Compass Lake Work Area[1]	MOA and ATCAA	2,973	0%	29%	65%	6%
Carrabelle Work Area[2]	MOA and ATCAA	3,036	0%	29%	65%	6%
W-470	WA	16,563	1%	30%	58%	11%
W-151	WA	1,840	1%	30%	58%	11%
Avon Park Range	RA	61	0%	29%	65%	6%
Grand Bay Bombing and Gunnery Range	RA	61	0%	29%	65%	6%
Pinecastle Impact Range	RA	61	0%	29%	65%	6%

Key < = less than; > = greater than; AGL = above ground level; ATCAA = Air Traffic Control Assigned Airspace; FL = Flight Level; MOA = Military Operations Area; MSL = mean sea level; RA = Restricted Area; UPBNI = Up To But Not Including; W- or WA = Warning Area

Notes:

[1] The Compass Lake Work Area comprises the Tyndall B and Tyndall H MOAs with an overlying ATCAA scheduled together and operated as a single block of airspace extending from 9,000 feet AGL up to but not including (UTBNI) 23,000 feet MSL.

[2] The Carrabelle Work Area is typically composed of a subset of the Tyndall E MOA with an overlying ATCAA, extending from 9,000 feet AGL UTBNI 37,000 feet MSL.

2.2.6 No Action Alternative for F-35A Wing Beddown

40 CFR 1502.14(d) of the CEQ's regulations for implementing NEPA requires the analysis of a No Action Alternative in an EIS to provide a benchmark, and enable decisionmakers to compare the magnitude of the environmental effects to a proposed action and alternatives. No action means that an action would not take place and the resulting environmental effects from taking no action would be compared with the effects of allowing the proposed activity to go forward. No facilities construction, personnel changes, or airspace transit and proficiency training would occur at this time.

No action for the F-35A Wing proposal in this EIS reflects the status quo, where no beddown of an F-35A Wing would occur, and there would be no F-35A–related changes to base facilities, personnel, or airfield and airspace flight operations. The No Action Alternative would represent the existing base conditions, or affected environment, as described for each resource area in Section 3.1. For the majority of the resource areas, the affected environment represents the most current data available. For a few resources, such as infrastructure and socioeconomics, the affected environment (No Action) would represent the existing base conditions projected for 2023, when reconstruction of Tyndall AFB would be well underway, but without the construction, personnel, or flight operations associated with a fifth-generation aircraft flying mission. There would continue to be transient aircraft and training aircraft using the available airspace, as well as working with the 53rd Weapons Evaluation Group (53 WEG). There would be manned and unmanned QF-16 flight operations in support of the 53 WEG. The total number of No Action base personnel and associated employees as of 2023 would be approximately 4,250 as compared with the pre-hurricane number of 5,657 (USAF, 2018a).

2.2.7 Pre-Hurricane 2018 Basis for Comparison

As described above, the No Action Alternative represents the affected environment (the "current" state at Tyndall AFB, or the "during base reconstruction" state, which has no active F-22 mission and reduced base personnel levels). The pre-hurricane conditions of 2018 are presented for some resource areas where it would be useful as a point of comparison to provide context to the environmental impacts for the local public and decisionmakers. The No Action Alternative conditions (post-hurricane) depict the affected environment, from which the potential impacts of a given Proposed Action are determined. Thus, for specific resources, the ability to compare the pre-hurricane with No Action and the Proposed Action(s) helps understand the intensity of impacts.

2.2.8 Identification of the Preferred Alternative for the F-35A Wing Beddown at Tyndall AFB

According to CEQ guidelines, an agency's preferred alternative is the alternative that the agency believes would fulfill its statutory mission and responsibilities, considering economic, environmental, technical, and other factors (CEQ, 1981). CEQ regulations require the section of the EIS on alternatives to "identify the agency's preferred alternative if one or more exists, in the draft statement, and identify such alternative in the final statement…" (CEQ, 1981).

In spring 2019, the SecAF determined that Tyndall AFB is a preferred location for the beddown of a new F-35 Wing. The USAF has identified the Three-Squadron F-35A Wing Alternative as the preferred alternative for the F-35A Wing beddown at Tyndall AFB.

The USAF decisionmaker will use the information and analysis contained in this EIS, along with other factors, to decide how best to satisfy the stated purpose and need within mission constraints. A final determination regarding the beddown of the F-35A Wing at Tyndall AFB will be reflected in the ROD at the conclusion of the EIS process.

2.3 MQ-9 RPA OPERATIONAL WING BEDDOWN

ACC is the primary force provider for combat airpower, including the MQ-9 RPA, to the United States' warfighting commands. The MQ-9 aircraft is increasingly used by the United States and allied forces to support military actions. The intensity of MQ-9 aircraft requirements has placed extreme pressure on MQ-9 personnel. The MQ-9 Proposed Action is to beddown an MQ-9 Wing with 24 MQ-9 aircraft at one of two alternative bases, which could achieve mission requirements while helping to improve conditions for MQ-9 personnel.

The MQ-9 Wing beddown would support ACC in the operation of MQ-9 RPAs with fully trained combat aircrews. The Wing's mission is twofold:

- Wing personnel would conduct proficiency training in operations and maintenance of the MQ-9 aircraft at the selected base to ensure combat crews are fully capable of performing all mission tasks.

- Wing pilots and sensor operators would use cockpits at the selected base location to fly, by satellite, remote combat missions with MQ-9 aircraft based in an overseas theater of operations.

2.3.1 General Requirements for an MQ-9 Operational Wing

The proposed MQ-9 Wing beddown would include a Wing HQ with an Operations Group and Maintenance Group.

The Operations Group consists of an Operations Support Squadron (OSS) and three MQ-9 Attack Squadrons. One assigned MQ-9 squadron would perform flight operations using the 24 MQ-9 aircraft stationed at the selected base, including departures, arrivals, flight in local and regional airspace, and deployment of inert munitions on existing ranges (see Sections 3.1.3 and 3.2.3). The other two MQ-9 squadrons would remotely fly overseas combat missions using MQ-9 aircraft that are physically located at the overseas bases.

The Maintenance Group supervises the Aircraft Maintenance Squadron, the Aircraft Maintenance Unit (AMU), and the Aircraft Maintenance Communications Unit. Maintenance would be performed on the 24 assigned aircraft to train and to support flight operations in a newly constructed Maintenance Complex. An estimated 1,000 personnel would work at the Maintenance Complex. This complex includes constructing/retrofitting facilities for the AMU and the Aircraft Maintenance Communications Unit, managing and storing all required parts and supplies, storing MQ-9 aircraft, providing training to load and unload weapons using inert munitions, and maintaining aircraft fuel cells. With typically scheduled 12-hour missions, MQ-9 aircraft will need personnel to perform maintenance during the day and night.

2.3.1.1 Facilities and Infrastructure for the MQ-9 Wing Beddown

A combination of new construction and renovation to existing facilities and infrastructure would be needed to support the new Wing at either base alternative. Table 2.3-1 outlines the basic allocation and physical requirements necessary to support the MQ-9 Wing and 24 RPAs. An estimate of the square footage is given for each new or renovated facility. MQ-9–specific facility construction would occur over a 4- to 5-year period. This environmental analysis assumes that the MQ-9 construction schedule begins in 2021. All beddown schedules incorporated in this EIS are subject to Congressional budget allocations.

Service-type facilities and infrastructure would be required to support the MQ-9 mission at either base, depending on a combination of factors. These base-specific facilities and infrastructure include connecting utilities, extending communications, implementing roadway improvements, and/or providing new or improved access to the base. The estimated construction for the MQ-9-specific facilities would occur over a 4- to 5-year period. The beddown schedule of any weapon system is dependent on Congressional budgeting. For the purpose of this EIS, the MQ-9 beddown schedule is assumed to be as identified in 2018 when this EIS was initiated.

Table 2.3-1. MQ-9 Wing Required Facilities and Infrastructure

Building	Square Footage[1]
Operations Complex	
Wing Headquarters (HQ) with Squadron Operations Center	20,000
Operations Group HQ/Operations Support Squadron	22,000
Operations Facility (including Satellite Communications (SATCOM) maintenance, foundations) • Attack Squadrons 1 and 2 (61,000) • Dwell space (9,000) • Predator® Mission Aircrew Training System (PMATS) (simulator) (18,000)	91,000
Maintenance (MX) Complex	
MX Group HQ	10,000
Maintenance Squadron, general purpose MX	30,000
Aerospace Ground Equipment (MX/storage)	10,000
Aircraft Maintenance Squadron/two aircraft MX Units/Aircraft Communications MX Unit	38,000
Launch and Recovery Attack Squadron (with 7 Ground Data Terminal foundations and towers)	20,000
Two 10-bay hangars	130,000
One two-bay fuel cell hangar	21,000
One two-bay weapons load training hangar	21,000
Parts/supply/casket storage	82,000
Flight line kitchen	6,000
Satellite fire station	7,000
Two Munitions Storage Buildings (Tyndall AFB: 4,320 square feet; Vandenberg AFB: none)	4,320 or 0
Base Support Facilities	
Fitness Center addition (Tyndall AFB: 20,000 sf; Vandenberg AFB: 38,700 sf)	20,000 or 38,700
168-person Airmen Dormitory	68,200
Child Development Center – Tyndall AFB Alternative only	44,000
Infrastructure	
Parking for up to 420 vehicles (Operations Complex)	138,600
Roadways	No new roadways anticipated except parking lot access
Utilities/communications to site (Existing utility corridors are anticipated; ½ mile of new)	31,700 (surface disturbance)
Site clearing	Approx. 40–50 acres total
Runoff retention	Approx. 1–2 acres total
Technical support communications/power towers/tech pads (Ground Data Terminals)	1,008
Mobile Ground Control Station concrete pad and utilities (includes fence)	12,500
MQ-9 parking ramp, taxiways, airfield lighting	Re-utilize existing at Tyndall AFB preferred site. 240,000 all other sites
Parking for up to 330 vehicles (Maintenance Complex)	108,900
Dormitory parking for up to 120 vehicles	39,600

Key: AFB = Air Force Base; HQ = Headquarters; MX = Maintenance; PMATS = Predator® Mission Aircrew Training System; SATCOM = Satellite Communications; sf = square feet

Note:

[1] Measurements in square feet unless otherwise noted.

2.3.1.2 Personnel and Dependents for the MQ-9 Wing Beddown

The beddown of the MQ-9 mission would require basing sufficient personnel to operate and maintain the aircraft and to provide necessary support services. The beddown of a new MQ-9 Wing would bring an estimated 1,900 additional personnel to the selected base. The additional personnel would include 1,500 active-duty USAF personnel (300 officers and 1,200 enlisted), 300 DoD civilians, and an estimated 100 BOS personnel who would provide engineering, contracting, and other base support for the new MQ-9 Wing.

The 1,900 personnel would be accompanied by a calculated 2,584 dependents, including 1,292 children, of whom approximately 950 would be school-aged.

2.3.1.3 MQ-9 Aircraft Operations

The MQ-9 aircraft proposed for the Wing beddown would operate from the selected airfield (Tyndall AFB or Vandenberg AFB) with clear line of sight to a Ground Data Terminal (GDT) antenna for communications during take-off and landing. The remote pilot and sensor operator would take control of the aircraft using the primary MQ-9 satellite link for over the horizon communications. Aircraft operations include proficiency training for the MQ-9 aircrews and maintenance personnel that would permit operational pilots and sensor operators to support the wide range of the aircraft's capabilities. Table 2.3-2 identifies proposed MQ-9 flying sorties for the 24 MQ-9 aircraft at the selected base. Sorties would normally be conducted 5 days per week during 260 flying days per year, and would last approximately 12 hours. The total number of annual sorties is calculated to be 2,820. The 2,820 MQ-9 sorties would equate to about 5,640 airfield operations plus any additional closed pattern practice landings and takeoffs the operator may perform as part of a single sortie. The flying schedule includes daytime and nighttime flights, and will require an average daily flying window of 16 hours. With a mission duration of up to 12 hours, as many as 2,200 of the 2,820 total annual sorties could occur, at least partially, during nighttime. Daily proficiency training sorties would typically depart and return to the selected base. During a typical weekday, MQ-9 sorties include flying pattern work at the airfield for an estimated 4 hours per day.

Table 2.3-2. Proposed MQ-9 Aircraft Sorties

Total MQ-9 RPAs – 24	Daily Sorties	Annual Sorties
Daily sorties	Up to 12	Up to 2,820
Nighttime sorties	From 2 to 10 of the daily sorties	Up to 2,200 of the annual sorties would occur at least partially during nighttime.
Sorties deploying inert munitions at ranges approved for the inert munitions	From 2 to 4 of the daily sorties	200 of the annual sorties

Key: RPA = remotely piloted aircraft

The MQ-9 system carries the multi-spectral targeting system, a camera system similar to targeting pods carried by all tactical attack platforms. The multi-spectral targeting system incorporates a laser range finder/designator, which would be deployed at approved military ranges to precisely designate targets for inert laser-guided munitions, such as the GBU-12 Paveway II. The proposed Wing would deploy an estimated 300 inert GBU munitions and 100 inert JDAMs at military ranges approved for their use as part of personnel proficiency training. A JDAM is a bomb with a guidance

kit to make it an all-weather precision-guided munition. There would be no live or inert storage or use of Hellfire missiles at the base or at ranges associated with the proposed MQ-9 Wing beddown evaluated in this EIS. Captive-carry training missiles would be used for training purposes. Captive-carry munitions are completely inert and remain attached to the aircraft at all times.

Of the proposed 2,820 proficiency-training sorties, 200 sorties would involve deploying two inert munitions each on existing ranges approved for the inert munitions. No live weapons would be deployed. The ranges proposed for use by Tyndall AFB-based MQ-9s are identified in Section 2.3.3.2. The ranges proposed for use by Vandenberg AFB-based MQ-9s are identified in Section 2.3.4.2. The MQ-9 does not deploy defensive countermeasures such as chaff or flares.

2.3.2 Alternative Selection Process

Identifying and analyzing alternatives is one of the core elements of the EIAP under NEPA and the USAF's implementing regulations. The USAF may expressly eliminate alternatives from detailed analysis based on reasonable selection standards (32 CFR 989.8[c]). This section describes the USAF strategic basing process and the application of this process to identify MQ-9 Wing beddown alternative base locations. The process applied operational and other criteria to identify reasonable alternatives for the beddown of the MQ-9 Wing.

The USAF followed the process identified in AFI 10-503, July 28, 2017, *Strategic Basing*, to determine proposed locations to beddown the MQ-9 Wing. The USAF strategic basing process provides an enterprise-wide repeatable process for decision making to ensure basing actions involving USAF units and missions support mission requirements. The need for a new MQ-9 Wing was validated through an enterprise process involving collaborative staffing between ACC and HQ USAF/SecAF functional offices. SecAF is the final approval authority on moving forward with actions to establish and locate the MQ-9 Wing.

2.3.2.1 Selection Standards for Base Alternatives

ACC worked to identify reasonable alternatives based on universal selection standards, which represent capabilities that each installation must have, to a reasonable degree, in order to qualify as an alternative. The selection standards are as follows:

- **Mission:** ability to conduct RPA core mission, access to training and range airspace, and minimum weather requirements
- **Capacity:** ability to provide mission operational and maintenance facilities, communications infrastructure, and base operating support
- **Environmental:** considerations on air quality, incompatible development, base encroachment, and land use controls
- **Cost:** consideration of area construction factors (based on Unified Facilities Criteria 3-701-01, *DoD Facilities Pricing Guide*, dated March 2011, Change 11, September 2016), area basic allowance housing rates, and area General Schedule locality pay

Each of the 50 bases was sent an extensive data survey that addressed each area of consideration. The individual bases completed the data survey, validated the results at Wing leadership level, and

again at the respective major command level. The responses were matched against each linear weighted sub-criteria and input into a USAF-approved studies and analysis model. The model results ordered each base as to how well each base met the SecAF-approved MQ-9 Wing needs—mission, capacity, environmental considerations, and cost.

The selection standards used to evaluate potential installations were based on a base's ability to meet the MQ-9 core mission capabilities. The five mission capability standards applied to refine the identification of reasonable alternatives are outlined below:

Standard 1: Mission Proficiency Training

- Proficiency training infrastructure access within 200 nautical miles (NM)
  - RPA allowable airspace (Restricted, Warning, MOA/ATCAA with FAA Certificate of Authorization [COA])
  - Air Surveillance Radar 11
  - Access to air-to-surface range
  - Overwater warning or restricted airspace for airborne interdiction of maritime targets mission
- Ability to conduct proficiency training:
  - Co-located and/or ability to train with a flying Wing/Group in RPA core competencies (intelligence surveillance reconnaissance, air interdiction, Close Air Support, personnel recovery, dynamic target, strike coordination and reconnaissance)
  - External partner operation in RPA airspace/range
  - Visual flight rules pattern compatible: (day and/or night, 4 hours total per day)
  - Ability to support up to 12 proficiency sorties per day

Standard 2: Mission Weather

- Meet minimum weather criteria:
  - No icing conditions at least 67 percent of the time
  - Crosswinds less than 15 knots for at least 80 percent of the time
  - Ceiling/visibility of at least 1,500 feet for 3 NM for at least 75 percent of the time

Standard 3: Available Land and/or Repurpose Facilities for Operation, Support and Maintenance Activities

- Sensitive Compartmented Information Facilities (SCIF) protection level-3
- Wing/general purpose/OSS/LR/simulator
- Administrative/training
- One load-bearing pad for two Mobile Ground Control Stations
- Commercial power and heating, ventilation, and air conditioning
- Two hangars
- General purpose/storage/support
- Ramp to accommodate a minimum of 18 MQ-9 aircraft

Standard 4: Capacity Communications Requirements

- External base communications architecture
- Intra-base communications architecture
- BOS communications (non-classified internet protocol, router/secret internet protocol, router/telephone) with 24/7 support
- Joint worldwide intelligence communications system infrastructure access with 24/7 support
- Available C-Band spectrum

Standard 5: Capacity Base Support/Quality of Life

- Base support facilities to provide services, or the ability to construct facilities, to support an increase of up to 1,900 personnel
    - Medical facilities
    - Dormitories
    - Fitness center
    - Child Development Center
    - Dining facilities
- The installation selected for the MQ-9 Wing beddown must meet CPIP objectives (see Section 1.3.1) to care for Airmen and provide improvements in work environment and overall quality of life.

2.3.2.2 Results from Application of Selection Standards for Base Alternatives

The selection standards, including the mission capability standards, were applied to the 50 bases determined to meet at least the basic purpose of and need for the MQ-9 Proposed Action. SecAF determined the following two locations best meet the purpose of and need for the MQ-9 Proposed Action. These locations are analyzed in this EIS as the two reasonable alternatives:

- Tyndall AFB, Florida
- Vandenberg AFB, California

The storm damage to Tyndall AFB resulting from Hurricane Michael in October 2018 did not negate the application of the basing selection standards to identify Tyndall AFB as a reasonable alternative for the MQ-9 Wing beddown.

2.3.3 Detailed Description of the Tyndall AFB MQ-9 Wing Beddown Alternative

This section describes the Tyndall AFB Alternative, and presents the base-specific facilities and airspace needed to meet all mission requirements associated with a beddown of the MQ-9 Wing at Tyndall AFB. Personnel and dependents at either location would be as described in Section 2.3.1.2. MQ-9 aircraft operations at either base would be as described in Section 2.3.1.3.

2.3.3.1 New Facilities and Infrastructure

The USAF considered optional locations for the facilities and infrastructure at each base alternative. Table 2.3-3 lists the new facilities needed for the MQ-9 Wing beddown at Tyndall AFB, along with the optional facility locations evaluated in this EIS. As a result of anticipated climate change, all structural designs for base reconstruction and for any facilities associated with a new mission would be in alignment with the SecAF directed Severe Weather Readiness Assessment direction in the *Severe Weather/Climate Hazard Screening and Risk Assessment Playbook* (AFCEC, 2020), as described in Section 2.2.4.1.

Table 2.3-3. Tyndall AFB Proposed Facility Siting

Building	Description
Operations Complex	Construct a new Operations Complex facility. The new facility would be sited off Beacon Beach Road.
Maintenance Complex (Option 1)	Construct a new Maintenance Complex facility. The new facility would be sited on the south side of the existing Main Runway and would include up to seven Ground Data Terminal foundations and towers located on the north side of the main runway airfield.
Maintenance Complex (Option 2)	Construct a new Maintenance Complex facility that would be sited on the southwest side of the existing drone runway (the "Alternate Runway Option") in the eastern portion of the base, and would include up to seven Ground Data Terminal foundations and towers.
Child Development Center	Construct a new Child Development Center facility that would be sited off Mississippi Road.
Airmen Dormitory	Construct a new dormitory. The new dormitory would be sited in the base dormitory complex area.
Fitness Center (Option 1)	Construct an additional fitness center with capabilities to provide adequate space for additional assigned personnel, which would be sited near the flight line in the central portion of the airfield.
Fitness Center (Option 2)	Construct an additional fitness center with capabilities to provide adequate space for additional assigned personnel, which would be sited near the flight line at the western end of the airfield.
Additional Base Entry Control Gate	Construct a new base entry control gate from U.S. Highway 98 on the eastern end of the base to provide access for the Alternate Runway Option.
Infrastructure and Communication Conduit Extensions	Power, base communication, water, and wastewater lines would need to be extended to new facilities. Extensive infrastructure extensions would be required for the remote Maintenance Complex for the Alternate Runway Option. A combination of existing conduit and over 31,000 feet of new conduit would be required to support the Maintenance Complex. This is a very remote site with minimal communications infrastructure available.
Munitions Storage	Construct a munitions storage facility capable of storing the inert GBUs and inert JDAMs that would be deployed during MQ-9 training, which would be sited within the existing munitions storage area.

Key: GBU = Guided Bomb Unit; JDAM = Joint Direct Attack Munition

Operations Complex

The Operations Complex includes the Wing HQ, Operations Group HQ, OSS, and two Attack Squadrons, utilities, and associated parking lot. The outlined area in Figure 2.3-1 illustrates the potentially disturbed area to be used during siting and construction of the Consolidated Operations Complex. As part of the MQ-9 Proposed Action, areas that are temporarily disturbed during construction would be revegetated.

The square footage of the Mission Control Element Squadron and Squadron Operations Center (SOC) required facilities is presented in Table 2.3-1. Two generators (with fencing) would be

needed to support the Attack Squadrons and SOC. Construction of four 50-foot by 50-foot concrete pads exterior to the building for four satellite communications antennas with a supporting generator (with fencing) would also be required.

Maintenance Complex

The Maintenance Complex includes Maintenance Group HQ, Aircraft Maintenance Squadron, AMU, Aircraft Maintenance Communications Unit, LR Attack Squadron, utilities, and associated parking lot. The square footage of required facilities is presented in Table 2.3-1. Two options are carried forward for environmental analysis of the Maintenance Complex. Option 1 would be sited on the south side of the existing Main Runway, toward the eastern end of the airfield. Option 2 of the Maintenance Complex would be constructed on the west side of the existing drone runway (the "Alternate Runway Option") in the eastern portion of the base. Figure 2.3-1 presents the two optional sites for the Maintenance Complex. The outlined areas in Figure 2.3-1 indicate the potentially disturbed area to be used during siting and construction of Option 2 of the Maintenance Complex; including a new gate, roadway, up to seven GDT foundations and towers, and utilities; totaling approximately 596 acres. Areas that are temporarily disturbed during construction would be revegetated as part of the MQ-9 Proposed Action.

Placement of the Maintenance Complex at the Alternate Runway in the eastern portion of the base (Option 2) would require construction of a new Base Entry Control Gate adjacent to U.S Highway 98 (US-98). The proposed Base Entry Control Gate would reduce traffic congestion and provide direct access to the proposed Maintenance Complex location, which is adjacent to the Alternate Runway. Figure 2.3-1 includes the new access gate from US-98.

LR Squadron requirements include construction of a new 20,000-square-foot facility located on the flight line. Two Mobile Ground Control Stations would be placed on an exterior 70-foot by 70-foot concrete pad with up to four Environmental Control Units and up to three generators (with fencing). The LR Squadron would be located within the Maintenance Complex.

Ground Data Terminal Foundations and Towers

Up to seven GDT foundations and towers would be required for each option of the Maintenance Complex, and would consist of 12-foot by 12-foot concrete pads, with towers up to 60 feet tall. In order to perform maintenance on the GDTs, a 12-foot wide one-lane Access Road connecting them would be built. Option 2 of the Maintenance Complex would have the towers within the 596-acre area of potential disturbance, and Option 1 would have the towers on the north side of the airfield (Figure 2.3-1).

Child Development Center

The Child Development Center is a new 44,000-square-foot facility that would support the increase in base population. The outlined areas in Figure 2.3-1 present the potentially disturbed area to be used during siting and construction of the center (17 acres).

Airmen Dormitory

The Airmen Dormitory proposed for Tyndall AFB would be a 95,626 square-foot building required to support the increase in population associated with the proposed MQ-9 Wing beddown. The dormitory site is near existing dormitories, with access to base recreation and eating facilities.

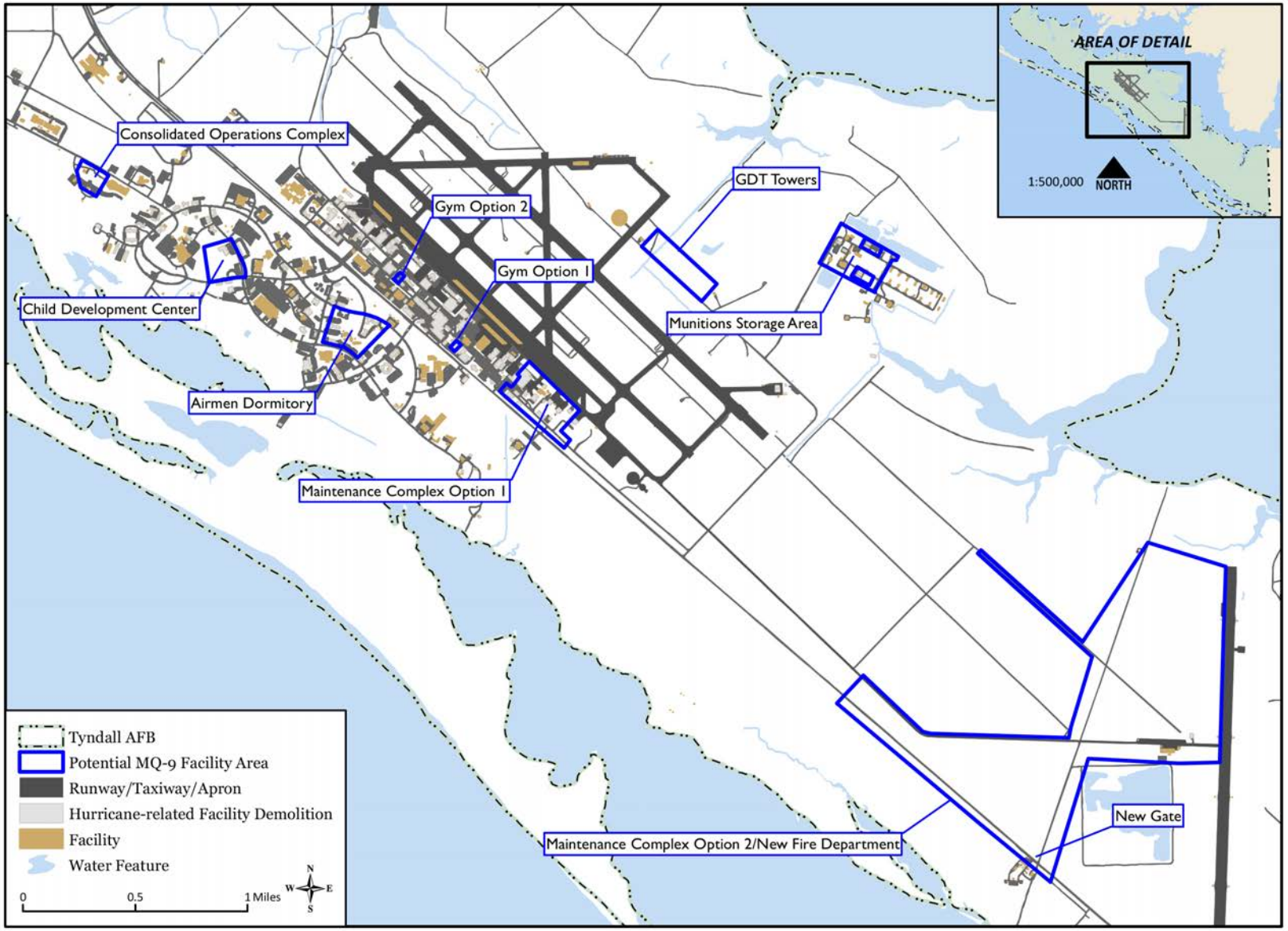

Figure 2.3-1. Tyndall AFB Facilities and Optional Facility Locations Associated With the Proposed MQ-9 Beddown

The outlined area in Figure 2.3-1 presents the potentially disturbed area to be used during siting and construction of the proposed dormitory, buildings access, and parking areas, totaling approximately 8 acres.

Fitness Center

The Fitness Center would be a new building (up to 28,000 square foot in size), and would be placed in the developed area on the flight line. Option 1 would locate the facility in the central portion of the airfield, and Option 2, at the western end of the airfield and provide capacity for the projected additional demand. The outlined area in Figure 2.3-1 presents the potentially disturbed area to be used during siting and construction of the Fitness Center, building access, and parking areas, totaling approximately 0.73 acre.

Munitions Storage

Two 2,160-square-foot munitions storage buildings would be built within the existing Munitions Storage Area (MSA). These two new facilities would be capable of storing the inert GBUs and inert JDAMs that would be deployed during MQ-9 training.

2.3.3.2 Airspace and Ranges

Depending on which option for the location of the Maintenance Complex, Tyndall AFB-based MQ-9 aircraft would normally conduct daily pattern work within a 3-NM radius of the Main Runway (Option 1) or the Alternate Runway (Option 2). The MQ-9s would operate in the area presented in Figure 2.3-2 to the north, east, and south of the base for 4 hours of daily pattern work during weekdays. The pattern work would require an FAA-issued COA to operate the RPAs outside of Tyndall AFB airspace and adjacent offshore warning area airspace. The FAA-approved COAs would be 2 NM wide. MQ-9 arrivals on the Main and Alternate Runways would normally be from the south. Normal MQ-9 departures and arrivals on the Alternate Runway would not affect traffic on US-98.

An MQ-9 mission to the ATCAAs to the east or north of Tyndall AFB (see Figure 2.3-3) would typically depart to the south and fly in a COA to climb outside of the restricted airspace to operational altitudes in the ATCAAs above 18,000 feet MSL (FL180). The MQ-9 typically would fly between FL200 to FL220 in the COAs and could operate from FL220 to FL260 for proficiency training in approved airspace. With an appropriate COA, the MQ-9 would operate in the Eglin AFB-coordinated Gulf Regional Airspace Strategic Initiative (GRASI) Nail (FL240-FL600), Rustic (FL240-FL600), Raven North (FL240-FL600), and Raven South (FL240-FL600) ATCAAs (Figure 2.3-3).

An MQ-9 mission would use an approved FAA COA to transit to the Grand Bay Range managed by Moody AFB, Georgia, and to train in the adjacent MOAs/ATCAAs. Figure 2.3-3 presents the conceptual COA transit routes to access the training ranges from Tyndall AFB. MQ-9s would use an approved FAA COA to transit to the south and east to the Avon Park Range, managed by MacDill AFB, Florida, and to train in the adjacent MOAs/ATCAAs. The COAs are all 2 miles wide and are designed to avoid, to the extent possible, civil aviation flight operations. The overwater range is located just south of Tyndall AFB in the offshore RAs (W-470 and W-151). Figure 2.3-3 also includes the RAs.

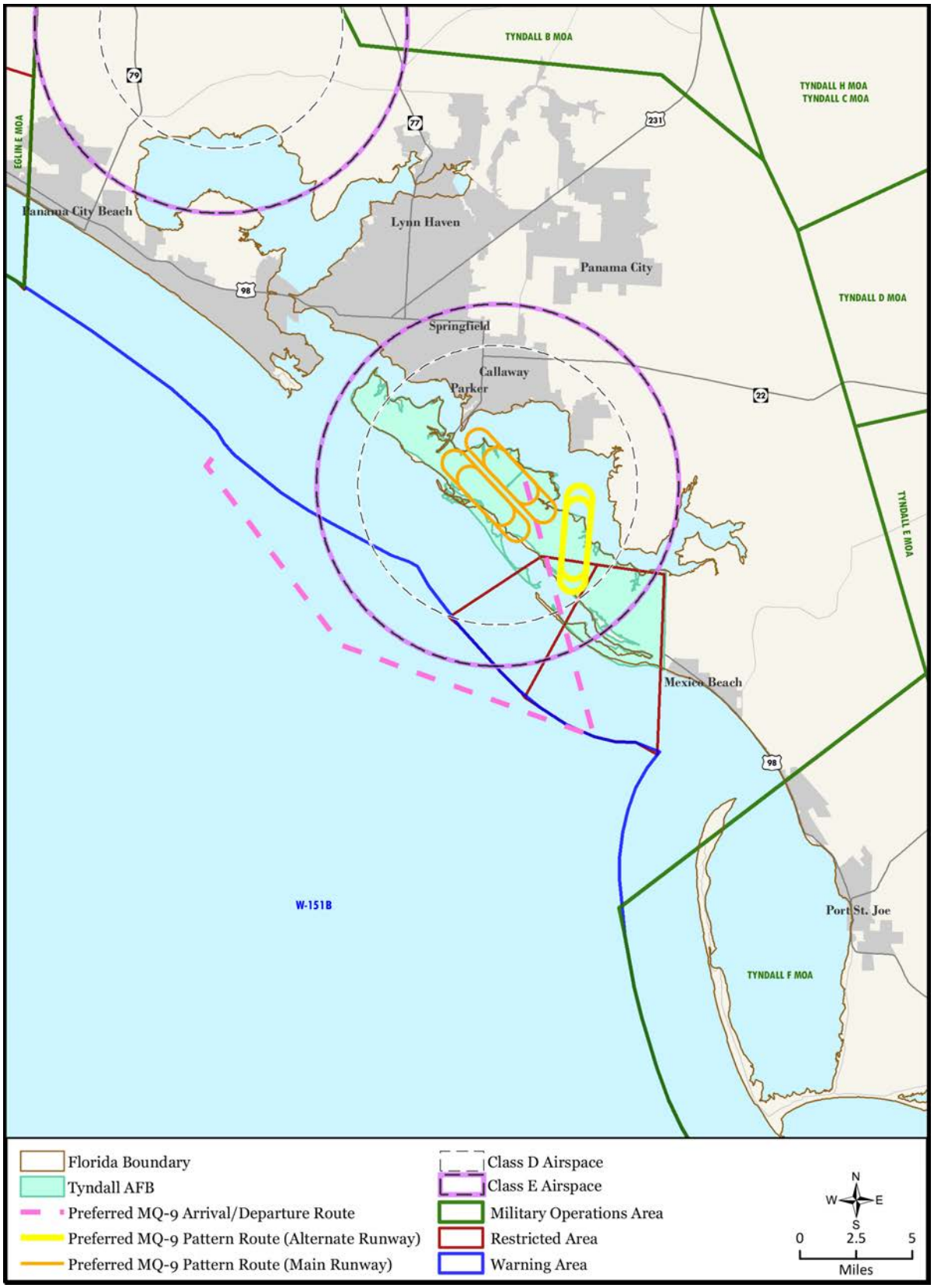

Figure 2.3-2. Proposed MQ-9 Patterns and Proposed MQ-9 Departure and Arrival Track in the Vicinity of Tyndall AFB

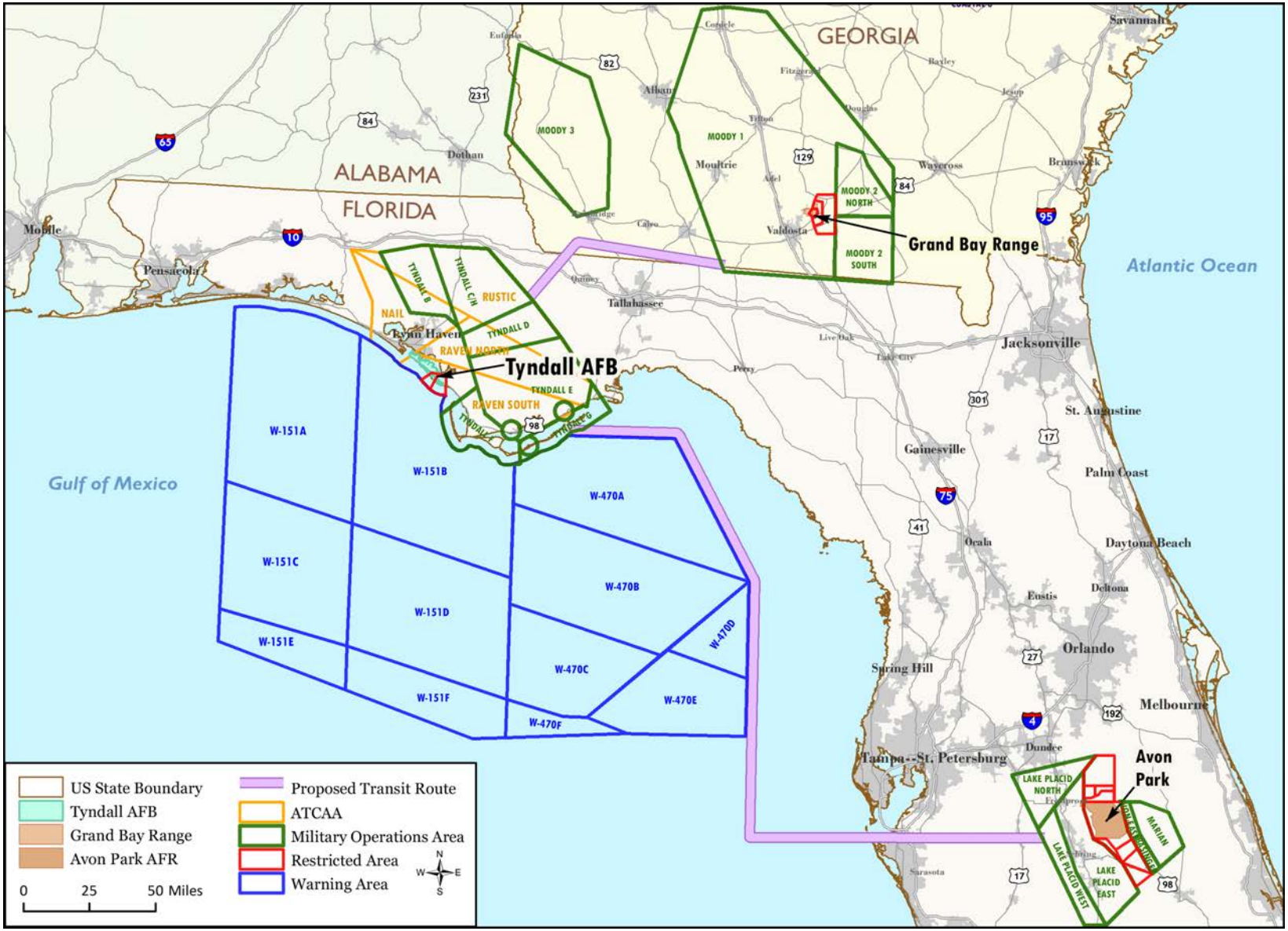

Figure 2.3-3. Proposed MQ-9 COA Transit Routes to Access Training Ranges from Tyndall AFB

2.3.4 Detailed Description of the Vandenberg AFB MQ-9 Wing Beddown Alternative

This section describes the Vandenberg AFB Alternative and presents the base-specific facilities, and airspace needed to meet all mission requirements associated with a beddown of the MQ-9 Wing at Vandenberg AFB. Personnel and dependents at either location would be as described in Section 2.3.1.2. MQ-9 Aircraft operations at either base would be as described Section 2.3.1.3.

2.3.4.1 New Facilities and Infrastructure

Table 2.3-4 lists the new facilities needed for the MQ-9 beddown at Vandenberg AFB**.** No new munitions storage facility would be needed because Vandenberg AFB already has sufficient capacity to accommodate the inert munitions storage needs of the proposed MQ-9 Wing.

Proposed MQ-9 facilities design would take into account the Preliminary Vandenberg AFB Installation-specific Climate Change Summaries for Incorporation into the Vandenberg AFB INRMP (AFCEC, 2020; Vandenberg AFB, 2020d).

Table 2.3-4. Vandenberg AFB Proposed Facility Siting for M-9 Wing

Building	Description
Operations Complex	Renovate the interior of Building 8401 to house the Wing Headquarters (HQ)/Operations Group/Operations Support Squadron/Squadron Operations Center, two Attack Squadrons, and PMATS/dwell space.
Maintenance Complex	Construct a new maintenance complex facility on the north side of the runway off the east end of the runway to include the Maintenance Group HQ, Aircraft Maintenance Squadron, Aircraft Maintenance Unit, Aircraft Maintenance Communications Unit, Launch and Recovery Attack Squadron, utilities, and associated parking lot.
Ground Data Terminal Foundations and Towers	Construct up to seven Ground Data Terminal foundations and towers along the northeast side of the runway. Includes a one-lane Access Road connecting the three towers that would not be accessible from existing airfield taxiway pavement.
Fitness Center	Construct a 38,700-sf addition to the existing fitness center.
Airmen Dormitory	Construct a 68,200-sf new dormitory. The new dormitory would be sited in the base dormitory complex area.
Infrastructure and Communication Conduit Extensions	Power, base communication, water, and wastewater lines would need to be extended to facilities. Infrastructure capabilities are accessible to all facilities and can normally be extended to the facilities using disturbed corridors.

Key: HQ = Headquarters; PMATS = Predator® Mission Aircrew Training System; sf = square foot

Operations Complex

The Operations Complex includes the Wing HQ, Operations Group HQ, OSS, two Attack Squadrons, utilities, and associated parking lot. The Operations Complex would occupy existing Building 8401, which would require internal renovations to adapt it for its reuse for the MQ-9 Wing Operations Complex (Figure 2.3-4). Requirements for the Mission Control Element Squadron and SOC include construction of facilities presented in Table 2.3-4. Two generators (with fencing) would be needed to support the Attack Squadrons and SOC. Four 50-foot by 50-foot concrete pads would need to be constructed outside of the building to support four satellite communications antennas with a supporting generator (see Figure 2.3-4).

Maintenance Complex

The proposed new Maintenance Complex facility would be constructed on the north side of the runway off the east end of the runway to include Maintenance Group HQ, Aircraft Maintenance Squadron, AMU, Aircraft Maintenance Communications Unit, LR Attack Squadron, utilities, and associated parking lot.

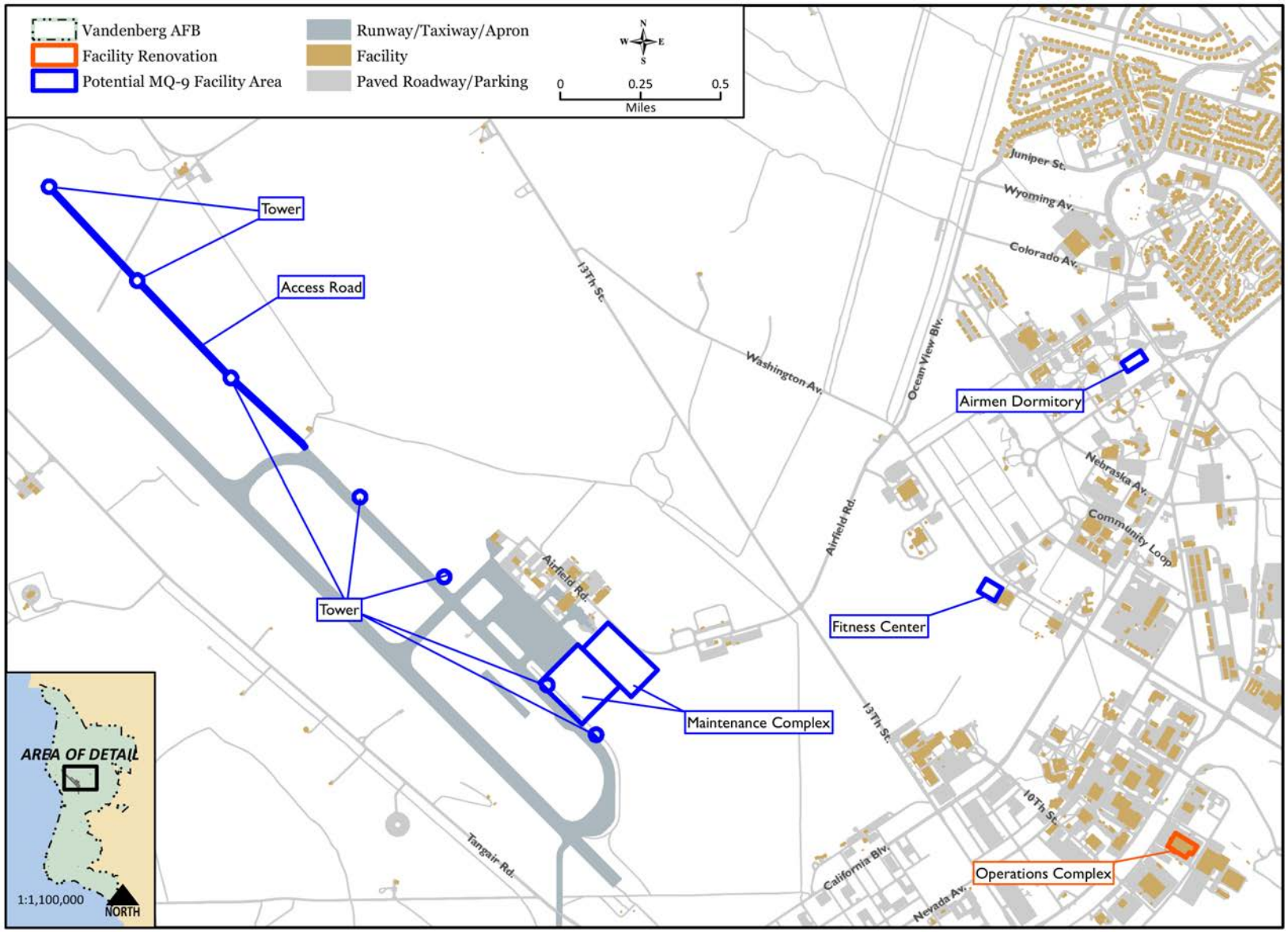

Figure 2.3-4. Vandenberg AFB Facilities Locations Associated With the Proposed MQ-9 Beddown

The outlined area in Figure 2.3-4 presents the potentially disturbed area to be used during siting and construction of the Maintenance Complex facilities. As part of the MQ-9 Proposed Action, areas that are temporarily disturbed during construction would be revegetated.

LR Squadron requirements include constructing a new 20,000-square-foot facility located on the flight line (see Figure 2.3-4 and Table 2.3-1). Two Mobile Ground Control Stations would be placed on an exterior 70-foot by 70-foot concrete pad with up to four Environmental Control Units and up to three generators (with fencing). The LR Squadron would be located adjacent to the Maintenance Complex.

Ground Data Terminal Foundations and Towers

Up to seven GDT foundations and towers would be built along the northeast side of the runway. They would consist of 12-foot by 12-foot concrete pads, with towers up to 60 feet tall. In order to perform maintenance on the GDTs, a 12-foot wide one-lane Access Road would be built to connect to the three towers that would not be accessible from existing airfield taxiway pavement.

Airmen Dormitory

The Airmen Dormitory proposed for Vandenberg AFB would be a new 68,200-square-foot building to support the increase in population associated with the proposed MQ-9 Wing beddown. The dormitory site is near existing dormitories with access to base recreation and eating facilities. The outlined area in Figure 2.3-4 presents the potentially disturbed area to be used during siting and construction of the proposed dormitory, building access, and parking areas.

Fitness Center

The Fitness Center would be an addition/alteration that would add 38,700 square feet to the current fitness center to provide capacity for the projected additional demand created by the personnel increase associated with the proposed MQ-9 Wing beddown. Figure 2.3-4 presents the potentially disturbed area to be used during siting and construction of the proposed Fitness Center, building access, and parking areas

2.3.4.2 Airspace and Ranges

Vandenberg AFB-based MQ-9 aircraft would normally conduct 4 hours of daily pattern work as depicted on Figure 2.3-5 to the west and/or east of the base runway. Various factors would determine which pattern was flown, including meteorological conditions, sensitive marine and bird species, and altitude above on-base housing. The most common pattern altitude that would be expected to be assigned to MQ-9 aircraft would be 1,400 feet MSL (equates to approximately 1,000 feet above field elevation). On any given operational day or week, an estimated up to two-thirds of the pattern work could be to either the west or east side of the runway. However, over the course of a year, the split between east and west patterns would be expected to be 50/50. The pattern work would be within Vandenberg AFB R-2516 restricted airspace or in W-537 restricted airspace and would not require an FAA-issued COA.

MQ-9 aircraft would operate in the approximately 40- by 10-NM restricted airspace, R-2516, above Vandenberg AFB and/or in the warning areas immediately adjacent to Vandenberg AFB to the west and south. To allow for other aircraft or systems using Vandenberg AFB, R-2516 could be divided into R-2516A to the east and R-2516B to the west.

An MQ-9 mission to the Camp Roberts Army Base/Hunter Liggett RA to the north of Vandenberg could use an FAA-issued COA after the MQ-9 climbed to above 18,000 feet MSL (FL180) in FAA-controlled airspace. Transit COAs would be 2 NM wide. Figure 2.3-6 depicts the COA between Vandenberg AFB R-2516 and the Hunter MOAs. Alternatively, the MQ-9 could fly from R-2516 into the offshore-restricted warning areas (W-537), which parallel the coast and transit from the offshore warning areas to the Hunter MOAs using an FAA-issued COA. MQ-9 operations in MOAs/ATCAAs associated with Camp Roberts Army Base/Hunter Liggett would require COAs outside the restricted airspace. An MQ-9 would typically fly from approximately 20,000 feet MSL (FL200) to 22,000 feet MSL (FL220) in the COAs and could operate from 22,000 feet MSL (FL220) to 26,000 feet MSL (FL260) for proficiency training in approved airspace.

For a mission to the Navy San Clemente Range south of Vandenberg AFB, the MQ-9 would fly over open water in W-537 and W-2895 restricted airspace to the R-2535 restricted airspace over the San Clemente Range (Figure 2.3-6). FAA COAs would not be required in restricted airspace.

2.3.5 No Action Alternative for MQ-9 Wing Beddown

40 CFR 1502.14(d) of the CEQ's regulations for implementing NEPA requires the analysis of a No Action Alternative in an EIS to provide a benchmark and enable decisionmakers to compare the magnitude of the environmental effects to a proposed action and alternatives. No action means that an action would not take place and the resulting environmental effects from taking no action would be compared with the effects of allowing the proposed activity to go forward. No action for the MQ-9 Wing proposal in this EIS reflects the affected environment, as described in Sections 3.1 (Tyndall AFB) and 3.2 (Vandenberg AFB), where no beddown of an MQ-9 Wing would occur. No MQ-9 facilities construction, personnel changes, or airspace transit and proficiency training would occur at either Tyndall AFB or Vandenberg AFB.

2.3.6 Identification of Preferred and Reasonable Alternatives for an MQ-9 Wing Beddown

The USAF's preferred alternative is to beddown the MQ-9 Wing at Tyndall AFB due to its low-risk construction location, lower cost of living for Airmen, and no seasonal sea fog in winter months, in comparison to Vandenberg AFB, that also meets the mission and capacity (e.g., facilities, communications, base operating support) requirements. The USAF has identified the preferred alternative pursuant to 40 CFR 1502.14(e). However, identification of the preferred alternative is not a decision. A decision will be reflected in a ROD at the completion of the EIS process. The ROD will also identify the alternative that is considered to be environmentally preferable.

The USAF decisionmaker will use the information and analysis contained in this EIS to support the decision about how best to satisfy the stated purpose and need within mission constraints. A final determination regarding which installation is selected for the MQ-9 Wing beddown will be reflected in the ROD.

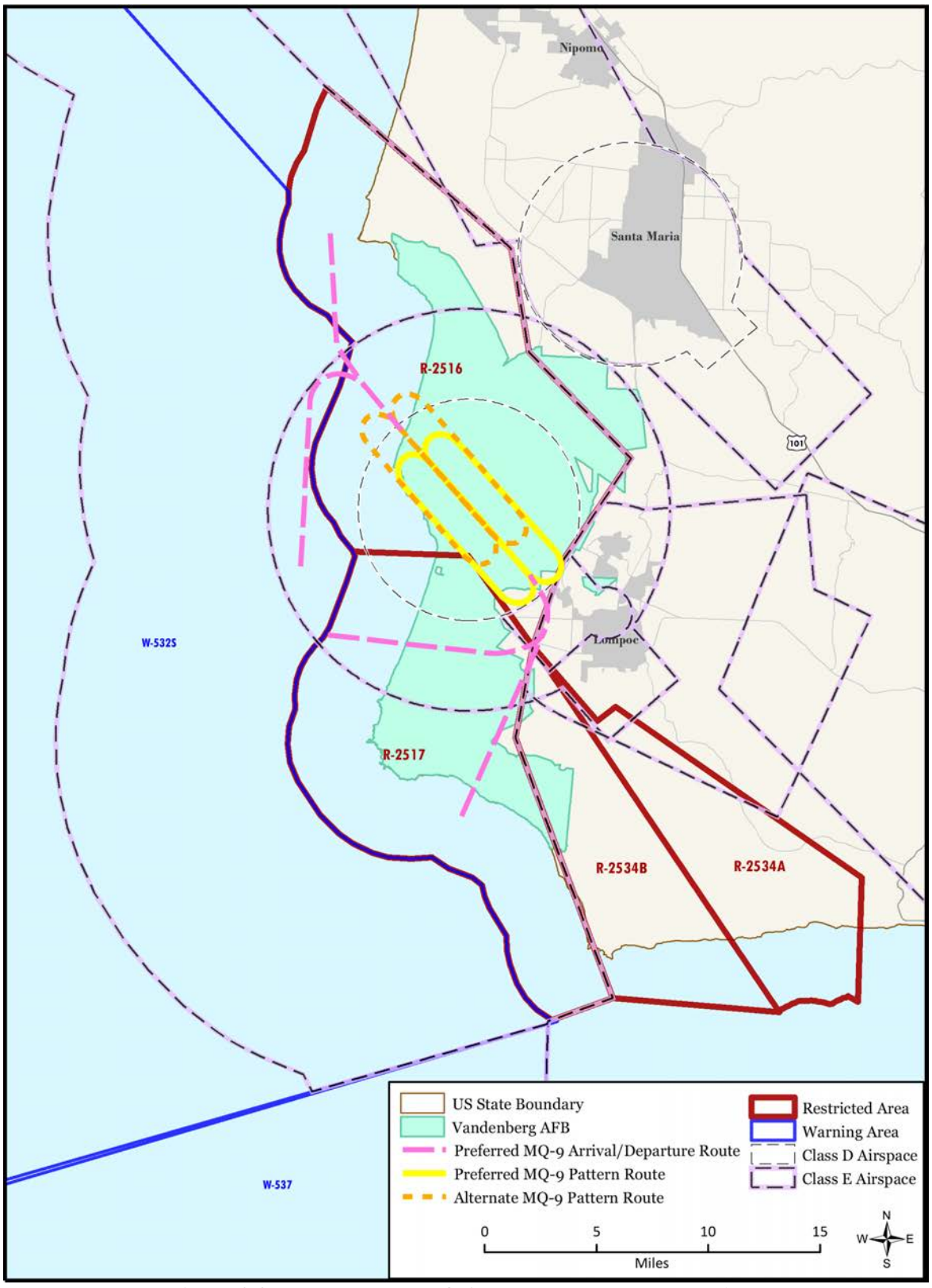

Figure 2.3-5. Proposed MQ-9 Pattern at Vandenberg AFB

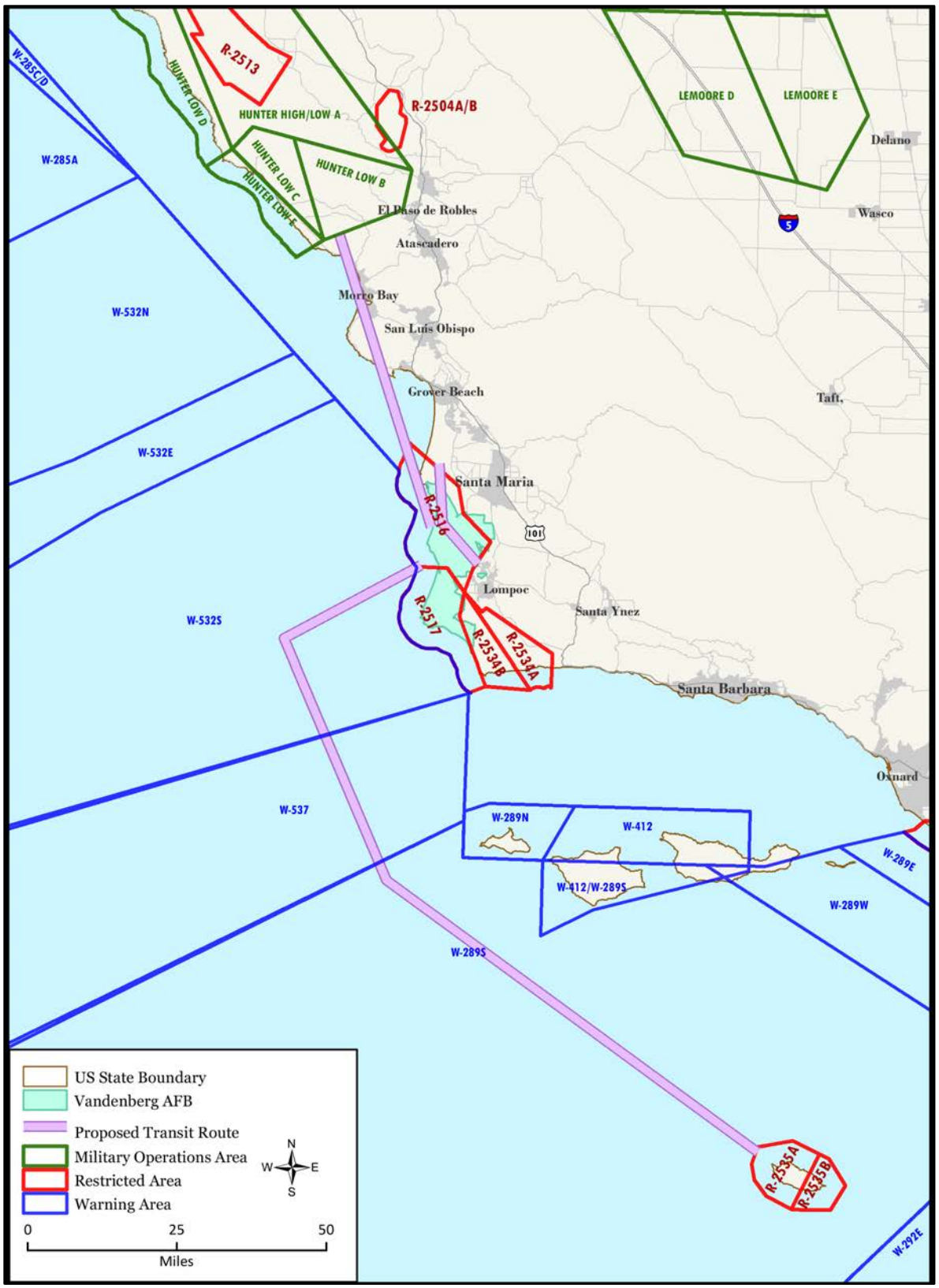

Figure 2.3-6. Proposed MQ-9 COA Transit Routes to Access Training Ranges from Vandenberg AFB

2.4 POTENTIAL COMBINED DECISIONS AT TYNDALL AFB

This EIS will be used to provide decisionmakers with the environmental consequences of two independent decisions, which could have combined environmental effects at Tyndall AFB. This section identifies the facilities, personnel, aircraft operations, and training associated with the potential combination of decisions to beddown both the F-35A Wing and the MQ-9 Wing at Tyndall AFB.

2.4.1 Beddown a Three-Squadron Wing of F-35A Aircraft and an MQ-9 Wing at Tyndall AFB

A combination of independent decisions to beddown the three-squadron F-35A Wing (as described in Section 2.2) and an MQ-9 Wing (as described in Section 2.3) at Tyndall AFB would result in 72 PAA, plus 6 BAI F-35A aircraft and 24 MQ-9 RPA, to be based and operating from Tyndall AFB.

2.4.1.1 Combined Facilities and Infrastructure

The three-squadron F-35A Wing facilities and infrastructure described in Section 2.2.2 would be constructed at Tyndall AFB, along with the MQ-9 facilities described in Section 2.3.3.

2.4.1.2 Combined Personnel and Dependents

The combined personnel and dependents for the three-squadron F-35A Wing (see Section 2.2.2) and the MQ-9 Operational Wing (see Section 2.3.1) would result in a total 4,100 personnel. The combined personnel would consist of 469 officers, 3,131 enlisted, 313 DoD civilians, and 187 BOS personnel.

The 4,100 total personnel would be accompanied by approximately 5,576 dependents, including 2,788 children, of whom approximately 2,049 would be expected to be school-aged. The reduction of F-22 related billets would be as described in Section 2.2.4.2.

2.4.1.3 Combined Aircraft Operations

Three squadrons of F-35A pilots would perform approximately 47 sorties per day, generating approximately 33,440 annual airfield operations (Section 2.2.2). Approximately 1 percent of the annual flight operations would occur during environmental night (from 10:00 p.m. to 7:00 a.m.). MQ-9 aircraft would be remotely piloted by rotating aircrews during the MQ-9's 12-hour-long training mission, as described in Section 2.3.1. Because of the long mission duration, an estimated 2,200 of the 2,820 MQ-9 annual sorties would have a departure or arrival during environmental night.

2.4.1.4 Combined Training in Airspace and Ranges

Training in airspace and ranges would be as described in Section 2.2.2 for three F-35A Squadrons, and as described in Section 2.3.3 for the MQ-9. Ordnance use would occur as described for the

F-35A in Section 2.2.2, and as described in Section 1.3.4 for the MQ-9. The total number of inert munitions deployed on established ranges by 200 MQ-9 and 100 F-35A sorties is estimated to be 600. Only the F-35A would deploy flares, and 31,630 flares would be deployed in airspace approved for their use.

2.4.2 Beddown a Four-Squadron Wing of F-35A Fighter Aircraft and an MQ-9 Wing at Tyndall AFB

A combination of independent decisions to beddown a four-squadron F-35A Wing (as described in Section 2.4) and beddown an MQ-9 Wing (as described in Section 2.3) at Tyndall AFB would result in 96 PAA plus 8 BAI F-35A aircraft and 24 MQ-9 RPA to be based and operating from Tyndall AFB.

2.4.2.1 Combined Facilities and Infrastructure

The three-squadron F-35A Wing facilities and infrastructure described in Section 2.2.2 would be constructed at Tyndall AFB, along with the MQ-9 facilities described in Section 2.3.3. Facilities needed for the fourth squadron could include the same facilities built for a three-squadron alternative but could require additional facilities and infrastructure within the same construction footprint identified in Figure 2.2-1.

2.4.2.2 Combined Personnel and Dependents

The combined personnel and dependents for the four F-35A squadrons (see Section 2.2.5) and the MQ-9 Wing (see Section 2.3.1) would result in an estimated total of 4,832 incoming personnel.

The combined personnel would consist of 525 officers, 3,774 enlisted, 317 DoD civilians, and 216 BOS personnel. The 4,832 total personnel would be accompanied by approximately 6,572 dependents, including 3,286 children, of whom approximately 2,415 would be expected to be school-aged. The reduction of F-22 related billets would be as described in Section 2.2.4.2.

2.4.2.3 Combined Aircraft Operations

Four squadrons of F-35As would perform approximately 63 sorties per day, generating an estimated annual 44,586 airfield operations (Section 2.2.5). Approximately 1 percent of the annual flight operations would occur during environmental night (from 10:00 p.m. to 7:00 a.m.). MQ-9 aircraft would be remotely piloted by rotating aircrews during the MQ-9's 12-hour long training mission as described in Section 2.3.1. Because of the long mission duration, an estimated 2,200 of the 2,820 MQ-9 annual sorties would have a departure or arrival during environmental night.

2.4.2.4 Combined Training in Airspace and Ranges

Training in airspace and ranges would be as described in Section 2.2.5 for four squadrons of fighter-35As, and as described in Section 2.3.3 for the MQ-9. Ordnance use would occur as described for the F-35A in Section 2.2.5, and for the MQ-9 in Section 1.3.4. The total number of inert munitions deployed on established ranges by 200 MQ-9 and 134 fifth-generation fighter

annual sorties is estimated to be 668. Only the F-35s would deploy flares, and 42,174 flares would be deployed in airspace approved for their use.

2.5 THE ENVIRONMENTAL IMPACT ANALYSIS PROCESS

NEPA requires consideration of environmental issues in federal agency planning and decision making. Under NEPA, federal agencies must prepare an Environmental Assessment or EIS for any major federal action, except those actions that are determined to be "categorically excluded" from further analysis.

This EIS was prepared in accordance with NEPA (42 U.S.C. 4321–4347), the CEQ regulation of 1978 (40 CFR Parts 1500–1508), and 32 CFR Part 989.

32 CFR Part 989 establishes the EIAP, which addresses the USAF implementation of NEPA, and AFI 32-1015 directs USAF officials to consider the environmental consequences of any proposed action prior to implementation. The EIAP involves several steps. The EIAP reviews all information pertinent to the Proposed Actions and No Action Alternative and provides a full and fair discussion of potential consequences to the natural and human environment resulting from implementing either or both of the Proposed Actions:

(1) The beddown of an F-35A Operational Wing at Tyndall AFB, Florida (Figure 2.2-1) and

(2) The beddown of an MQ-9 Operational Wing at either of two alternative locations: (1) Tyndall AFB in Florida (Figure 2.3-1); or (2) Vandenberg AFB in California (Figure 2.3-4)

The following major environmental resources and/or issues of concern have been identified and will be analyzed in this EIS:

- Airspace Management and Air Traffic Control
- Noise
- Health and Safety
- Air Quality
- Hazardous Materials and Waste
- Geologic Resources
- Water Resources
- Biological Resources
- Cultural Resources
- Land Use
- Infrastructure
- Transportation
- Socioeconomics
- Environmental Justice

2.5.1 Environmental Resources Not Carried Forward for Detailed Analysis

The environmental subject areas listed below do not present a potential for significant environmental impact as there would be no potential for direct, indirect, or cumulative impacts. They will not be carried forward for detailed analysis.

Aesthetics and Visual Resources – Visual resources are defined as the natural and manufactured features that constitute the aesthetic qualities of an area. Any construction that would occur would be located within the existing developed areas of both Tyndall AFB and Vandenberg AFB.

MQ-9 Airspace and Range Operations – Due to the MQ-9's relatively small size, low noise profile, and typical training altitude of between FL200 to FL220 in the COAs and from FL220 to FL260 in approved SUA, it was determined that MQ-9 Airspace and Range Operations do not present a potential for significant environmental impact, and therefore will not be carried forward for detailed quantitative analysis in this EIS. Analysis for potential environmental impact is considered qualitatively in the Airspace Management and Air Traffic Control and Health and Safety sections of this EIS.

2.6 ENVIRONMENTAL COMPARISON OF ALTERNATIVES

Table 2.6-1 provides a summary comparison of the alternatives for the proposed F-35A Wing beddown at Tyndall AFB, along with the potential combined decisions to beddown both the MQ-9 Wing and F-35A Wing at Tyndall AFB, and the No Action Alternative. Each alternative is compared for each of the environmental resources evaluated in Chapter 4 (Environmental Consequences) of this EIS.

Table 2.6-2 provides a summary comparison of the two alternative bases for the proposed MQ-9 Wing beddown, along with the No Action Alternative. Each alternative is compared for each of the environmental resources evaluated in Chapter 4 (Environmental Consequences) of this EIS.

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Table 2.6-1. Comparison of Alternatives for the Proposed F-35A Wing Beddown at Tyndall AFB

Environmental Resource	F-35A at Tyndall AFB Three-Squadron F-35A Wing Alternative	F-35A at Tyndall AFB Four-Squadron F-35A Wing Alternative	F-35A and MQ-9 at Tyndall AFB Three-Squadron F-35A Wing Alternative and MQ-9 at Tyndall AFB Alternative	F-35A and MQ-9 at Tyndall AFB Four-Squadron F-35A Wing Alternative and MQ-9 at Tyndall AFB Alternative	F-35A at Tyndall AFB No Action Alternative
Airspace Management and ATC	No significant impacts to airfield operations or training airspace. A three-squadron F-35A Wing beddown would conduct an estimated 12,300 sorties, which would generate an estimated 33,440 airfield operations. For context, under pre-hurricane conditions, there were 37,900 F-22 and 11,800 T-38 airfield operations at Tyndall AFB. (Section 4.1.1.1)	No significant impacts to airfield operations or training airspace. A four-squadron F-35A beddown would conduct 16,400 sorties, which would generate an estimated 44,600 airfield operations. For context, under pre-hurricane conditions, there were 37,900 F-22 and 11,800 T-38 airfield operations at Tyndall AFB. (Section 4.1.1.2)	No significant impacts to airfield operations or training airspace. An MQ-9 Wing beddown would add 2,820 training sorties to the estimated 12,300 F-35A training sorties, which would add an estimated 5,700 airfield operations to the estimated 33,440 three-squadron F-35A airfield operations. Given the highly regulated manner in which RPA flights are controlled in both the airfield and unrestricted airspace, MQ-9 operations could be safely integrated with F-35A and other aircraft flight activities. For context, under pre-hurricane conditions, there were 37,900 F-22 and 11,800 T-38 airfield operations at Tyndall AFB. (Section 4.3.1.1)	No significant impacts to airfield operations or training airspace. An MQ-9 Wing beddown would add 2,820 training sorties to the estimated 16,400 F-35A training sortie which would add an estimated 5,700 airfield operations to the estimated 44,600 four-squadron F-35A airfield operations. Given the highly regulated manner in which RPA flights are controlled in both the airfield and unrestricted airspace, MQ-9 operations could be safely integrated with F-35A and other aircraft flight activities. For context, under pre-hurricane conditions, there were 37,900 F-22 and 11,800 T-38 airfield operations at Tyndall AFB. (Section 4.3.1.2)	Airfield and training airspace operations under the No Action Alternative would remain at the affected environment levels (17,000 annual operations) described in Section 3.1.1. (Section 4.1.1.3)
Noise	The number of off-base acres of land exposed to noise levels greater than 65 dB DNL would increase from 2 acres to as many as 68 acres, and the number of people exposed would increase from 0 to as many as 80 when compared with the No Action Alternative with no active F-22 mission. For context, prior to Hurricane Michael, there were 217 off-base acres of land and an estimated 190 people exposed to noise levels greater than 65 dB DNL. Compared to the No Action Alternative (with no active F-22 mission), proposed F-35A operations would result in increased levels at noise-sensitive locations by as much as 14 dB DNL under any of the afterburner take-off scenarios. Noise levels at Long Point Condominiums, Tyndall Elementary School, and Tyndall AFB dormitories would increase to greater than 65 dB, 70 dB, and 80 dB, respectively, under any afterburner scenario and would result in the same incompatible land uses as existed under pre-hurricane conditions based on DoD guidelines. The DNL at representative noise-sensitive locations would be uniformly lower with the F-35A operations than noise levels under pre-hurricane conditions. Average daytime outdoor speech-interference events would increase from two events per hour to as many as seven events per hour (under any afterburner scenario). To put the speech-interference events in context, the number of events would decrease or remain the same at all locations studied when compared with pre-hurricane conditions. The F-35A operations would result in noise levels at Tyndall Elementary School exceeding criteria for	The number of off-base acres of land exposed to noise levels greater than 65 dB DNL would increase from 2 acres to as many as 93 acres, and the number of people exposed would increase from 0 to as many as 135 when compared with the No Action Alternative with no active F-22 mission. For context, prior to Hurricane Michael, there were 217 off-base acres of land and an estimated 190 people exposed to noise levels greater than 65 dB DNL. Compared with the No Action Alternative with no active F-22 mission, proposed F-35A operations would result in levels at noise-sensitive locations increasing as much as 15 dB DNL under any of the afterburner take-off scenarios. Noise levels at Long Point Condominiums, Tyndall Elementary School, and Tyndall AFB dormitories would increase to greater than 70 dB, 70 dB, and 80 dB, respectively, and would result in the same incompatible land uses as existed under pre-hurricane conditions based on DoD guidelines. The DNL noise levels at representative noise-sensitive locations would be uniformly lower with the F-35A operations than noise levels under pre-hurricane conditions. Average daily outdoor speech-interference events would increase from 2 events to as many as 9 to 11 events per average hour (under any afterburner scenario) when compared with the No Action Alternative. To put the speech-interference events in	The number of off-base acres of land exposed to noise levels greater than 65 dB DNL would increase from 2 acres to as many as 69 acres, and the number of people exposed would increase from 0 to as many as 80 when compared with the No Action Alternative with no active F-22 mission. For context, prior to Hurricane Michael, there were 217 off-base acres of land and an estimated 190 people exposed to noise levels greater than 65 dB DNL Compared with the No Action Alternative with no active F-22 mission, proposed F-35A and MQ-9 operations would result in an increase at noise-sensitive locations by as much as 14 dB DNL under any of the afterburner take-off scenarios. Noise levels at Long Point Condominiums, Tyndall Elementary School, and Tyndall AFB dormitories would increase to levels louder than 65 dB, 70 dB, and 80 dB, respectively, under any afterburner scenario and would result in the same incompatible land uses as existed under pre-hurricane conditions based on DoD guidelines. The DNL at representative noise-sensitive locations would be uniformly lower with the F-35A and MQ-9 operations than under pre-hurricane conditions. The number of outdoor speech-interference events per hour would increase from two events under the No Action Alternative to as many as seven events (under any afterburner scenario). To put the speech-interference	The number of off-base acres of land exposed to noise louder than 65 dB DNL would increase from 2 acres to as many as 93 acres, and the number of people exposed would increase from 0 to as many as 136 when compared with the No Action Alternative with no active F-22 mission. For context, prior to Hurricane Michael, 217 off-base acres of land and an estimated 190 people were exposed to noise levels greater than 65 dB DNL The DNL at representative locations would increase by as much as 15 dB under any of the afterburner take-off scenarios relative to the No Action Alternative with no active F-22 mission. Noise at the Long Point Condominiums, Tyndall Elementary School, and Tyndall AFB dormitories would increase to levels louder than 70 dB, 70 dB, and 80 dB, respectively, and would result in the same incompatible land uses as existed under pre-hurricane conditions based on DoD guidelines. The DNL at representative noise-sensitive locations would be uniformly lower with the F-35A and MQ-9 operations than noise levels under pre-hurricane conditions. The number of outdoor speech-interference events would increase from 2 events per hour to as many as 10 to 12 events per average hour relative to the No Action Alternative. To put the speech-interference events in context, the number of events would decrease or remain the same at all locations studied when compared with pre-hurricane conditions.	Under the No Action Alternative, aircraft operations and noise levels would not increase due to an F-35A Wing beddown. There would be no additional noise impacts to the affected environment from implementation of the No Action Alternative. (Section 4.1.2.3)

Table 2.6-1. Comparison of Alternatives for the Proposed F-35A Wing Beddown at Tyndall AFB

Environmental Resource	F-35A at Tyndall AFB Three-Squadron F-35A Wing Alternative	F-35A at Tyndall AFB Four-Squadron F-35A Wing Alternative	F-35A and MQ-9 at Tyndall AFB Three-Squadron F-35A Wing Alternative and MQ-9 at Tyndall AFB Alternative	F-35A and MQ-9 at Tyndall AFB Four-Squadron F-35A Wing Alternative and MQ-9 at Tyndall AFB Alternative	F-35A at Tyndall AFB No Action Alternative
Noise (continued)	classrooms, with exterior school-day noise levels as loud as 75 dB L_{eq-8hr}. The number of events per average hour with potential to interfere with speech with windows open would increase by as many as five to six events per average hour and up to four to five events with windows closed. To put this effect in context, noise levels and potential speech-interference events at Tyndall Elementary School would remain the same or decrease compared with pre-hurricane conditions. Noise levels at Parker Elementary School would remain below classroom criteria under all afterburner usage scenarios. The percentage of people awakened at least once per night by aircraft noise would increase to as much as 2 percent, compared with 1 percent under the No Action Alternative. The percentage awakened would decrease or remain the same relative to pre-hurricane conditions. Risk of potential hearing loss, workplace noise impacts, or nonauditory health impacts would remain minimal under all afterburner-usage scenarios. The noise level beneath overland training airspace would increase to as much as 48 dB L_{dnmr} (3 dB increase). Time-averaged noise levels would remain similar to 45 dB, which is a level typical of rural areas with no aircraft noise. The number of sonic booms in warning areas would decrease with F-35A operations compared with pre-hurricane F-22 flights. (Section 4.1.2.1)	context, the number of events would decrease or remain the same at all locations studied when compared with pre-hurricane conditions. Noise levels at Tyndall Elementary School would exceed classroom criteria, with exterior school-day noise levels of up to 76 dB L_{eq-8hr}. Events with potential to interfere with speech would increase from one under the No Action Alternative to as many as six events per average hour, with windows open or closed. To put the effect in context, noise levels and potential speech-interference events at Tyndall Elementary School would remain the same or decrease compared with pre-hurricane conditions. Levels at Parker Elementary School would remain below classroom noise-level criteria under all afterburner scenarios. The percentage of people awakened at least once per night by aircraft noise would increase to as much as 2 percent compared with 1 percent under the No Action Alternative. The percentage awakened would decrease or remain the same relative to pre-hurricane conditions. Risk of potential hearing loss, workplace noise impacts, and nonauditory health impacts would remain minimal under all afterburner-usage scenarios. The noise level beneath overland training airspace proposed for regular use would increase by as much as 4 dB (up to 49 dB L_{dnmr}). Time-averaged noise levels would remain similar to 45 dB, which is a level typical of rural areas with no aircraft noise. Numbers of sonic booms in warning areas would decrease with F-35A flights as compared with F-22 flights before the hurricane. (Section 4.1.2.2)	events in context, the number of events would decrease or remain the same at all locations studied when compared with pre-hurricane conditions. Noise at Tyndall Elementary School would exceed classroom criteria, with exterior school-day noise levels as loud as 75 dB L_{eq-8hr}. Events with potential to interfere with speech would increase by as many as five to six events per average hour, with windows open or closed, relative to the No Action Alternative with no active F-22 mission. To put the effect in context, noise levels and potential speech-interference events at Tyndall Elementary School would remain the same or decrease compared with pre-hurricane conditions. Noise at Parker Elementary School would remain below classroom criteria under all afterburner-usage scenarios. The percentage of people awakened at least once per night by aircraft noise would increase to as much as 2 percent compared with 1 percent under the No Action Alternative. The percentage awakened would decrease or remain the same relative to pre-hurricane conditions. Risk of potential hearing loss, workplace noise impacts, and nonauditory health impacts would remain minimal under all afterburner-usage scenarios. MQ-9 operations at mission altitude are below typical ambient noise levels and would not add to overall noise beneath overland training airspace from subsonic aircraft operations. F-35A operations increase noise up to as much as 48 dB L_{dnmr} (a 3-dB increase). Time-averaged noise levels would remain similar to 45 dB, which is a level typical of rural areas with no aircraft noise. Numbers of sonic booms in warning areas would decrease with F-35A operations compared with pre-hurricane F-22 flights. (Section 4.3.2.1)	Noise at Tyndall Elementary School would exceed classroom criteria, with exterior school-day noise levels of up to 76 dB L_{eq-8hr}. Events with potential to interfere with speech would increase from one under the No Action Alternative to as many as six to eight events per average hour (with windows open) or six to seven events per average hour (with windows closed) relative to the No Action Alternative. To put the effect in context, noise levels and potential speech-interference events at Tyndall Elementary School would remain the same or decrease compared with pre-hurricane conditions. Noise at Parker Elementary School would remain below classroom criteria under all afterburner-usage scenarios. The percentage of people awakened at least once per night by aircraft noise would increase to as much as 2 percent compared to the No Action Alternative with no active F-22 mission. The percentage awakened would decrease or remain the same relative to pre-hurricane conditions. Risk of potential hearing loss, workplace noise impacts, and nonauditory health impacts would remain minimal under all afterburner-usage scenarios. Noise from MQ-9 operations at mission altitude are below typical ambient noise levels and would not add to overall subsonic aircraft operations noise levels beneath overland training airspace. F-35A operations would increase noise up to as much as 49 dB L_{dnmr} (a 4-dB increase). Time-averaged noise levels would remain similar to 45 dB, which is a level typical of rural areas with no aircraft noise. Numbers of sonic boom in warning areas would decrease with F-35A operations as compared with pre-hurricane F-22 flights. (Section 4.3.2.2)	

Table 2.6-1. Comparison of Alternatives for the Proposed F-35A Wing Beddown at Tyndall AFB

Environmental Resource	F-35A at Tyndall AFB Three-Squadron F-35A Wing Alternative	F-35A at Tyndall AFB Four-Squadron F-35A Wing Alternative	F-35A and MQ-9 at Tyndall AFB Three-Squadron F-35A Wing Alternative and MQ-9 at Tyndall AFB Alternative	F-35A and MQ-9 at Tyndall AFB Four-Squadron F-35A Wing Alternative and MQ-9 at Tyndall AFB Alternative	F-35A at Tyndall AFB No Action Alternative
Health and Safety	No significant impacts would occur. Initiation of F-35A flight operations compared with 17,000 annual flight operations under the No Action Alternative would result in an increase from approximately 6 to an estimated 17 BASH incidents per year. BASH incidents would be comparable to the average of 20 incidents per year prior to 2018. Based on the projected Class A mishap rate, the three-squadron Wing would have an estimated annual average of 0.43 Class A mishaps training over water and 0.14 Class A mishaps over land. Training and construction activities would be conducted in accordance with applicable USAF, state, and federal safety standards and requirements. F-35As would not deploy combat coded flares in SUA. Safety impacts to the public resulting from training flare use would be negligible. (Section 4.1.3.1)	No significant impacts would occur. Initiation of F-35A flight operations would result in an increase from approximately 6 to an estimated 20 BASH incidents per year, the same as the average prior to 2018. Based on the projected Class A mishap rate, the four-squadron Wing would have an estimated annual average of 0.57 Class A mishaps training over water and 0.19 Class A mishaps over land. Training and construction activities would be conducted in accordance with applicable USAF, state, and federal safety standards and requirements. F-35As would not deploy combat coded flares in SUA. Safety impacts to the public resulting from training flare use would be negligible. (Section 4.1.3.2)	No significant impacts would occur. Initiation of F-35A flight operations would result in an increase from approximately 6 to an estimated 19 BASH incidents per year, the same as the average prior to 2018. Based on the projected Class A mishap rates and combined operations, there would be a statistical increase in the potential for aircraft mishaps compared with No Action. Training and construction activities would be conducted in accordance with applicable USAF, state, and federal safety standards and requirements. F-35As would not deploy combat coded flares in SUA. Safety impacts to the public resulting from training flare use would be negligible. There is a potential for MQ-9 mishaps resulting from loss of satellite communications with the aircraft ("lost-link"). Under such circumstances, aircraft are programmed to return to base for direct line-of-sight control. Existing flight safety procedures combined with the nature of the MQ-9 operational areas (i.e., over low population or military-controlled lands or over water) would minimize any impacts. (Section 4.3.3.1)	No significant impacts would occur. Initiation of F-35A flight operations would result in an increase from approximately 6 to an estimated 21 BASH incidents per year, the same as the average prior to 2018. Based on the projected Class A mishap rates and combined operations, there would be a statistical increase in the potential for aircraft mishaps compared with No Action. Training and construction activities would be conducted in accordance with applicable USAF, state, and federal safety standards and requirements. F-35As would not deploy combat coded flares in SUA. Safety impacts to the public resulting from training flare use would be negligible. There is a potential for MQ-9 mishaps resulting from loss of satellite communications with the aircraft ("lost-link"). Under such circumstances, aircraft are programmed to return to base for direct line-of-sight control. Existing flight safety procedures combined with the nature of the MQ-9 operational areas (i.e., over low population or military-controlled lands or over water) would minimize any impacts. (Section 4.3.3.2)	Under the No Action Alternative, flight activity would be as described for the affected environment (Section 3.1.1). No F-35A–related personnel changes or construction would occur. All aspects of ground safety and safety in the airspace would continue as described in Section 3.1.3. (Section 4.1.3.3)
Air Quality	Annual emissions from construction would remain below all initial indicators of significance and would not result in any significant impacts to air quality. Annual operational emissions of VOCs, SO_x, PM_{10}, NO_x, and $PM_{2.5}$ would not exceed any initial indicator of significance and would produce less than significant air quality impacts. Annual operational emissions of CO would exceed the 250 tons per year initial indicator of significance. However, these operational emissions would only result in approximately a 0.8 percent change (increase) in the total CO emissions generated within Bay County in 2017 and would not result in any significant impacts to air quality. These emission increases are lower than the amounts of CO emissions produced by Tyndall AFB in 2017 in comparison to the 2017 Bay County emissions. Flight operational emissions from flying in airspaces and over ranges for training would remain below all initial indicators of significance, and there would be no significant impacts to air quality. (Section 4.1.4.1)	Annual emissions from construction would remain below all initial indicators of significance and would not result in any significant impacts to air quality. Annual operational emissions of VOCs, SO_x, PM_{10}, and $PM_{2.5}$ would not exceed any initial indicator of significance and would produce less than significant air quality impacts. Annual operational emissions of CO and NO_x would exceed the 250 tons per year initial indicator of significance. However, these operational emissions would only result in approximately a 1.1 and 3.5 percent change (increase) in the total CO and NO_x emissions generated within Bay County in 2017, respectively, and would not result in any significant impacts to air quality. These emission increases are lower than the amounts of CO and NO_x emissions produced by Tyndall	Annual emissions from construction would remain below all initial indicators of significance and would not result in any significant impacts to air quality Annual operational emissions of VOCs, SO_x, PM_{10}, NO_x, and $PM_{2.5}$ would not exceed any initial indicator of significance and would produce less than significant air quality impacts. Annual operational emissions of CO would exceed the 250 tons per year initial indicator of significance. However, these operational emissions would only result in approximately a 1.0 percent change (increase) in the total CO emissions generated within Bay County in 2017 and would not result in any significant impacts to air quality. These emission increases are lower than the amounts of CO emissions produced by Tyndall AFB in 2017 in comparison to the 2017 Bay County emissions.	Annual emissions from construction would remain below all initial indicators of significance and would not result in any significant impacts to air quality Annual operational emissions of VOCs, SO_x, PM_{10}, and $PM_{2.5}$ would not exceed any initial indicator of significance and would produce less than significant air quality impacts. Annual operational emissions of CO and NO_x would exceed the 250 tons per year initial indicator of significance. However, these operational emissions would only result in approximately a 1.2 and 3.6 percent change (increase) in the total CO and NO_x emissions generated within Bay County in 2017, respectively, and would not result in any significant impacts to air quality. These emission increases are lower than the amounts of CO and NO_x emissions produced by Tyndall AFB in 2017 in comparison to the 2017 Bay County emissions.	Air quality impacts would be the same as those described for the affected environment. No F-35A–related changes that could affect air quality would occur at Tyndall AFB or in the associated airspace. (Section 4.1.4.3)

Table 2.6-1. Comparison of Alternatives for the Proposed F-35A Wing Beddown at Tyndall AFB

Environmental Resource	F-35A at Tyndall AFB Three-Squadron F-35A Wing Alternative	F-35A at Tyndall AFB Four-Squadron F-35A Wing Alternative	F-35A and MQ-9 at Tyndall AFB Three-Squadron F-35A Wing Alternative and MQ-9 at Tyndall AFB Alternative	F-35A and MQ-9 at Tyndall AFB Four-Squadron F-35A Wing Alternative and MQ-9 at Tyndall AFB Alternative	F-35A at Tyndall AFB No Action Alternative
Air Quality (continued)		AFB in 2017 in comparison to the 2017 Bay County emissions. Flight operational emissions from flying in airspaces and over ranges for training would remain below all initial indicators of significance, and there would be no significant impacts to air quality. (Section 4.1.4.2)	Flight operational emissions from flying in airspaces and over ranges for training would remain below all initial indicators of significance, and there would be no significant impacts to air quality. (Section 4.3.4.1)	Flight operational emissions from flying in airspaces and over ranges for training would remain below all initial indicators of significance, and there would be no significant impacts to air quality. (Section 4.3.4.2)	
Hazardous Materials and Waste	Minor hazardous materials and wastes would be generated from construction, operations, and maintenance. Impacts would be minimized with implementation of appropriate and established handling procedures. Construction within and adjacent to multiple ERP sites would require following USAF regulations. (Section 4.1.5.1)	Minor hazardous materials and wastes would be generated from construction, operations, and maintenance. Impacts would be minimized with implementation of appropriate and established handling procedures. Construction within and adjacent to multiple ERP sites would require following USAF regulations. (Section 4.1.5.2)	Minor hazardous materials and wastes would be generated from construction, operations, and maintenance. Impacts would be minimized with implementation of appropriate and established handling procedures. Construction within and adjacent to multiple ERP sites would require following USAF regulations. (Section 4.3.5.1)	Minor hazardous materials and wastes would be generated from construction, operations, and maintenance. Impacts would be minimized with implementation of appropriate and established handling procedures. Construction within and adjacent to multiple ERP sites would require following USAF regulations. (Section 4.3.5.2)	The management of hazardous materials and the generation of hazardous waste at Tyndall AFB would continue as described for the affected environment in Section 3.1.5. No impacts to hazardous materials or waste. (Section 4.1.5.3)
Soils and Geologic Resources	Up to 130.3 acres of previously disturbed land could be temporarily disturbed due to construction of 26.2 acres of base facilities. Implementing standard construction practices in accordance with an NPDES Construction General Stormwater Permit, the SWPPP, and other BMPs would result in no significant impacts occurring. (Section 4.1.6.1)	Up to 130.3 acres of previously disturbed land could be temporarily disturbed due to construction of approximately 27 acres of base facilities. Implementing standard construction practices in accordance with an NPDES Construction General Stormwater Permit, the SWPPP, and other BMPs would result in no significant impacts occurring. (Section 4.1.6.2)	Construction required for the F-35A and MQ-9 combined actions would temporarily disturb 276.1 acres for a 37.3-acre footprint with MQ-9 Maintenance Complex Option 1 or 834 acres for an approximately 50-acre footprint with MQ-9 Maintenance Complex Option 2. Implementing standard construction practices in accordance with an NPDES Construction General Stormwater Permit, the SWPPP, and other BMPs would result in no significant impacts occurring. (Section 4.3.6.1)	Construction required for the F-35A and MQ-9 combined actions would temporarily disturb 276 acres for an approximately 39-acre footprint with MQ-9 Maintenance Complex Option 1 or 834 acres for an approximately 50-acre footprint with MQ-9 Maintenance Complex Option 2. Implementing standard construction practices in accordance with an NPDES Construction General Stormwater Permit, the SWPPP, and other BMPs would result in no significant impacts occurring. (Section 4.3.6.2)	No F-35A–related impacts to soils and geologic resources. (Section 4.1.6.3)
Water Resources	There would be no significant impacts to water resources. BMPs to control erosion and runoff during construction would minimize impacts to water resources resulting from constructing 0 to 23 acres of new impervious surfaces, depending on facility siting. LID in facility design (mandatory for facilities over 5,000 square feet) would maintain pre-development hydrology to the greatest extent practicable. Construction would be consistent with the enforceable policies of Florida's Coastal Management Program. (Section 4.1.7.1)	There would be no significant impacts to water resources. BMPs to control erosion and pollution during construction would minimize impacts to water resources resulting from constructing 0 to 28 acres of new impervious surfaces, depending on facility siting. LID in facility design (mandatory for facilities over 5,000 square feet) would maintain pre-development hydrology to the greatest extent practicable. Construction would be consistent with the enforceable policies of Florida's Coastal Management Program. (Section 4.1.7.2)	Water resources could be affected differently depending on the MQ-9 option. Construction of the F-35A and MQ-9 facilities on the main runway would disturb at least 48 acres of land and, depending on facility siting, resulting in 10.5 to 42.5 acres of new impervious surfaces. With the F-35A Wing beddown MQ-9 Alternate Runway Option, construction would disturb at least 276 acres of land and, depending on facility siting, result in 27 to 50 acres of new impervious surfaces. BMPs and LID methods employed to control erosion and pollution during construction would minimize impacts to water resources under this combination of alternatives. Construction would be consistent with the enforceable policies of Florida's Coastal Management Program. (Section 4.3.7.1)	Water resources could be affected differently depending on the MQ-9 option. Construction of the F-35A and MQ-9 facilities on the main runway would disturb approximately 276 acres of land and, depending on facility siting, result in 10.5 to 44.5 acres of new impervious surfaces. With the F-35A beddown, MQ-9 Alternate Runway Option, construction would disturb approximately 834 acres of land and, depending on facility siting, result in 27 to 52 acres of new impervious surfaces. BMPs and LID methods employed to control erosion and pollution during construction would minimize impacts to water resources under this combination of alternatives. Construction would be consistent with the enforceable policies of Florida's Coastal Management Program. (Section 4.3.7.2)	No land disturbance or development would occur, and there would be no F-35A–related impacts to water resources. (Section 4.1.7.3)

Table 2.6-1. Comparison of Alternatives for the Proposed F-35A Wing Beddown at Tyndall AFB

Environmental Resource	F-35A at Tyndall AFB Three-Squadron F-35A Wing Alternative	F-35A at Tyndall AFB Four-Squadron F-35A Wing Alternative	F-35A and MQ-9 at Tyndall AFB Three-Squadron F-35A Wing Alternative and MQ-9 at Tyndall AFB Alternative	F-35A and MQ-9 at Tyndall AFB Four-Squadron F-35A Wing Alternative and MQ-9 at Tyndall AFB Alternative	F-35A at Tyndall AFB No Action Alternative
Biological Resources	Construction of facilities would result in the loss of up to 8.5 acres of vegetation/wildlife habitat and loss of up to 3.3 acres of wetlands. No adverse effects to sensitive species would occur. (Section 4.1.8.1)	Construction of facilities would result in the loss of up to 8.5 acres of vegetation/wildlife habitat and loss of up to 3.3 acres of wetlands. No adverse effects to sensitive species would occur. (Section 4.1.8.2)	Construction of facilities would result in the loss of up to 33.5 acres of vegetation/wildlife habitat and loss of up to 11.4 acres of wetlands (MQ-9 Maintenance Complex Option 1) or loss of up to 629.5 acres of vegetation/ wildlife habitat and 306.7 acres of wetlands (Maintenance Complex Option 2). No adverse effects to sensitive species would occur under MQ-9 Maintenance Complex Option 1. Under MQ-9 Maintenance Complex Option 2, potential impacts to the federally listed Godfrey's butterwort species that may be present could occur. (Section 4.3.8.1)	Construction of facilities would result in the loss of up to 33.5 acres of vegetation/wildlife habitat and loss of up to 11.4 acres of wetlands (MQ-9 Maintenance Complex Option 1) or loss of up to 629.5 acres of vegetation/wildlife habitat and 306.7 acres of wetlands (Maintenance Complex Option 2). No adverse effects to sensitive species would occur under MQ-9 Maintenance Complex Option 1. Under MQ-9 Maintenance Complex Option 2, potential impacts to the federally listed Godfrey's butterwort species that may be present could occur. (Section 4.3.8.2)	No F-35A–related impacts to wildlife habitat, wetlands, or federally listed species. (Section 4.1.8.3)
Cultural Resources	There are no historic properties in the APE for direct impacts; there would be no adverse effect to NRHP-listed or -eligible resources. (Section 4.1.9.1)	There are no historic properties in the APE for direct impacts; there would be no adverse effect to NRHP-listed or -eligible resources. (Section 4.1.9.2)	There are no historic properties in the APE for direct impacts; there would be no adverse effect to NRHP-listed or -eligible resources in the APE for indirect impacts. (Section 4.3.9.1)	There are no historic properties in the APE for direct impacts; there would be no adverse effect to NRHP-listed or -eligible resources in the APE for indirect impacts. (Section 4.3.9.2)	No ground-disturbing activities and no change in airspace use. No F-35A–related impact to cultural resources. (Section 4.1.9.3)
Land Use and Recreation	*Land Use* On-base land use would be compatible with the base reconstruction plan following the hurricane. Off-base land use would be compatible with reconstruction of hurricane-destroyed housing and other facilities. Between 61 and 68 acres of off-base land would be exposed to noise levels of 65 dB DNL or greater, including up to 10 acres of incompatible residential land on the peninsula leading to DuPont Bridge. This is less acreage than had been exposed to comparable noise levels before the hurricane. No land use effects from small differences in afterburner off-base noise. The USAF is working closely with the off-base communities to provide information which can be used for community land use planning decisions. Additional military households would create a need for off-base residential development. Available residential land was affected by the hurricane but could meet new development demands. *Recreation* Few impacts in local off-base recreational areas (park) from noise similar to, or less than, pre-hurricane levels. A small part of Shell Island within St Andrew State Park would be exposed to noise of 65 dB DNL. (Section 4.1.10.1)	*Land Use* On-base land use would be compatible with the base reconstruction plan following the hurricane. Off-base land use would be compatible with reconstruction of hurricane-destroyed housing and other facilities. Between 84 and 93 acres of off-base land would be exposed to noise levels of 65 dB DNL or greater, including up to 18 acres of incompatible residential land on the peninsula leading to DuPont Bridge. This is less acreage than had been exposed to comparable noise levels before the hurricane. No land use effects from small differences in afterburner off-base noise. The USAF is working closely with the off-base communities to provide information which can be used for community land use planning decisions. Additional military households would create a need for off-base residential development. Available residential land was affected by the hurricane, and demand could increase the strain on local resources in the midst of ongoing hurricane recovery.	*Land Use* On-base land use would be compatible with the base reconstruction plan following the hurricane. Off-base land use would be compatible with reconstruction of hurricane-destroyed housing and other facilities. Between 61 and 68 acres of off-base land would be exposed to noise levels of 65 dB DNL or greater, including up to 10 acres of incompatible residential land on the peninsula leading to DuPont Bridge. This acreage is less than had been exposed to comparable noise levels before the hurricane. No land use effects from small differences in afterburner off-base noise. The USAF is working closely with the off-base communities to provide information which can be used for community land use planning decisions. Additional military households would create a need for off-base residential development. Available residential land was affected by the hurricane, and demand could increase the strain on local resources in the midst of	*Land Use* On-base land use would be compatible with the base reconstruction plan following the hurricane. Off-base land use would be compatible with reconstruction of hurricane-destroyed housing and other facilities. Between 84 and 93 acres of off-base land would be exposed to noise levels of 65 dB DNL or greater, including up to 18 acres of incompatible residential land on the peninsula leading to DuPont Bridge. This is fewer acres than had been exposed to comparable noise levels before the hurricane. No land use effects from small differences in afterburner off-base noise. The USAF is working closely with the off-base communities to provide information which can be used for community land use planning decisions. Additional military households would create a need for off-base housing and could generate a need for residential development. Available residential land is limited due to hurricane damage, and residential land could become more difficult to develop. Shortages of residential land could increase the time and	*Land Use* There would be no F-35A mission at Tyndall Noise levels above 65 dB DNL would not affect any off-base areas. There would be no mission-induced new off-base housing. *Recreation* No F-35A–related effects to off-base recreation from existing use by USAF personnel. (Section 4.1.10.3)

Table 2.6-1. Comparison of Alternatives for the Proposed F-35A Wing Beddown at Tyndall AFB

Environmental Resource	F-35A at Tyndall AFB Three-Squadron F-35A Wing Alternative	F-35A at Tyndall AFB Four-Squadron F-35A Wing Alternative	F-35A and MQ-9 at Tyndall AFB Three-Squadron F-35A Wing Alternative and MQ-9 at Tyndall AFB Alternative	F-35A and MQ-9 at Tyndall AFB Four-Squadron F-35A Wing Alternative and MQ-9 at Tyndall AFB Alternative	F-35A at Tyndall AFB No Action Alternative
Land Use and Recreation (continued)		Some residents living in areas underlying training airspace or long-term visitors to the Mud Swamp Wilderness Area could be annoyed by additional overflights and associated noise. *Recreation* Few impacts in local off-base recreational areas (park) from noise similar to, or less than, pre-hurricane levels. A small part of Shell Island within St Andrew State Park would be exposed to noise of 65 dB DNL. (Section 4.1.10.2)	ongoing hurricane recovery. Possible moderate impact on local land use. Some residents living in areas underlying training airspace or long-term visitors to the Mud Swamp Wilderness Area could be annoyed by additional overflights and associated noise. *Recreation* The projected increase in 3,942 military households living off base could result in increased demand for community recreational resources (parks, playgrounds, public recreational centers, swimming pools, etc.). Military personnel would continue to use on base recreational resources. (Section 4.3.10.1)	cost to develop new housing. Possible high impact on local land use. Some residents living in areas underlying training airspace or long-term visitors to the Mud Swamp Wilderness Area could be annoyed by additional overflights and associated noise. *Recreation* The projected increase in 4,646 military households living off base could result in moderate impacts to community recreational resources (parks, playgrounds, public recreational centers/swimming pools, etc.). Potential for moderate impact on local recreational resources. Military personnel would continue to use on base recreational resources. (Section 4.3.10.2)	
Infrastructure	There would be no significant impacts to the base infrastructure following post-hurricane reconstruction. The infrastructure capacity, including potable water, sanitary sewer system, stormwater discharge system, solid waste, electrical, and natural gas, would not be affected by an increased demand over the affected environment conditions. (Section 4.1.11.1)	There would be no significant impacts to the base infrastructure following post-hurricane reconstruction. The infrastructure capacity, including potable water, sanitary sewer system, stormwater discharge system, solid waste, electrical, and natural gas, would not be affected by an increased demand over the affected environment conditions. (Section 4.1.11.2)	There would be no significant impacts to the base infrastructure following post-hurricane reconstruction. The infrastructure capacity, including potable water, sanitary sewer system, stormwater discharge system, solid waste, electrical, and natural gas, would not be affected by an increased demand over the affected environment conditions. Contracts with Bay County for potable water and wastewater service would need to be revised to reflect higher demands for service. (Section 4.3.11.1)	There would be no significant impacts to the base infrastructure following post-hurricane reconstruction. The infrastructure capacity, including potable water, sanitary sewer system, stormwater discharge system, solid waste, electrical, and natural gas, would not be affected by an increased demand over the affected environment conditions. Contracts with Bay County for potable water and wastewater service would need to be revised to reflect higher demands for service. Additional interconnection capacity with Bay County may be needed for potable water, and storage requirements may increase on base as a result of new building construction and personnel increases. (Section 4.3.11.2)	No construction or personnel increase would occur. The use of utilities and power and waste generation would be substantially below capacity after base reconstruction following the hurricane. No F-35A–related impacts to the Tyndall AFB reconstructed infrastructure system. (Section 4.1.11.3)
Transportation	Additional traffic at the intersection of US-98, Tyndall Drive, and Airey Avenue, particularly during the morning and afternoon peak periods, would become LOS F. The intersection would experience significant impacts, up to 10 minutes of delay, from morning right turns onto Airey Avenue and evening left turns onto US-98. A segment of US-98 would exceed capacity (LOS F) during the morning peak period and would be at capacity (LOS E) during the afternoon peak period. (Section 4.1.12.1)	Additional traffic at the intersection of US-98, Tyndall Drive, and Airey Avenue and along US-98 would result in LOS F at the intersection and along US-98 during both peak periods. Delays would be significant under this alternative (over 11 minutes of control delay at the intersection), with volume-to-capacity (V/C) ratios of more than 2.0. (Section 4.1.12.2)	For the F-35A beddown in combination with the MQ-9 Main Runway Option: The combination of alternatives would generate additional traffic at the intersection of US-98, Tyndall Drive, and Airey Avenue and along US-98. The LOS would decrease to LOS F for all analyzed facilities. Delays would be significant under this alternative (over 11 minutes of control delay at the intersection), with V/C ratios of up to 2.7 at the intersection. F-35A beddown in combination with the MQ-9 Alternate Runway Option: The combination of alternatives would generate additional traffic at the intersection of US-98,	For the F-35A beddown in combination with the MQ-9 Main Runway Option: The combination of alternatives would generate additional traffic at the intersection of US-98, Tyndall Drive, and Airey Avenue and along US-98. The LOS would decrease to LOS F for all analyzed facilities. Delays would be significant under this alternative (nearly 11 minutes of control delay at the intersection), with V/C ratios of up to 3.0 at the intersection. For the F-35A beddown in combination with the MQ-9 Alternate Runway Option: The combination of alternatives would generate additional traffic at the intersection of US-98, Tyndall Drive, and Airey Avenue and along	No mission-related construction or personnel increases would occur. Traffic conditions for the intersection of US-98 and Tyndall Drive would be acceptable (LOS C), although LOS D could occur during the afternoon peak period. No F-35A–related impacts to the Tyndall AFB transportation system would result from implementation of the No Action Alternative. (Section 4.1.12.3)

Table 2.6-1. Comparison of Alternatives for the Proposed F-35A Wing Beddown at Tyndall AFB

Environmental Resource	F-35A at Tyndall AFB Three-Squadron F-35A Wing Alternative	F-35A at Tyndall AFB Four-Squadron F-35A Wing Alternative	F-35A and MQ-9 at Tyndall AFB Three-Squadron F-35A Wing Alternative and MQ-9 at Tyndall AFB Alternative	F-35A and MQ-9 at Tyndall AFB Four-Squadron F-35A Wing Alternative and MQ-9 at Tyndall AFB Alternative	F-35A at Tyndall AFB No Action Alternative
Transportation (continued)			Tyndall Drive, and Airey Avenue and along US-98. A new gate would be included on US-98 that would divert a portion of the traffic from the main gate and lessen the impact at the main gate. However, the LOS would still decrease to LOS F for all analyzed facilities. The combination of the F-35A beddown with either MQ-9 beddown option would result in significant impacts. (Section 4.3.12.1)	US-98. A new gate would be included on US-98 that would divert a portion of the traffic from the main gate and lessen the impact at the main gate. However, the LOS would still decrease to LOS F for all analyzed facilities. The combination of the F-35A beddown with either MQ-9 beddown option would result in significant impacts. (Section 4.3.12.2)	
Socioeconomics	A total increase of 2,200 USAF personnel would occur at a rate of 550 personnel per year from 2022 through 2025. There would be a total of 2,992 dependents including 1,496 children. The estimated 1,100 school-age children would increase enrollment in Bay County schools by an estimated 275 students per year from 2022 through 2025. USAF personnel expenditures would create indirect and induced employment of the equivalent total of an additional 1,206 jobs, or approximately 302 jobs added per year from 2022 through 2025. Construction costs for F-35A facilities of $320 million would result in a total of direct, indirect, and induced jobs of approximately 657 jobs in 2021, rising to 1,288 to 1,239 jobs from 2022 through 2024. This alternative would result in an estimated on-base and off-base increase in jobs of 657 in 2021, to 2,140 in 2022, increasing to 3,795 jobs in 2024, peaking at 5,008 jobs in 2025, and then leveling off at approximately 3,406 jobs after 2025. There would be an annual demand for USAF off-base housing, stabilizing at 2,019 additional units by 2025. Construction workers and secondary employees would also demand housing, and, assuming a labor participation rate of 1.5 jobs per household, there would be an additional demand by construction and secondary workers for up to 1,630 housing units in the community for the years 2022 through 2025. Adding that to the 2025 USAF off-base housing demand of 2,019 would result in a total demand of 3,649 units by the end of 2024. Housing demand would be reduced to represent total housing demand for 2,019 off-base USAF personnel plus 804 secondary personnel, for a demand for 2,823 housing units after 2025. There would be a demand for additional public service personnel throughout Bay County. For example, there would be a calculated demand for an additional 11 policemen, 8 firemen, and 14 medical	A total increase of 2,933 USAF personnel would occur at a rate of 587 personnel per year from 2022 through 2026. There would be a total of 3,988 dependents including 1,994 children. The estimated 1,466 school-age children would increase enrollment in Bay County schools by an estimated 293 students per year from 2022 through 2026. USAF personnel expenditures would create indirect and induced employment of the equivalent total of an additional 1,609 jobs, or approximately 322 jobs added per year from 2022 through 2026. Construction costs for F-35A facilities of $400 million would result in a total of direct, indirect, and induced jobs of approximately 1,314 jobs in 2021, declining to 1,191 jobs in 2025 before completing construction. This alternative would result in an estimated on-base and off-base increase in jobs of 1,314 in 2021, to 3,966 in 2024, and then leveling off at approximately 4,542 jobs from 2026 and onward. There would be an annual demand for USAF off-base housing, stabilizing at 2,690 additional units by 2026. Construction workers and secondary employees would also demand housing, and, assuming a labor participation rate of 1.5 jobs per household, there would be an additional demand by construction and secondary workers for up to 1,899 housing units in the community for the years 2022 through 2025. Adding this to the 2025 USAF off-base housing demand of 2,690 would result in a total demand of 4,589 units by the end of 2024.	An increase of 4,100 USAF personnel would be accompanied by 5,576 dependents including 2,788 children. The estimated 2,049 school-age children would substantially increase enrollment in Bay County schools. USAF personnel expenditures would create indirect and induced employment of the equivalent total of an additional 2,284 jobs, or approximately 571 jobs added per year from 2022 through 2025. Construction costs for Three-Squadron F-35A and MQ-9 facilities of $720 million would create secondary employment. The estimated total increase in on-base and off-base jobs would be 1,642 in 2021 up to 9,172 jobs by the beginning of 2025, and then level off at approximately 6,384 jobs from 2026 and onward. There would be an annual demand for USAF off-base housing, stabilizing at 3,608 additional units by the end of 2026. Construction workers and secondary employees would also demand housing. The additional demand by construction and secondary workers would be for up to 3,382 housing units in the community by the end of 2024. Adding that to the 2025 USAF off-base housing demand of 3,608 would result in a total demand of 6,990 units by 2026. The demand for construction labor would exceed the county's capacity and require additional in-migration of personnel. In-migrating construction workers would compete for housing and other services with other Bay County residents. Housing costs in the next several years could continue rising by 10 to 15 percent or more per year as supply tries to catch up with	A total increase of 4,832 USAF personnel would occur at a rate of 1,063 personnel per year from 2022 through 2025 plus 800 personnel in 2026. There would be a total of 6,572 dependents including 3,286 children. The estimated 2,415 school-age children would substantially increase enrollment in Bay County schools by an estimated 532 students per year from 2022 through 2025 and 293 students in 2026. USAF personnel expenditures would create indirect and induced employment of the equivalent total of an additional 2,689 jobs, or approximately 592 jobs added per year from 2022 through 2025 and 321 jobs in 2026. Construction costs for Four Squadron F-35A and MQ-9 facilities of $800 million would create direct, indirect, and induced employment and earnings. The estimated total increase in USAF on-base and secondary off-base jobs would be 2,299 in 2021 up to 9,403 jobs at the end of 2024, and then level off at approximately 7,522 jobs from 2026 and onward. There would be an annual demand for USAF personnel off-base housing, stabilizing at 4,280 additional units by 2026. Construction workers and secondary employees would also demand housing, and, assuming a labor participation rate of 1.5 jobs per household, there would be an additional demand by construction and secondary workers for up to 3,438 housing units in the community by the beginning of 2025. Adding that to the 2025 USAF off-base housing demand of 4,280 would result in a peak demand of 7,718 units by 2025. The demand for construction labor would exceed the county's capacity and require additional in-migration of personnel. In-migrating construction workers would compete for	Socioeconomic resources conditions would be as described for the affected environment in Section 3.1.13. There would continue to be 2,200 USAF employees at Tyndall AFB and no construction of facilities for the F-35A or MQ-9 Wing beddowns. (Section 4.1.13.3)

Table 2.6-1. Comparison of Alternatives for the Proposed F-35A Wing Beddown at Tyndall AFB

Environmental Resource	F-35A at Tyndall AFB Three-Squadron F-35A Wing Alternative	F-35A at Tyndall AFB Four-Squadron F-35A Wing Alternative	F-35A and MQ-9 at Tyndall AFB Three-Squadron F-35A Wing Alternative and MQ-9 at Tyndall AFB Alternative	F-35A and MQ-9 at Tyndall AFB Four-Squadron F-35A Wing Alternative and MQ-9 at Tyndall AFB Alternative	F-35A at Tyndall AFB No Action Alternative
Socioeconomics (continued)	personnel to support off-base USAF families by 2026. There could be a substantially greater number of personnel needed during construction. (Section 4.1.13.1)	Housing demand would be reduced to represent a secondary employee demand for 1,073 plus the USAF demand for 2,690 housing units, for a total off-base demand for 3,763 housing units from 2026 and onward. There would be a demand for additional public service personnel throughout Bay County. For example, there would be a calculated demand for an additional 15 policemen, 11 firemen, and 18 medical personnel to support off-base USAF families by 2026. There could be a substantially greater number of service personnel needed during construction. (Section 4.1.13.2)	demand before leveling off, or even declining, as construction workers no longer contribute to housing demand. USAF-related direct and secondary off-base housing demand would decline to 5,131 units after 2026. There would be a demand for additional public service personnel throughout Bay County. For example, there would be a calculated demand for an additional 21 policemen, 15 firemen, and 25 medical personnel to support off-base USAF families by 2026. There could be a substantially greater number of service personnel needed during construction. (Section 4.3.13.1)	housing and other services with other Bay County residents. Housing costs in the next several years could continue rising by 10 to 15 percent or more per year as supply tries to catch up with demand before leveling off, or even declining, as construction workers no longer contribute to housing demand. USAF direct and secondary off-base housing demand would decline to 6,073 units from 2026 and onward. There would be a demand for additional public service personnel throughout Bay County. For example, there would be a calculated demand for an additional 25 policemen, 17 firemen, and 29 medical personnel to support off-base USAF families by 2026. There could be a substantially greater number of service personnel needed during construction. (Section 4.3.13.2)	
Environmental Justice	The percent of minority and low-income populations in the census block group, defined as the ROI, does not exceed the percent of minority and low-income populations in the census tract, defined as the COC. There would be no disproportionately high and adverse impacts to environmental justice communities from aircraft noise. The increase in the demand for housing combined with the hurricane destruction of housing will increase housing costs, and low-income residents who typically spend a larger proportion of their income on housing than the general population could be especially affected. There are no schools, daycares, hospitals, or nursing homes located off-base within any afterburner scenario 65 dB DNL noise contour. The increase in USAF-related students would result in more funds for schools to restore education impacted by the hurricane destruction. No populations reside within the APZs. The off-base acreage within the 65 dB DNL or greater noise contour is less than under pre-hurricane conditions. (Section 4.1.14.1)	The percent of minority and low-income populations in the census block group, defined as the ROI, does not exceed the percent of minority and low-income populations in the census tract, defined as the COC. There would be no disproportionately high and adverse impacts to environmental justice communities from aircraft noise. The increase in the demand for housing combined with the hurricane destruction of housing will increase housing costs, and low-income residents who typically spend a larger proportion of their income on housing than the general population could be especially affected. There are no schools, daycares, hospitals, or nursing homes located off-base within any afterburner scenario 65 dB DNL noise contour. The increase in USAF-related students would result in more funds for schools to restore education impacted by the hurricane destruction. No populations reside within the APZs. The off-base acreage within the 65 dB DNL or greater noise contour is less than under pre-hurricane conditions. (Section 4.1.14.2)	MQ-9 flight operations do not add to off-base noise. The percent of minority and low-income populations in the census block group, defined as the ROI, does not exceed the percent of minority and low-income populations in the census tract, defined as the COC. There would be no disproportionately high and adverse impacts to environmental justice communities from aircraft noise. The large increase in the demand for housing combined with the hurricane destruction of housing will increase housing costs, and low-income residents who typically spend a larger proportion of their income on housing than the general population could be especially affected. There are no schools, daycares, hospitals, or nursing homes located off-base within any afterburner scenario 65 dB DNL noise contour. The increase in USAF-related students would result in more funds for schools to restore education impacted by the hurricane destruction. No populations reside within the APZs. The off-base acreage within the 65 dB DNL or greater noise contour is less than under pre-hurricane conditions. (Section 4.3.14.1)	MQ-9 flight operations do not add to off-base noise. The percent of minority and low-income populations in the census block group, defined as the ROI, does not exceed the percent of minority and low-income populations in the census tract, defined as the COC. There would be no disproportionately high and adverse impacts to environmental justice communities from aircraft noise. The substantial increase in the demand for housing combined with the hurricane destruction of housing will increase housing costs, and low-income residents who typically spend a larger proportion of their income on housing than the general population could be especially affected. There are no schools, daycares, hospitals, or nursing homes located off-base within any afterburner scenario 65 dB DNL noise contour. The increase in USAF-related students would result in more funds for schools to restore education impacted by the hurricane destruction. No populations reside within the APZs. The off-base acreage within the 65 dB DNL or greater noise contour is less than under pre-hurricane conditions. (Section 4.3.14.2)	There would be no disproportionate noise effect to minority or low-income populations as a result of the No Action Alternative. There are no residential land areas or populations impacted by noise levels of 65 dB DNL associated with affected environment aircraft operations at Tyndall AFB. Without an influx of students, schools would continue to face budget constraints. (Section 4.1.14.3)

Key: AFB = Air Force Base; APE = Area of Potential Effects; APZ = Accident Potential Zone; ATC = Air Traffic Control; BASH = bird/wildlife aircraft strike hazard; BMPs= best management practices; CO = carbon monoxide; COA = Certificate of Authorization; COC = Community of Comparison; dB = decibels; DNL = day-night average sound level; DoD = Department of Defense; ERP = Environmental Restoration Program; L_{dnmr} = onset rate-adjusted monthly day-night average sound level; $L_{eq\text{-}8hr}$ = 8-hour equivalent noise level; LID = Low Impact Development; LOS = level of service; NAAQS = National Ambient Air Quality Standards; NO_2 = nitrogen dioxide; NO_x = nitrogen oxides; NPDES = National Pollutant Discharge Elimination System; NRHP = National Register of Historic Places; 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; ROI = region of influence; RPA = remotely piloted aircraft; SO_x,= sulfur oxides; SUA = Special Use Airspace; SWPPP = Storm Water Pollution Prevention Plan; US-98 = U.S. Highway 98; USAF = U.S. Air Force; V/C = volume-to-capacity; VOCs = volatile organic compounds

Note: The pre-hurricane conditions of 2018 are presented for some resource areas, where it would be useful as a point of comparison to provide context to the environmental impacts for the local public and decisionmakers.

Table 2.6-2. Comparison of Alternatives for the Proposed MQ-9 Wing Beddown (Tyndall AFB or Vandenberg AFB)

Environmental Resource	MQ-9 Tyndall AFB Alternative	MQ-9 Vandenberg AFB Alternative	MQ-9 No Action Alternative
Airspace Management and ATC	No significant impacts to airfield operations or training airspace. An MQ-9 Wing at Tyndall AFB would generate an estimated 5,700 airfield operations plus any additional practice takeoffs/landings and 2,820 sortie operations in the training airspace and required COAs. The conduct of these operations in any airspace environment would adhere to the strict UAS requirements governing these flights. This includes the manner in which ATC and RPA operators must closely monitor and control these flights throughout all flight activities. Tyndall AFB has the airfield and airspace capabilities for supporting the MQ-9 Wing beddown and its operational requirements without impacting other manned aircraft operations and airspace uses. (Section 4.2.1.1)	No significant impacts to airfield operations or training airspace. An MQ-9 Wing at Vandenberg AFB would generate an estimated 5,700 airfield operations plus any additional practice takeoffs/landings and 2,820 sortie operations in the training airspace and required COAs. The conduct of these operations in any airspace environment would adhere to the strict UAS requirements governing these flights. This includes the manner in which ATC and RPA operators must closely monitor and control these flights throughout all flight activities. Vandenberg AFB has the airfield and airspace capabilities for supporting the MQ-9 beddown and its operational requirements without impacting other manned aircraft operations and airspace uses. (Section 4.2.2.1)	There would be no MQ-9 related impacts at either Tyndall AFB or Vandenberg AFB. Airfield and training airspace uses by the differing flight activities conducted at Tyndall AFB and Vandenberg AFB would remain at the representative affected environment levels. (Sections 4.2.1.3 and 4.2.2.2)
Noise	Noise levels exceeding 65 dB DNL would not extend off base. MQ-9 overflights under the Main Runway or Alternate Runway Option would increase the number of outdoor noise events, with potential to interfere with speech momentarily, by up to three events per hour at the locations studied relative to the No Action Alternative with minimal flying operations. Noise levels at Tyndall Elementary School would remain above the recommended maximum noise level, and noise at Parker Elementary School would remain below criteria levels under both options. The number of events per hour at Tyndall Elementary School with potential to interfere with speech would be two with windows open or closed under the Main Runway Option and one under the Alternate Runway Option. The probability of people being awakened at least once per night by MQ-9 operations at the Tyndall AFB Dormitories and residential areas in the vicinity of Tyndall Elementary School would increase from 0 to 1 percent under the Main Runway Option and would remain near 0 percent at all locations under the Alternate Runway Option. Risk of potential hearing loss, workplace noise impacts, and nonauditory health impacts would remain minimal. MQ-9 operations at mission altitude are below typical ambient noise levels and do not add to overall subsonic-aircraft-operations noise levels beneath overland training airspace. (Section 4.2.1.3)	Noise levels exceeding 65 dB CNEL (or DNL) would not extend off base. Noise levels at representative noise-sensitive locations near Vandenberg AFB would increase by as much as 2 dB to 48 dB (similar to 45-dB noise levels typical in rural areas). MQ-9 overflights would increase the number of outdoor noise events, with potential to interfere with speech momentarily, by up to three events per hour at the locations studied. Outdoor noise levels at Crestview Elementary School and Maple High School would remain below 60 dB $L_{eq\text{-}8hr}$ under the Proposed Action. The probability of sleep disturbance at the representative noise-sensitive locations would continue near zero. Risk of potential hearing loss, workplace noise impacts, and nonauditory health impacts would remain minimal. MQ-9 operations at mission altitude are below typical ambient noise levels and do not add to overall subsonic-aircraft-operations noise levels beneath overland training airspace. (Section 4.2.2.3)	Under the No Action Alternative, aircraft operations and noise levels would not increase due to an MQ-9 Wing beddown. There would be no MQ-9–related acoustic impacts at either Tyndall AFB or Vandenberg AFB from implementation of the No Action Alternative. (Sections 4.2.1.4 and 4.2.2.4)
Health and Safety	There is a potential increase of BASH events with additional flight operations. The 5,900 MQ-9 flight operations would be calculated to result in 2 additional BASH incidents per year. There are approximately 6 BASH incidents per year with No Action. There could be one calculated Class A incident every 1.2 years. There is a potential for MQ-9 mishaps resulting from loss of satellite communications with the aircraft (“lost-link”). The aircraft is programmed to return to the vicinity of the base so that direct line-of-sight communication can be restored. Existing flight safety procedures combined with the nature of the MQ-9 operational areas (i.e., low public presence) would minimize any impacts. All planned training and construction activities would be accomplished by technically qualified personnel and conducted in accordance with applicable USAF, state, and federal safety standards and requirements. No significant impacts would be anticipated. (Section 4.2.1.5)	There is potential increase of BASH events with additional flight operations. The 5,900 MQ-9 flight operations would be calculated to result in fewer than 2 additional BASH incidents per year. Animals and birds would become accustomed to increased airfield operations by a relatively slow aircraft and would be able to avoid the MQ-9. There could be one calculated Class A incident every 1.2 years. There is an average of fewer than 2 BASH incidents per year with No Action. There would be one calculated Class A incident every 1.2 years. There is a potential for MQ-9 mishaps resulting from loss of satellite communications with the aircraft (“lost-link”). The aircraft is programmed to return to the vicinity of the base so that direct line-of-sight communication can be restored. Existing flight safety procedures combined with the nature of the MQ-9 operational areas (i.e., low public presence) would minimize any impacts. All planned training and construction activities would be accomplished by technically qualified personnel and conducted in accordance with applicable USAF, state, and federal safety standards and requirements. No significant impacts would be anticipated. (Section 4.2.2.5)	There would be no MQ-9 related impacts to flight- or ground-safety at either Tyndall AFB or Vandenberg AFB. Ground operations would continue to be conducted using the same safety processes and procedures as under current operations. (Sections 4.2.1.6 and 4.2.2.6)
Air Quality	Total annual construction and operational emissions would be below all initial indicators of potential significance. This alternative would not result in any significant impacts to air quality. (Section 4.2.1.7)	Total annual construction and operational emissions would be below all initial indicators of potential significance. This alternative would not result in any significant impacts to air quality. (Section 4.2.2.7)	There would be no MQ-9-related air quality impacts at either Tyndall AFB or Vandenberg AFB. (Sections 4.2.1.8 and 4.2.2.8)
Hazardous Materials and Waste	Minor hazardous materials and wastes would be generated from demolition, construction, operations, and maintenance. Impacts would be minimized with implementation of appropriate and established handling procedures. Construction within and adjacent to multiple ERP sites would follow USAF regulations. (Section 4.2.1.9)	Minor hazardous materials and wastes would be generated from demolition, construction, operations, and maintenance. Impacts would be minimized with implementation of appropriate and established handling procedures. Construction within ERP Site AOC-147 would follow USAF regulations. (Section 4.2.2.9)	There would be no MQ-9-related hazardous materials or waste impacts at either Tyndall AFB or Vandenberg AFB. (Sections 4.2.1.10 and 4.2.2.10)

Table 2.6-2. Comparison of Alternatives for the Proposed MQ-9 Wing Beddown (Tyndall AFB or Vandenberg AFB)

Environmental Resource	MQ-9 Tyndall AFB Alternative	MQ-9 Vandenberg AFB Alternative	MQ-9 No Action Alternative
Soils and Geologic Resources	Up to 120.7 (Maintenance Complex Option 1) or 678.9 (Maintenance Complex Option 2) acres could be temporarily disturbed due to construction. Facility footprints within the disturbed areas total approximately 23 acres for either option. Implementing standard construction practices would result in no significant impacts to soils or geologic resources. (Section 4.2.1.11)	Potential construction impacts include the disturbance of at least 50 acres and creation of approximately 21 acres of impervious surfaces. Implementing standard construction practices would result in no significant impacts to soils or geologic resources. (Section 4.2.2.11)	There would be no MQ-9–related impacts to soils or geologic resources at either Tyndall AFB or Vandenberg AFB. (Sections 4.2.1.12 and 4.2.2.12)
Water Resources	Up to 120.7 (Maintenance Complex Option 1) or 678.9 (Maintenance Complex Option 2) acres could be temporarily disturbed due to construction. Facility footprints within the disturbed areas total approximately 23 acres for either option. The incorporation of BMPs to control erosion and pollution during construction would reduce impacts to water resources. The incorporation of LID in facility design (mandatory for facilities over 5,000 square feet) would maintain pre-development hydrology to the greatest extent practicable. There would be no significant impacts to water resources. This alternative would be consistent with the enforceable policies of Florida's Coastal Management Program. (Section 4.2.1.13)	Construction would result in the addition of 25 acres of new impervious surfaces. The incorporation of BMPs to control erosion and pollution during construction would reduce impacts to water resources. The incorporation of LID in facility design (mandatory for facilities over 5,000 square feet) would maintain pre-development hydrology to the greatest extent practicable. There would be no significant impacts to water resources. There would be no effects to California coastal uses or resources. (Section 4.2.2.13)	There would be no MQ-9–related land disturbance or development and no impacts to water resources at Tyndall AFB or Vandenberg AFB. (Sections 4.2.1.14 and 4.2.2.14)
Biological Resources	Construction of facilities would result in the loss of up to 25 acres of vegetation/wildlife habitat and loss of up to 8.1 acres of wetlands under Maintenance Complex Option 1. No adverse impacts to sensitive species would occur. Construction under Maintenance Complex Option 2 would result in the loss of up to 621 acres of vegetation/wildlife habitat and up to 303.4 acres of wetlands. Potential impacts to the federally listed Godfrey's butterwort that may be present within the proposed location of the Maintenance Complex Option 2 and within the MSA could occur. Flight operations are not expected to impact any sensitive species. (Section 4.2.1.15)	Facility construction would result in impacts to biological resources with Maintenance Complex construction resulting in loss of up to 52.3 acres of vegetation/wildlife habitat. No impacts to federally jurisdictional wetlands would occur. A determination of "may affect, not likely to adversely affect" has been made for three federally listed species and a determination of "may affect, likely to adversely affect" has been made for an additional three species (Section 4.2.2.15). The USFWS has issued a Biological Opinion concurring with these determinations.	There would be no MQ-9–related impacts to wildlife habitat, wetlands, or federally listed species at Tyndall AFB or Vandenberg AFB. (Sections 4.2.1.16 and 4.2.2.16)
Cultural Resources	There are no historic properties in the APE; there would be no adverse effect to historic properties. (Section 4.2.1.17)	There are no known historic properties in the APE; there would be no adverse effect to historic properties. (Section 4.2.2.17)	No ground disturbing activities and no change in airfield operations. There would be no MQ-9–related impacts to cultural resources at Tyndall AFB or Vandenberg AFB. (Sections 4.2.1.18 and 4.2.2.18)
Land Use and Recreation	*Land Use* On-base land use would be compatible with the base reconstruction plan following the hurricane. Off-base land use for housing would be compatible with reconstruction of hurricane-destroyed housing and other facilities. Proposed construction on base would be consistent with base planning. The Alternate Runway Option would provide some benefits to circulation on base and preserve flexibility for future flightline development. No off-base residential land would be exposed to noise levels of 65 dB DNL or greater. The estimated additional military households would create a need for off-base residential development of between 208 to 416 acres. Available residential land was affected by the hurricane but could meet new development demands. *Recreation* Few impacts in local off-base recreational area (park) from noise similar or less than pre-hurricane levels. A small part of Shell Island within St Andrew State Park would be exposed to noise of 65 dB DNL. (Section 4.2.1.19)	*Land Use* On-base land use would be compatible with the base comprehensive plan. No off-base noise impacts on surrounding land use. Off-base land use for housing would be compatible with local planning and zoning. The estimated military households need off-base housing and could generate a need for residential development of between 208 to 416 acres. Limited supply of affordable homes in Santa Barbara North County could result in development of residential land in cities of Lompoc, Santa Maria, Guadalupe, and/or Buellton. *Recreation* No noise effects on off-base recreational areas or beaches. (Section 4.2.2.19)	*Land Use* No MQ-9–related impacts on land use under the No Action Alternative at Tyndall AFB or Vandenberg AFB. *Recreation* No MQ-9–related impact on recreation under the No Action Alternative at Tyndall AFB or Vandenberg AFB. (Sections 4.2.1.20 and 4.2.2.20)
Infrastructure	The capacity of Tyndall AFB's infrastructure, including potable water, sanitary sewer system, stormwater discharge system, solid waste, electrical, and natural gas, would continue to operate below capacity and would not be affected by the slightly increased demand over current conditions. No significant impacts to infrastructure are anticipated. (Section 4.2.1.21)	The capacity of Vandenberg AFB's infrastructure, including potable water, sanitary sewer system, stormwater discharge system, solid waste, electrical, and natural gas, would have adequate capacity for the increased demand. No significant impacts to infrastructure are anticipated. (Section 4.2.2.21)	The use of utilities and power and waste generation would remain at the affected environment levels, and there would be no MQ-9–related impacts to the infrastructure systems at Tyndall AFB and Vandenberg AFB. (Sections 4.2.1.22 and 4.2.2.22)

Table 2.6-2. Comparison of Alternatives for the Proposed MQ-9 Wing Beddown (Tyndall AFB or Vandenberg AFB)

Environmental Resource	MQ-9 Tyndall AFB Alternative	MQ-9 Vandenberg AFB Alternative	MQ-9 No Action Alternative
Transportation	The MQ-9 Main Runway Option would generate additional traffic at the intersection of US-98, Tyndall Drive, and Airey Avenue, particularly during the morning and afternoon peak periods. The intersection would operate at LOS F, below an acceptable LOS for highway facilities. Impacts would be significant. Delays at the intersection would be approximately 5 minutes and 1.5 minutes for the morning and afternoon peak periods, respectively. The MQ-9 Alternate Runway Option includes a new gate on US-98 to divert traffic from the main gate and lessen the impact at the main gate. Congestion on US-98 would be moderate, as it is the primary highway serving the base. (Section 4.2.1.23)	During afternoon peak hour, traffic conditions would be at unacceptable levels at the intersections of CA-1 and Lompoc Casmalia Road (LOS D) and Santa Lucia Canyon Road and Pine Canyon Road (LOS F). In addition, LOS D would occur at the intersection of CA-1 and Lompoc Casmalia Road during the morning peak period. Impacts to these two intersections and two road segments would be significant according to the Caltrans guidelines, which consider LOS D and below to be unacceptable. (Section 4.2.2.23)	No MQ-9–related construction or personnel increases would occur at either Tyndall AFB or Vandenberg AFB. At both bases, there would continue to be congestion but it would not be the result of any MQ-9 beddown. (Sections 4.2.1.24 and 4.2.2.24)
Socioeconomics	A total increase of 1,900 USAF personnel would occur at a rate of 475 personnel per year from 2022 through 2025. There would be a total of 2,584 dependents including 1,292 children. The estimated 950 school-age children would increase enrollment in Bay County schools by an estimated 238 students per year from 2022 through 2025. USAF personnel expenditures would create indirect and induced employment of the equivalent total of an additional 1,080 jobs, or approximately 270 jobs added per year from 2022 through 2025. Construction costs for MQ-9 facilities of $400 million would result in a total of direct, indirect, and induced jobs of approximately 985 jobs in 2021, rising to 1,675 in 2024. The MQ-9 Wing beddown would result in an estimated on-base and off-base increase in jobs of 985 in 2021, to 3,910 jobs in 2024, and then leveling off at approximately 2,980 jobs after 2025. There would be a USAF annual demand for approximately 417 off-base housing units, stabilizing at 1,589 additional units by 2025. Construction workers and secondary employees would also demand housing, and, assuming a labor participation rate of 1.5 jobs per household, there would be an additional demand by construction and secondary workers for up to 1,837 housing units in the community for the years 2022 through 2025. When combined with the off-base USAF housing demand of 1,589 units, this would produce a total 2024 demand for 3,426 housing units. MQ-9 induced housing demand would drop back to a demand for 1,589 off-base units for USAF personnel plus units for 720 secondary personnel housing, for a total demand for 2,309 housing units after 2025. There would be a demand for additional public service personnel throughout Bay County. For example, there would be a demand for an additional 10 policemen, 7 firemen, and 11 medical personnel to support off-base USAF families by 2026. There could be a substantially greater number of service personnel needed during construction. (Section 4.2.1.25)	A total increase of 1,900 USAF personnel would occur at a rate of 475 personnel per year from 2022 through 2025. There would be 2,584 dependents including 1,292 children. The estimated 950 school-age children would increase enrollment in Santa Barbara County schools by an estimated 238 students per year from 2022 through 2025. USAF personnel expenditures would create indirect and induced employment of the equivalent total of an additional 760 jobs, or approximately 190 jobs added per year from 2022 through 2025. Construction costs for MQ-9 facilities of $400 million would result in a total of direct, indirect, and induced jobs of approximately 915 jobs in 2021, rising to 1,496 in 2022, and to 1,437 in 2024. The MQ-9 Wing would result in an estimated on-base and off-base increase in jobs of 915 in 2021, to 3,432 jobs in 2024, and then leveling off at approximately 2,660 jobs after 2025. There would be a USAF annual demand for approximately 417 off-base housing units, stabilizing at 1,589 additional units by 2025. Construction workers and secondary employees would also demand housing, and, assuming a labor participation rate of 1.5 jobs per household, there would be an additional demand by construction and secondary workers for up to 1,338 housing units in the community by 2024. When combined with the demand for 1,589 USAF off-base housing units, this would result in a total demand of 2,587 units by the end of 2024. MQ-9 induced housing demand would drop back to a demand for 1,589 off-base units for USAF personnel plus 507 units for secondary personnel, for a total demand for 2,096 housing units after 2025. There would be a demand for additional public service personnel throughout Santa Barbara County. For example, there would be a demand for an additional 10 policemen, 7 firemen, and 11 medical personnel to support off-base USAF families by 2026. There could be a substantially greater number of service personnel needed during construction. (Section 4.2.2.25)	There would be no MQ-9 facilities construction, personnel changes, or flight operations. Socioeconomic conditions would be as described for the affected environment for Tyndall AFB and Vandenberg AFB. (Sections 4.2.1.26 and 4.2.2.26)
Environmental Justice	No off-base populations or noise-sensitive locations would be exposed to noise levels of 65 dB DNL or greater from MQ-9 aircraft operations at Tyndall AFB, and no off-base populations would be within the APZs. There would be no direct impacts to minority or low-income populations or children or elderly populations residing off base. Increased demand for off-base housing from USAF personnel, construction workers, and secondary workers in a market with a hurricane-reduced housing supply could amplify any adverse impacts on low-income residents since low-income residents typically spend a larger proportion of their income on housing than the general population. (Section 4.2.1.27)	No off-base populations or noise-sensitive locations would be exposed to noise levels of 65 dB CNEL or greater from MQ-9 aircraft operations at Vandenberg AFB and no off-base populations would be within the APZs. There would be no direct impacts to minority or low-income populations or children or elderly populations residing off base. Increased demand for off-base housing from USAF personnel, construction workers, and secondary workers in a tight housing market could amplify any adverse impacts on low-income residents since low-income residents typically spend a larger proportion of their income on housing than the general population. USAF policies that identify certain housing and commute distances as unacceptable reduce off-base demand for low-cost housing by USAF personnel. (Section 4.2.2.27)	There would be no disproportionate noise effect to minority or low-income populations as a result of the No Action Alternative. There are no residential land areas or populations impacted by noise levels of 65 dB CNEL associated with affected environment aircraft operations at either Tyndall AFB or Vandenberg AFB, and there would be no impacts to minority or low-income populations and no impacts on children or the elderly residing off base. (Sections 4.2.1.28 and 4.2.2.28)

Key: AFB = Air Force Base; AOC = areas of concern; APE = Area of Potential Effects; APZ = Accident Potential Zone; ATC = Air Traffic Control; BASH = bird/wildlife aircraft strike hazard; BMPs= best management practices; CA-1 = Cabrillo Highway; Caltrans = California Department of Transportation; CNEL = Community Noise Equivalent Level; COA = Certificate of Authorization; dB = decibels; DNL = day-night average sound level; ERP = Environmental Restoration Program; $L_{eq\text{-}8hr}$ = 8-hour equivalent noise level; LID = Low Impact Development; LOS = level of service; RPA = remotely piloted aircraft; US-98 = U.S. Highway 98; UAS = unmanned aircraft systems; USAF = U.S. Air Force

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2.7 MITIGATION

Mitigation measures avoid, minimize, remediate, or compensate for environmental impact. CEQ regulations (40 CFR 1508.20) define mitigation to include the following:

- Avoiding the impact altogether by not taking a certain action or parts of an action
- Minimizing impacts by limiting the degree or magnitude of the action, and its implementation
- Rectifying the impact by repairing, rehabilitating, or restoring the affected environment
- Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action
- Compensating for the impact by replacing or providing substitute resources or environments

Avoiding, minimizing, or reducing potential beddown and operational impacts resulting from implementing the F-35A Wing at Tyndall AFB and, separately, the MQ-9 Wing at Tyndall AFB is a priority for the USAF. The mitigations described in Table 2.7-1 by applicable environmental resource will be evaluated and incorporated, as applicable, into a decision to beddown the F-35A Wing and the MQ-9 Wing to avoid, minimize, or reduce potential beddown and operational impacts. A variety of procedures and best management practices (BMPs) will be incorporated into the F-35A and MQ-9 beddowns in furtherance of 32 CFR 989.22 or to fulfill permit requirements, regardless of the location alternative. These mitigations include BMPs for construction practices and continuation of ongoing operational restrictions and avoidance measures. BMP mitigations are designed and incorporated into the contractual responsibilities for on-base projects and activities to increase safety and avoid or reduce the potential for environmental consequences. The USAF retains the responsibility to monitor projects and activities to ensure that these BMPs (Table 2.7-1) are applied.

Since projects for both the proposed F-35A and MQ-9 beddowns could involve construction in a wetland, a Finding of No Practicable Alternative (FONPA) will be included in the ROD for each Proposed Action. The FONPA will be prepared in accordance with Air Force Manual (AFMAN) 32-7003, DoD Instruction 4715.03, Clean Water Act (CWA) Sections 401, 404 and 404(b)(1) guidelines, and provisions of EO 11990.

Table 2.7-1. Mitigations

Resource Area/Alternative	Mitigations
Airspace Management and Air Traffic Control	
All Bases	MQ-9s will operate in existing SUA and maintain close contact with the FAA Air Route Traffic Control Centers (ARTCCs), ATC and other FAA entities to minimize conflicts with civil and commercial aviation.
Tyndall AFB	F-35A pilots will operate in existing SUA and maintain close contact with the FAA ARTCCs, ATC and other FAA entities to minimize conflicts with civil and commercial aviation.

Table 2.7-1. Mitigations

Resource Area/Alternative	Mitigations
Noise	
Vandenberg AFB	As a follow-up to this EIS, once the MQ-9 Wing beddown is complete and the full operational tempo of the squadron is in place, the USAF will confirm that the operational noise levels are within the noise impacts identified in this EIS in a new AICUZ. In addition, the USAF would continue to work closely with local communities to minimize noise impacts.
Tyndall AFB	As a follow-up to this EIS, once the F-35A Wing beddown is complete and the full operational tempo of the squadrons is in place, the USAF will confirm that the operational noise levels are within the noise impacts identified in this EIS in a new AICUZ study. As part of the AICUZ update, pilots would be consulted to either confirm or revise the operational data used in this Final EIS's noise modeling based on their first-hand knowledge. If noise levels calculated as part of the AICUZ update exceed those described in the Final EIS, then supplemental NEPA analysis and re-consideration of potential noise mitigation measures will be considered. In addition, the USAF would continue to work closely with local communities and Bay District Schools, Florida, to minimize noise impacts. Noise mitigation measures that were considered, and found to be not feasible at this time, are listed in Section 2.7.1 (Noise Mitigation Measures Considered and Found to not be Feasible at This Time).
Health and Safety	
All Bases	• Emergency and mishap response plans will be updated to address the needed procedures and response actions specific to the F-35A and or MQ-9 airframe. • Multiple AFIs address mishap notification, prevention, and investigation (see Appendix B.3.2).
Vandenberg AFB	Replace the current, ineffective electrobraid fence with a state-of-the-art deer exclusion fence to eliminate the potential for BASH.
Air Quality	
All Bases	Construction contractors will be required to implement the following BMPs to reduce fugitive dust emissions from exposed soils: • Construction personnel would minimize idling of all vehicles during construction. • Truckloads of dirt, sand, or gravel will be covered at all times. • Disturbed areas will be revegetated as soon as possible post construction. • Maintain all equipment to manufacturer specifications. • Employ fugitive dust control and soil retention practices including: o Use water spray trucks to keep all areas of vehicle movement damp enough to prevent dust from leaving the construction area. o Suspend all soil disturbance activities when visible dust plumes emanate from the site. o Minimize vehicle traffic on non-paved roads. o Designate personnel to monitor the dust control program and to order increased watering, as necessary, to prevent the transport of dust off-site. • Bases would incorporate Leadership in Energy and Environmental Design (LEED®) and sustainable development concepts to minimize air emissions during operations and achieve optimum resource efficiency and energy conservation, except to the extent limited or prohibited by law.
Tyndall AFB	The USAF will require construction to be consistent with the permitting requirements identified in the Florida State Clearinghouse comments on the Draft EIS (Appendix A).

Table 2.7-1. Mitigations

Resource Area/Alternative	Mitigations
Hazardous Materials and Wastes	
All Bases	Hazardous Materials and Waste Management • Use the existing Hazardous Materials Pharmacy (HAZMART) for handling hazardous materials; dispose of all such materials in accordance with existing procedures. • If necessary, establish additional satellite accumulation areas for waste; manage in accordance with the installation hazardous waste management plan. Contamination Sites • Construction on an existing ERP site will follow USAF regulations. • As a BMP, prior to construction, workers will be educated on how to identify evidence of contamination, such as petroleum odors or soil staining.
Soils and Geologic Resources	
All Bases	• Use of reinforcement structures for any construction involving excavation to prevent collapse of excavated walls. • Frequently spray water on exposed soil during construction to keep soil from becoming airborne (especially with soils susceptible to wind erosion). • Use of biodegradable erosion control blankets on steeper slopes (greater than 50%). • New road construction or re-grading should employ measures including, but not limited to the following: o Stabilize areas of bare soil to reduce erosion (restore vegetative cover, mulch, and seed if possible) and o Install and or/maintain road erosion control devices. o Avoidance of uncoated steel and concrete being directly exposed to soils due to acidity and potential for corrosion. o Installation of sediment controls such as silt fencing, straw wattles, and drain inlet protection. • Proper soil stockpiling methods. • Revegetation of any disturbed areas as soon as possible.
Water Resources	
All Bases	• Implement National Pollutant Discharge Elimination System construction General Permit requirements. • Permit requirements include preparation and implementation of a Storm Water Pollution Prevention Plan and minimum BMPs such as those for erosion and sediment controls, materials management, waste management, and non-stormwater management. Revegetation is required meet to the permit's Notice of Termination conditions. • Implement Low Impact Development as required per Section 438 of the Energy Independence and Security Act (42 U.S.C. 17094).
Tyndall AFB	• Avoid wetlands during site design and construction as much as is feasible. • Prior to dewatering in or within 500 feet of an identified contaminated site (see Section 3.1.5.4), the groundwater would be tested; If groundwater does not meet disposal-to-surface-water criteria without treatment, the USAF will consult with the Florida Department of Environmental Protection to determine the proper permit and method to dispose of groundwater.

Table 2.7-1. Mitigations

Resource Area/Alternative	Mitigations
Vandenberg AFB	Prepare a Storm Water Control Plan per the Vandenberg AFB Post-Construction Storm Water Standards.
Biological Resources	
All Bases	• Avoid wetlands during site design and construction as much as is feasible • Implement mitigation contained in USFWS Biological Opinion. • Compensatory mitigation and federal permitting and state water quality certification, in accordance with Sections 401 and 404 of the CWA, would be necessary for any future construction activities affecting wetlands. • Implement mitigation contained in USACE/state agency Wetland Permit requirements.
Tyndall AFB	The FWC provided recommendations for mitigations to listed species (see Section 4.1.8, Biological Resources, F-35A at Tyndall). The recommendations are incorporated into the EIS by reference and are summarized below. For beach-nesting birds: • Conduct construction or demolition activities outside of the breeding season (generally April, but potentially as early as mid-February, through August), if feasible; • Clear the site only when ready to build, and avoid leaving cleared areas or potentially suitable nesting sites (such as gravel rooftops) with little to no activity for an extended amount of time; and • Monitor daily proposed works sites during the nesting season and any cleared sites to ensure no active nests of ground nesting birds are present prior to the commencement of construction or demolition activities. If nesting is observed within or adjacent to a demolition or construction work site prior to or after the start of work, installation staff can coordinate with FWC staff to discuss nest buffers and other avoidance and minimization measures. For sea turtle lighting: • Tyndall AFB will develop an exterior lighting plan that specifies long-wavelength (560 nanometers or shorter) lamps with the lowest lumen output necessary to meet the required design foot candles. Lamps should be installed in full cut-off, fully shielded fixtures mounted at the lowest height possible. To minimize visibility of lights from the adjacent beach, bollards—42 inches or less in height—should be utilized in parking areas. Poles along roadways should be limited to 15 to 18 feet in height. In addition, restoration of coastal vegetation should include taller, shrubby plants that can serve as a barrier to landward lights and block sky glow. For Florida black bear: • Continue to implement management objectives from the Tyndall AFB Integrated Natural Resources Management Plan. For Florida pine snake: • If a Florida pine snake is observed during construction, work activities will cease, and the snake will be allowed to leave with no support or hindrance. Sightings will be reported to the FWC.

Table 2.7-1. Mitigations

Resource Area/Alternative	Mitigations
Vandenberg AFB	The following measures would be implemented to avoid adverse effects to California least tern and western snowy plover: • Flight restrictions identified in the Programmatic Biological Opinion and Letter of Authorization will be incorporated into the Proposed Action to reduce noise effects on California least tern and western snowy plover. These actions include the following: o No construction or other ground-disturbing activities would occur within or near any known or potential California least tern or western snowy plover habitat. o Operation of the MQ-9 aircraft will adhere to existing programmatic flight restrictions to reduce noise effects (NOAA, 2019, p. 2; USFWS, 2015, pp. 14–15). These restrictions include the following: ▪ Except during takeoff and landing, RPA will not be flown below 1,000 feet over Purisima Point. ▪ Pilots will climb to 1,900 feet ASL over the Purisima Point area during the California least tern breeding season (typically April 15 to August 15). ▪ From March 1 through September 30 (which includes the breeding season for both birds): • Circling approaches to the southwest are prohibited unless flight safety dictates otherwise. • For air traffic approaching from the right to Runway 12, aircraft conducting rectangular/closed traffic patterns will delay base turn until near Purisima Point. • For air traffic approaching from the left to Runway 30, aircraft conducting rectangular/closed traffic patterns will execute a crosswind turn prior to the departure end of the runway. If unable to execute a crosswind turn prior to the departure end of the runway, then they will fly runway heading and climb to 1,900 feet MSL before turning crosswind. The following measures would be implemented to avoid adverse effects to the southern sea otter: • No construction or other ground-disturbing activities would occur within or near any known southern sea otter habitat. • Operation of the MQ-9 aircraft will adhere to existing programmatic flight restrictions to reduce noise effects (NOAA, 2019, p. 2; USFWS, 2015, pp. 14–15). These restrictions include: o Except during takeoff and landing, RPA will not be flown below 1,000 feet over Purisima Point. o From March 1 through September 30: ▪ Pilots will climb to 1,900 feet ASL over the Purisima Point area. ▪ Circling approaches to the southwest are prohibited unless flight safety dictates otherwise. ▪ For air traffic approaching from the right to Runway 12, aircraft conducting rectangular/closed traffic patterns will delay base turn until near Purisima Point. ▪ For air traffic approaching from the left to Runway 30, aircraft conducting rectangular/closed traffic patterns will execute a crosswind turn prior to the

Table 2.7-1. Mitigations

Resource Area/Alternative	Mitigations
Vandenberg AFB (continued)	departure end of the runway. If unable to execute a crosswind turn prior to the departure end of the runway, aircraft will fly runway heading and climb to 1,900 feet MSL before turning crosswind. The following measures would be implemented to avoid adverse effects to the California red-legged frog: • Project construction activities, primarily habitat removal, shall occur during the dry season to the maximum extent feasible. • Prior to conducting construction activities, a USFWS-approved biologist will conduct daily surveys of the active project site if potential suitable California red-legged frog habitat is present, prior to the initiation of work, and relocate all life stages of California red-legged frogs found within suitable habitat in the proposed project sites to the nearest suitable habitat outside of the area but within the same watershed. • Equipment maintenance and refueling will be conducted at least 250 feet (76 meters) away from riparian habitats and wetlands. • A qualified biological monitor will conduct pre-project training for all workers. At a minimum, the training would include a description of the listed species occurring in the area, and the general and specific measures and restrictions to protect these species during project implementation. • If two adult, two subadult, or two juvenile California red-legged frogs are found dead or wounded or if five adult, five subadult, or five juvenile California red-legged frogs are captured and relocated during construction of the MQ-9 beddown project, the USAF must contact USFWS immediately to reinitiate formal consultation. Project activities that are likely to cause additional take should cease as the exemption provided pursuant to section 7(o)(2) may lapse and any further take could be a violation of section 4(d) or 9. The Air Force must notify the USFWS within three days of finding an injured or dead California red-legged frog. • California red-legged frogs must be relocated from all areas where project activities would occur near riparian or aquatic habitat and that may result in injury or mortality of these individuals. California red-legged frogs may only be captured by hand or dip net and transported in buckets separate from other species. When capturing and removing California red-legged frogs, the USFWS-approved biologist(s) must minimize the amount of time that animals are held in captivity. To further reduce the time a California red-legged frog is in captivity, the USAF must identify an area to relocate individuals (receiver site) prior to surveys. California red-legged frogs must be maintained in a manner that does not expose them to temperatures or any other environmental conditions that could cause injury or undue stress. • To avoid transferring disease or pathogens between aquatic habitats during the course of surveys and handling of California red-legged frogs, the USFWS-approved biologist(s) must follow the Declining Amphibian Population Task Force's Code of Practice. A bleach solution (0.5 to 1.0 cup of bleach to 1.0 gallon of water) may be substituted for the ethanol solution. Care must be taken so that all traces of the disinfectant are removed before entering the next aquatic habitat. The following measures would be implemented to avoid adverse effects to vernal pool fairy shrimp: • Project construction activities, primarily habitat removal, will occur during the dry season to the maximum extent possible.

Table 2.7-1. Mitigations

Resource Area/Alternative	Mitigations
Vandenberg AFB (continued)	• Equipment maintenance and refueling will be conducted at least 250 feet away from riparian habitats and wetlands. • A qualified biological monitor will conduct pre-project training for all workers. At a minimum, the training would include a description of the listed species occurring in the area, and the general and specific measures and restrictions to protect these species during project implementation • Mapped vernal pool fairy shrimp potential habitat and features will be avoided to the extent possible, particularly those within the disturbance boundary but outside of the permanent construction footprint. Sedimentation and downstream contaminant control of pools in the vicinity of proposed construction will also be implemented using drift fences and possibly small sandbag barriers to block potentially contaminated runoff from a potential pool. • To assess opportunities for future enhancement, the USAF identified 33 unoccupied pools, primarily in areas south and southwest of the airfield and prioritized/ranked the pools based on their potential for restoration and to function as suitable habitat for vernal pool fairy shrimp. Based on this previous effort, the USAF will prepare and submit a mitigation and enhancement plan to USFWS including, but not limited to, a description of the proposed enhancement activities, identification of success criteria, and a monitoring plan to ensure objectives are met. The plan will prioritize higher-ranked pools for enhancement. Other general planning considerations at Vandenberg AFB will be considered when determining the prioritization of pools considered for enhancement. • As part of the mitigation and enhancement plan, proposed loss of mapped vernal pool fairy shrimp habitat associated with the Maintenance Complex (approximately 5.87 acres), defined as "mowed/managed," will be restored at a ratio of 3:1 (habitat enhanced:habitat affected). The remainder of mapped vernal pool fairy shrimp habitat (not including "mowed/managed," approximately 0.86 acre) will be restored at a 1:1 ratio (habitat enhanced:habitat affected). The following are examples of potential mitigation for Lompoc yerba santa: • Continue the process of consultation with the USFWS. • To avoid or minimize impacts to Lompoc yerba santa localities along the southern project border, the USAF will install and maintain a 100-foot buffer fence around plant occurrences. • A qualified biological monitor will conduct pre-project training for all workers. At a minimum, the training would include a description of the listed species occurring in the area and the general and specific measures and restrictions to protect these species during project implementation. • The USAF will update the current Lompoc Yerba Santa Workplan to include additional future enhancement and restoration at the 35th Street Lompoc yerba santa population site and will: o Establish a mitigation/restoration program utilizing past restoration planning (Mantech, 2012) as a basis and incorporating information collected from the Maintenance Complex site. o Offset impacts to occupied habitat through enhancement (primarily invasive species removal) of the existing population at the 35th Street location at a 3:1 ratio (habitat enhanced: habitat affected). Locations on the remaining 37.40 acres at Vandenberg AFB may be incorporated into mitigation and restoration planning in coordination with USFWS.

Table 2.7-1. Mitigations

Resource Area/Alternative	Mitigations
Vandenberg AFB (continued)	• For all unavoidable occupied habitat removal, include an evaluation of known localities and incorporate information from the recent Santa Barbara Botanic Garden Lompoc Yerba Santa Genetics Program. Seeds and samples of vegetative cuttings were gathered from Lompoc yerba santa within the proposed Maintenance Complex site and will be included in the propagation, outplanting, and maintenance program on Vandenberg AFB. • Occupied habitat will be enhanced by invasive species removal (habitat enhanced: habitat affected) or other restoration activities (i.e., removing invasive plant species at a 3:1 ratio or other ratio approved in coordination with the USFWS). Other locations on Vandenberg may be incorporated into mitigation and restoration planning in coordination with the USFWS. OTHER MEASURES: • The USAF will follow reporting and notification requirements as indicated in the Biological Opinion (see Appendix A): o The USAF must request USFWS approval of any biologist who will conduct activities related to this Biological Opinion at least 30 days prior to any such activities. A qualified biologist(s) is more likely to reduce adverse effects based on their expertise with the covered species. Please be advised that possession of a 10(a)(1)(A) permit for the covered species does not substitute for the implementation of this measure. Authorization of USFWS-approved biologists is valid for this consultation only. • As feasible, the USAF will follow recommendations provided in the Biological Opinion.
Cultural Resources	
All Bases	In the case of unanticipated or inadvertent cultural resource discoveries, the USAF would comply with Section 106 of the NHPA and follow the standard operating procedures outlined in the Integrated Cultural Resources Management Plan.
Vandenberg AFB	The Santa Inez Band of Chumash Indians will be afforded the opportunity to monitor vegetation clearing in any and all project areas where vegetation clearing would occur, should the Tribe be interested in doing so.
Land Use and Recreation	
All Bases	Once the full complement of aircraft are operating at the selected base, prepare an update to the current AICUZ Study to validate operational data and identify projected noise levels based on the most recent noise data.
Infrastructure	
All Bases	Incorporate Leadership in Energy and Environmental Design (LEED®) and sustainable development concepts into construction projects to achieve optimum resource efficiency, sustainability, and energy conservation, except to the extent limited or prohibited by law.
Transportation	
Tyndall AFB	Low-cost traffic engineering improvements such as modified lane configurations (double right turn lane from Tyndall Drive, extended right turn lane to Airey Avenue from US-98), improved signal timing and phasing, off-peak scheduled construction trips, on-site concrete batch plant for F-35A apron construction activities.

Table 2.7-1. Mitigations

Resource Area/Alternative	Mitigations
Vandenberg AFB	Optimized signal timing at intersections, signal warrant analysis to determine need for future upgrade of intersection, off-peak construction trips, low-cost traffic engineering improvements such as lane configuration and intersection pavement markings and signs (including raised splitter island on CA-1 at Santa Lucia Canyon Road for safety of left turn movements).
Socioeconomics	
Tyndall AFB	Continue to work with Bay County communities to reduce impacts to housing and community services from base clean up and new construction.
Vandenberg AFB	No base-specific mitigation measures identified.
Environmental Justice	
All Bases	No base-specific mitigation measures identified.

Key: ACC = Air Combat Command; AFB = Air Force Base; AFI = Air Force Instruction; AICUZ = Air Installations Compatible Use Zones; ARTCC = Air Route Traffic Control Center; ASL = above sea level; ATC = Air Traffic Control; BASH = bird/wildlife aircraft strike hazard; BMP = best management practice; EIS = Environmental Impact Statement; ERP = Environmental Restoration Program; FAA = Federal Aviation Administration; HAZMART = Hazardous Materials Pharmacy; LEED® = Leadership in Energy and Environmental Design; MSL = mean sea level; NEPA = National Environmental Policy Act; NHPA = National Historic Preservation Act; RPA = remotely piloted aircraft; SPCCP = Spill Prevention, Control, and Countermeasures Plan; SUA = Special Use Airspace; USAF = U.S. Air Force; U.S.C. = United States Code; USFWS = U.S. Fish and Wildlife Service

2.7.1 Noise Mitigation Measures Considered and Found to not be Feasible at This Time

As described in Section 3.1.2 (Noise, Tyndall AFB), aircraft noise levels would increase relative to the No Action Alternative under all beddown scenarios. As mentioned previously, aircraft proposed for beddown would operate in accordance with local flying guidance, which has evolved over several years to balance operational efficiency and flexibility against potential reductions in noise impacts associated with certain operational restrictions. The primary purpose of local flying guidance is to ensure safety of flight while also maximizing training goals met per flying hour. There is typically some cost, in terms of operational efficiency, associated with adding restrictions to change current flight procedures. Example of such measures include the following:

- **Reduce the number of flying operations.** The proposed numbers of sorties and practice approaches to be conducted by F-35A flying units were calculated to meet minimum training requirements, with allowances for non-effective sorties (e.g., maintenance or weather mission cancellations). Flying a lesser number of sorties or practice approaches would not allow the unit to meet minimum Ready Aircrew Program training requirements. Conducting sorties or practice approaches at other locations is a possibility; these operations would occur during certain events such as off-station Large Force Exercises or combat deployments. However, other locations cannot be assumed available for use, and aircraft noise levels at Tyndall AFB were modeled under the assumption that all sorties and practice approaches would be conducted at home station.
- **Adjust runway usage patterns so that loud overflights occur less frequently over areas of greater noise sensitivity.** Currently, runway selection for approaches and departures is made based on considerations including winds, noise sensitivities, and air-traffic flows at

nearby airfields. Flight safety is improved by flying into the wind during landing and takeoff. No changes to the existing runway selection procedure are proposed at this time.

- **Increase the distance between aircraft and noise-sensitive locations by increasing altitudes or adjusting routing.** Current aircraft flight procedures at Tyndall AFB have been refined over several years to provide the greatest safety and operational efficiency, while also minimizing noise to the extent practicable. Wing leadership meets regularly with subordinate units to discuss issues including potential adjustments to flying procedures that could improve safety/effectiveness and/or reduce noise impacts. Current flight procedures at Tyndall AFB reflect a balancing of several factors to achieve safe and efficient operations.
- **Place restrictions on late-night flying.** Late-night flying (i.e., between 10:00 p.m. and 7:00 a.m.) makes up a small fraction (1 percent or less) of total operations expected to be flown by F-35A aircraft at Tyndall AFB. Further reductions in the number of late-night flights would limit operational flexibility, preventing aircrews from accomplishing night training during portions of the year when the sun sets late in the day. Limiting runway usage, altitudes, or routing specifically during these times could decrease safety and/or reduce operational effectiveness as described above.
- **Limit afterburner usage.** Several afterburner usage scenarios were considered as part of the EIS covering the range of expected afterburner use, and relatively small differences in noise levels were found at noise-sensitive locations under each usage scenario. Allowing afterburner usage would continue to be determined based on applicable guidance and pilot judgement.

3. AFFECTED ENVIRONMENT

3.0 INTRODUCTION

Chapter 3 contains information on the environment potentially affected by the F-35A Wing beddown at Tyndall AFB and an MQ-9 Wing beddown at either Tyndall AFB or Vandenberg AFB, both of which are considered in this EIS. This chapter presents the affected environment conditions upon which the proposed actions and alternatives from Chapter 2 are overlaid so that environmental consequences can be evaluated in Chapter 4.

Hurricane Michael dramatically changed Tyndall AFB and Bay County. Base and off-base facilities, housing, and infrastructure which existed before the hurricane were permanently impacted by the hurricane. That means that Tyndall AFB's aircraft operations, off-base noise conditions, infrastructure, facilities, and personnel all changed as of October 2018, and there is substantial base cleanup and reconstruction underway as of 2020.

To the extent possible, this EIS considers the affected environment to be when the cleanup would be completed and the reconstruction would be underway. The affected environment reflects the year 2023 when the cleanup is complete, reconstruction is underway, and F-22s have moved. It is important to put the affected environment during reconstruction in context, because there were aircraft operations and all supporting functions and personnel in 2018, which would not be present during reconstruction.

Where conditions before or following the hurricane are important for understanding of environmental consequences, the affected environment are also explained in the context of pre-hurricane conditions. For example, this EIS includes the noise contours of noise conditions before Hurricane Michael as a basis of comparison, so that decisionmakers and the public will have a pre-hurricane frame of reference for context and intensity of the environmental effects associated with the proposed F-35A and MQ-9 Wing beddowns at Tyndall AFB.

The affected environment for each environmental resource are presented in the following sections:

- Section 3.1 for Tyndall AFB
- Section 3.2 for Vandenberg AFB

For most resources in this chapter, the region of influence (ROI) for each Proposed Action (F-35A Wing beddown at Tyndall AFB and MQ-9 Wing beddown at either Tyndall AFB or Vandenberg AFB) is defined as the area affected by proposed airfield operations (F-35A and MQ-9), the area that could be affected by facility construction projects (F-35A and MQ-9), and the airspace proposed for use (F-35A). For some resources (such as noise, air quality, and socioeconomics), the ROI extends over a larger jurisdiction unique to the resource.

Resource definitions, as well as the regulatory setting and methodology of analysis, are found in Appendix B.

3.1 TYNDALL AFB

3.1.1 Airspace Management and Air Traffic Control, Tyndall AFB

Airspace management and Air Traffic Control (ATC) addresses the existing airfield, regional, and training airspace areas within the affected environments where the proposed F-35A and MQ-9 operations would occur and the manner in which this airspace is structured and managed to accommodate all military and civilian air traffic. Both the Tyndall AFB and Vandenberg AFB airspace environments include controlled airspace categories/classifications, SUA, and other areas that are explained in Appendix B (Section B.1) as they relate to this EIS.

3.1.1.1 Tyndall AFB Regional Airspace

Tyndall AFB is located in a high-density air traffic area along the Florida Panhandle where there is a large presence of both military and civilian private and commercial aviation activities. The USAF, Navy, and other military components operating out of Tyndall AFB (e.g., QF-16) (Tyndall AFB, 2013), Eglin AFB, Hurlburt Field, the Pensacola Naval Flying Training Center, and other airfields regularly conduct flight training missions at the different restricted areas (RAs), MOAs, and warning areas located within this region. General aviation and commercial aircraft operating out of the Panama City (Northwest Florida Beaches), Apalachicola, and Tallahassee airports also contribute to this region's air traffic environment. There are also small/private airfields and seaplane bases where sightseeing, fish spotter, and other general aviation aircraft typically operate under visual flight rules (VFR) at low altitudes (at or below 1,000 feet above ground level [AGL]) (see Section B.1.1 for definitions of terms, such as VFR).

The controlled airspace encompassing Tyndall AFB and the other regional airports is managed and controlled by the FAA Jacksonville Air Route Traffic Control Center. This center has in turn delegated terminal airspace areas to the Radar Approach Control (RAPCON) facilities in this region to manage and control IFR aircraft operating at the different airports and their surrounding airspace. The center has delegated such an area to the Tyndall AFB RAPCON through a Letter of Agreement that defines this assigned area and responsibilities for coordinating and managing air traffic within those boundaries. This terminal airspace area extends from the surface to FL230 within an expanded uncharted area. The RAPCON also provides traffic advisories to VFR aircraft within this airspace when requested. Real-time coordination between the Jacksonville Center, Tyndall AFB RAPCON, and the other adjacent ATC facilities ensures all IFR air traffic operating across this region is coordinated and aircraft are separated from each other and the active SUA training areas.

Tyndall AFB airfield operations are controlled and managed by the control tower within the tailored Class D airspace that extends from the airfield surface to 2,500 feet MSL within a 5.4-NM radius of the airfield. This area reverts to Class E airspace during weekend, holiday, and other advanced notice times when the tower is closed. This airfield has two 10,000-foot runways (14R/L and 32R/L) with an Instrument Landing System and Tactical Air Navigation System that provide

a means for pilots to navigate to the assigned runway during marginal weather conditions and as required for pilot training. There is also a separate 7,000-foot runway that is used for drone operations, which are managed by ATC so as not to conflict with the parallel runway operations and other airspace uses. The tower and RAPCON coordinate the sequencing and separation of airfield arrivals and departures while transitioning between the Class D and terminal airspace areas. (See Section B.1 in Appendix B for a definition of terms relating to airspace management.)

Tyndall AFB airfield operations have varied over the years due to aircraft realignments, pre/post-hurricane aircraft relocations, and other factors discussed in Chapter 2, which have affected this airfield's annual usage. From an historical perspective, the 2016 Air Installations Compatible Use Zones (AICUZ) Study noted that Tyndall AFB airfield operations over a 6-year period generally ranged from about 22,000 to 61,000 operations as shown in Table 3.1-1; this study projected 66,000 operations by 2018 (USAF, 2016a).

Table 3.1-1. Tyndall AFB Airfield Operations over Six-Year Period

Calendar Year	Based Operations	Transient Operations	Total
2015	56,706	3,954	60,660
2014	45,795	3,286	49,081
2013	41,084	4,664	45,748
2012	19,141	2,656	21,797
2011	35,186	5,558	40,744
2010	48,555	6,513	55,068

Source: (USAF, 2016a)

Other controlled airspace within this affected environment includes those federal airways and jet routes on which IFR air traffic operates while transiting between regional and other national airports. Aircraft using federal airways (victor routes) are below 18,000 feet MSL; those routes in this environment are located outside of the designated SUA areas. Jet routes are established at 18,000 feet MSL and above; those routes transiting this area are also outside of the SUA lateral boundaries and, therefore, this traffic does not interfere with active SUA uses. If any federal airways/jet route traffic needs to be rerouted through this SUA due to weather or other flight conditions, the FAA coordinates with the RAPCON to separate this traffic from military operations.

3.1.1.2 F-35A Training Airspace

Section 2.2.4.4, Figure 2.2-4, and Table 2.2-6 identify the SUA and range training areas used for Tyndall AFB flight training activities that are projected for F-35A training missions. Table 3.1-2 describes the floor/ceiling altitudes and controlling agency for each training area.

Table 3.1-3 compares the pre-hurricane and No Action sorties with those projected for both the three- and four-squadron beddown alternatives. These projected operations are further addressed in the airspace management and ATC discussions and other relevant resources relative to the affected environment and the proposed alternatives.

Table 3.1-2. Tyndall AFB Airspace and Range Descriptions

Airspace	Floor/Ceiling Altitudes (Feet AGL/MSL)	Controlling Agency
Tyndall B/H MOAs and overlying Compass Lake ATCAA	9,000 MSL up to, but not including, 18,000 MSL; ATCAA 18,000–23,000 MSL	Tyndall Radar Approach Control
Tyndall C/D MOAs	300 AGL–6,000 MSL	
Tyndall E MOA and overlying Carabelle ATCAA	300 AGL up to, but not including, 18,000 MSL; ATCAA 18,000–37,000 MSL	
Tyndall F MOA	300 AGL up to, but not including, 18,000 MSL	
Tyndall G MOA	1,000 AGL up to, but not including, 18,000 MSL	
ACMI Extension ATCAA	5,000–60,000 MSL	
R-2905A/B	Surface to 10,000 MSL	
R-2914A/B	A: Surface to unlimited B: 8,500 MSL to unlimited	FAA Jacksonville Center
W-470	Surface to unlimited	
W-151	Surface to unlimited	
Avon Park Range		
R-2901 A-N	Varying lower/upper altitudes for the 14 different subdivisions	FAA Miami Center
Grand Bay Range		
R-3008 A-D	A: Surface 10,000 MSL B: 100 AGL – 10,000 MSL C: 500 AGL – 10,000 MSL D: 10,000 to, but not including, 23,000 MSL	Valdosta Radar Approach Control
Pinecastle Range		
R-2910A-E	A: Surface to 23,000 MSL B/C: Surface to 6,000 MSL D: 2,000–23,000 MSL E: 500 AGL to, but not including, 2,000 MSL	FAA Jacksonville Center

Key: AFB = Air Force Base; ACMI = Air Combat Maneuvering Instrumentation; AGL = above ground level; ATCAA = Air Traffic Control Assigned Airspace; FAA = Federal Aviation Administration; MOA = Military Operations Area; MSL = mean sea level

Table 3.1-3. Pre-Hurricane, No Action Alternative, and Proposed F-35A Annual Sorties

Airspace Area[1]	Pre-Hurricane [2]		No Action		Three-Squadron		Four-Squadron [5]	
	F-35A[3]	Other Aircraft[4]	F-35A[3]	Other Aircraft[4]	F-35A[3]	Other Aircraft[4]	F-35A[3]	Other Aircraft[4]
Compass Lake Work Area	0	2,627	0	1,756	1,487	637	1,983	637
Carabelle Work Area	0	9,306	0	5,681	1,518	1,691	2,024	1,691
Tyndall C MOA	0	6,709	0	5,981	0	4,606	0	4,606
W-151	0	10,478	0	8,298	920	6,976	1,227	6,976
W-470	0	46,222	0	43,428	8,281	39,640	11,042	39,640
Total	**0**	**75,342**	**0**	**65,144**	**12,206**	**53,550**	**16,275**	**53,550**
Ranges[5]	*0*	*202,776*	*0*	*202,776*	*94*	*202,776*	*125*	*202,776*

Key: AFB = Air Force Base; FTU = Formal Training Unit; MOA = Military Operations Area

Notes:

[1] The pre-hurricane basis of comparison includes combat-coded and FTU F-22 squadrons in regional airspace.

[2] F-35A aircraft based at Tyndall AFB; F-35A aircraft based at other locations that operate in the airspace unit, are not included.

[3] Source is the Graduate/Training Information Management System records for Fiscal Year 2017.

[4] The combat-coded F-22 squadron (95th Fighter Squadron) has departed the region, but the FTU, which operates F-22 and T-38 aircraft (43rd Fighter Squadron), is assumed to continue operations in regional airspace from Eglin AFB under the No Action Alternative.

[5] Operations counts for "other aircraft" at ranges are not included in the overall total. They were based on the *Noise Study for Avon Park Air Force Range* (USAF, 2013a), *Moody AFB Air Installations Compatible Use Zones Study* (USAF, 2014a), and *Pinecastle Range Air Installations Compatible Use Zones Study* (Navy, 2017). For the purposes of this analysis, each sortie was assumed to include one operation and all months at Avon Park Air Force Range were assumed to be "busy months."

Following Hurricane Michael's devastation of Tyndall AFB in October 2018, the F-22 FTU restarted limited student flying from Eglin AFB on December 6, 2018. The USAF requested emergency alternative arrangements for compliance with NEPA, in accordance with the CEQ regulation 40 CFR 1506.11, to respond to a pilot manning crisis exacerbated by Hurricane Michael that presented significant national security implications.

As part of the alternative NEPA arrangements, the USAF was required to prepare a Special Environmental Assessment (i.e., the SEA) (USAF, 2019a). The purpose of the SEA was to conduct a rapid environmental review with public involvement and mitigation of the significant environmental effects of the interim beddown of the F-22 FTU at Eglin AFB with split operations[2] between Eglin and Tyndall AFBs, while the USAF proceeded to prepare an EIS for the permanent beddown of the F-22 FTU. On March 26, 2019, the USAF published its Notice of Intent to prepare an EIS for the permanent beddown and operations of the F-22 FTU as required by the emergency alternative arrangements approved by CEQ. That EIS will assess the potential environmental consequences of the proposed action to permanently beddown the F-22 FTU at Langley AFB, Virginia, and the No Action Alternative, which consists of continuing F-22 FTU operations from a combination of Eglin AFB and Tyndall AFB in Florida. Due to the possibility that the USAF could select the No Action Alternative for the F-22 FTU permanent beddown, its continuing and recurring operations at Tyndall AFB is part of the No Action Alternative. Current F-22 FTU operations include some training and aircraft maintenance occurring at Tyndall AFB, utilizing the flight simulators and the low observable coatings maintenance facilities that survived the hurricane.

In the past year, Tyndall AFB has slowly been recovering and regaining operational capability, which has permitted some flight training by the F-22 FTU to occur in Tyndall AFB airspace. While it is not the intent of the USAF to retain the F-22 FTU at Eglin AFB permanently, it may be necessary to continue F-22 FTU operations from a combination of Eglin AFB and Tyndall AFB until the USAF can fully analyze impacts for the preferred permanent location for the F-22 FTU, Langley AFB, Virginia, in order to maintain pilot production. Table 3.1-3 presents the projected sortie and operations counts in the Proposed Action and alternatives.

The majority of the F-35A operations would be conducted in the Tyndall AFB B, C/H, and E MOAs/ATCAAs and W-470 and W-151 with minor use of the Avon Park, Grand Bay, and Pinecastle Ranges/SUA. The projected F-35A operations for the different alternatives are addressed in Chapter 4.

The Tyndall MOAs are contiguous in both horizontal and vertical boundaries where they can be used individually or collectively to meet training and exercise requirements. The Tyndall B and H MOAs and their overlying ATCAA are generally scheduled together where they constitute the Compass Lake area. The E MOA and overlying ATCAA constitute the Carabelle training area. Because of the lower floor/ceiling altitudes of the Tyndall C, D, and E MOAs, this collective group is referred to as the Tyndall Low Level Area. Local procedures governing airfield and SUA

[2] Split operations means that the flying portion of the FTU would be at Eglin AFB while the academics, simulators and low observable maintenance (1 F-22 flight per week) would be conducted at Tyndall AFB.

operations and ATC direction manage those flights flown between the base and each training area so as to be separated from other airfields and IFR air traffic in this airspace environment.

3.1.1.3 MQ-9 Transit and Training Airspace

The existing Tyndall AFB airfield and training airspace areas that would support the MQ-9 operations include those areas previously described for the F-35A in Sections 3.1.1.1 and 3.1.1.2 and depicted in Figure 2.3-2 and Figure 2.3-3. The transit and training airspace includes the SUA and ATCAA areas, offshore WAs, and the Grand Bay and Avon Park ranges/SUA areas described in Table 3.1-2. These airspace areas provide the higher altitudes in which MQ-9 training flights normally occur for the different mission activities this RPA would perform in the existing training airspace. The MQ-9 would transit to the different SUA areas via unrestricted airspace where necessary, in which case an FAA-issued COA would be required to operate through this shared airspace, as explained in Appendix B.

3.1.2 Noise, Tyndall AFB

Although noise can affect several resource areas, this section focuses on potential noise impacts on human annoyance and health. Noise impacts on biological resources (e.g., wildlife), cultural resources, land use and recreation, socioeconomics, and environmental justice/protection of children are discussed in sections dedicated to those resources. Appendix D, published in the Draft EIS, defines terms used to describe the noise environment, as well as methods used to calculate noise levels and assess potential noise impacts. These terms and analytical methods are uniformly applied to Tyndall and Vandenberg AFBs. Appendix D was unchanged between the Draft EIS and Final EIS and is included in the Final EIS by reference. Appendix D is available in the Draft EIS appendix and is also available upon request. A summary of noise metrics used in this EIS is also provided below.

In accordance with DoD policy, multiple noise measurement metrics are used in this EIS to describe the acoustic environment and predict noise impacts. These noise metrics are as follows:

- Decibels (dB) are a unit of measure used to describe sound intensity. Those dB levels that match the range of human hearing are denoted as “A-weighted decibels” or dBA. All subsonic aircraft noise levels are expressed using dBA. Sounds that are felt as well as heard, such as sonic booms, are described with C-weighted decibels (dBC), which emphasize low-frequency sound energy.
- Day-Night Average Sound Level (DNL) combines the intensity and durations of noise events with the number of events over a 24-hour period to yield a single number descriptor. The DNL metric applies a 10 dB penalty to noises that occur between the hours of 10:00 p.m. and 7:00 a.m. This penalty reflects the fact that nighttime noise is more disruptive to activities like sleeping and less masked by the noise of typical daytime activities. DNL is very good for comparing one site to another by an overall daily exposure, but individual events are “averaged” together.
- Community Noise Equivalent Level (CNEL) is used in the state of California in place of DNL. It assigns a 5 dB penalty to noises that occur during the evening hours (7:00 p.m. to 10:00 p.m.) in addition to the late-night penalty applied to the DNL metric.

- Onset Rate-Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}) adds to the DNL metric the startle effects of an aircraft flying low and fast where the sound can rise to its maximum very quickly. Because the tempo of operations is so variable in airspace areas, L_{dnmr} is calculated based on the average number of operations per day in the busiest month of the year.
- C-Weighted Day-Night Average Sound Level (CDNL) is a DNL computed for impulsive noise such as sonic booms. The range is shifted to emphasize low-frequency sounds.
- Sound Exposure Level (SEL) expresses the maximum sound intensity and duration by compressing the total sound exposure for an individual event into a single second.
- Maximum Noise Level (L_{max}) is the highest sound level measured during a single event. As an aircraft approaches, the sound increases as the distance decreases, then the opposite occurs as the plane moves away. L_{max} would typically be the sound intensity when the aircraft is the closest.
- Equivalent Noise Level (L_{eq}) represents noise intensity (in decibels) averaged over a specified time. This is useful for considering noise effects during a specific time period such as an 8-hour school day (denoted $L_{eq\text{-}8hr}$ and measured from 8:00 a.m. to 4:00 p.m.).

3.1.2.1 Base

The discussion of the acoustic affected environment is divided into sections, each covering: aircraft operations before the 2018 hurricane for context and comparison purposes only; existing aircraft operations, which are the basis of the No Action Alternatives for both Proposed Actions at Tyndall AFB; and other base acoustics (e.g., construction and facility operations).

3.1.2.1.1 Flight Operations Before 2018 Hurricane

Under pre-hurricane conditions, which are described as a point of reference, 66,400 airfield operations were conducted annually at Tyndall AFB, including 37,900 F-22 operations and 11,800 T-38 operations. Other aircraft types based at Tyndall AFB included QF-16 drones (conducting approximately 2,100 airfield operations annually), E-9 (440 annual operations), and MU-2 (4,300 annual operations). Transient aircraft pilots used the airfield for a variety of purposes (e.g., as a stopover during cross-country flights, as an unfamiliar airfield for practice approaches, as a diverted landing location during severe weather), and transient aircraft could potentially include any aircraft type. Transient F-35 aircraft based at nearby Eglin AFB conducted approximately 6,900 airfield operations annually. Tyndall AFB was also used during Large Force Exercises, which can involve any aircraft type in the DoD inventory. Noise levels generated by individual overflights of the loudest aircraft types based at Tyndall AFB under pre-hurricane conditions at specified distances and aircraft configurations are listed in Table 3.1-4.

Noise levels prior to Hurricane Michael were presented in the 2016 AICUZ study (USAF, 2016a). Noise levels for the AICUZ operational scenario are depicted as DNL contours in Figure 3.1-1. Noise levels exceeding 65 decibel (dB) DNL extended approximately 3,000 feet onto the peninsula that contains US-98 crossing the East Bay and affected an industrial area on the southern shore of Panama City. Noise levels exceeding 65 dB DNL also affected a portion of Saint Andrews State Park on the barrier island south of the base. The remainder of the area exposed to noise levels

greater than 65 dB DNL was either open water or owned by the DoD. Of the 217 off-installation land acres exposed to noise greater than 65 dB DNL, 25 were residential. At noise levels greater than 65 dB DNL, noise-sensitive land uses including residential are considered incompatible land uses according to DoD guidelines. The population residing in this area was estimated (based on the 2017 American Community Survey [pre-hurricane]) to be 190 (Table 3.1-5) (USCB, 2018a). People living outside of the 65 dB DNL contour sometimes experience potentially disturbing aircraft overflights and can become annoyed by the noise. A person's reaction to noise is dependent on several non-acoustic factors, including the person's perception of the importance of the activity generating the noise and the activity the person is involved in at the time the noise occurs. Several social surveys have found that people are more likely to become annoyed by aircraft noise at higher DNL and are less likely to become annoyed at lower DNL (Schultz, 1978; Finegold, Harris, & Von Gierke, 1994; Miedema & Vos, 1998).

Table 3.1-4. Individual Overflight Noise Levels (L_{max}) at Tyndall AFB

Aircraft (engine type)	Power Setting[1]	Power Unit	L_{max} Values (in dB) at Varying Distances (in feet)				
			500	1,000	2,000	5,000	10,000
Takeoff/Departure Operations[3]							
F-22	100%	ETR	120	113	104	92	81
T-38	99%	RPM	109	101	91	76	63
F-35A[2]	100%	ETR	119	111	103	90	79
F-35A (afterburner)[2]	150%	ETR	124	117	108	97	87
F-16 (P220)	92.40%	NC	111	103	95	83	72
Landing/Arrival Operations							
F-22	43%	ETR	111	104	96	83	71
T-38	96%	RPM	96	88	79	66	54
F-35A[2]	40%	ETR	100	93	85	72	60
F-16 (P220)	80%	NC	90	83	75	63	53

Source: Omega10 using standard weather conditions of 59 degrees Fahrenheit and 70 percent relative humidity
Key: AFB = Air Force Base; dB = decibel; L_{max} = Maximum Noise Level; ETR = engine thrust request; NC = engine core RPM; RPM = revolutions per minute
Notes:
[1] Engine power settings are not constant during flight. Power settings shown are typical.
[2] Values are based on field noise-level measurements conducted at Edwards AFB in 2013 (USAF, 2020b).
[3] Departure noise levels are modeled without afterburner unless otherwise noted.

Table 3.1-5. Off-Base Acres of Land and Population Exposed to DNL of 65 dB or Greater Under Pre-Hurricane Conditions at Tyndall AFB

DNL (dB)	Acres	Estimated Population
65–69	199	184
70–74	15	6
75–79	3	0
80–84	0	0
≥85	0	0
Total	**217**	**190**

Source: (USCB, 2018a)
Key: ≥ = greater than or equal to; AFB = Air Force Base; dB = decibel; DNL = day-night average sound level

3.1.2.1.2 Current Flight Operations

After Hurricane Michael, all Tyndall AFB-based F-22 and T-38 aircraft operations stopped, resulting in a dramatic decrease in operations tempo and noise levels. Although F-22 aircraft are no longer based at Tyndall AFB, F-22 aircraft continue to visit Tyndall AFB at a rate of approximately one per week to make use of the low-observable paint facility. Other aircraft types continue to operate at the installation more-or-less as they had prior to the hurricane.

Noise levels reflecting No Action Alternative operations are shown in Figure 3.1-1. Off-base land affected by noise levels greater than 65 dB DNL consists entirely of US-98 right-of-way (2 acres in total), and there are no residents exposed to noise levels greater than 65 dB DNL.

Noise levels under pre-hurricane conditions (for comparison purposes only) and for No Action Alternative operations at several representative noise-sensitive locations are listed in Table 3.1-6. The noise-sensitive locations listed in Table 3.1-6 are not intended to be an exhaustive list of locations that could be considered to be noise-sensitive. Noise levels stated at these locations, which are shown in Figure 3.1-1, are similar to noise levels in nearby areas, which may contain other noise-sensitive locations. Only the Tyndall AFB Dormitories exceed 65 dB DNL under No Action Alternative operations. Areas outside the 65 dB DNL contour line could also experience noise that can be disturbing at times. Although noise events are less frequent and/or less intense in locations exposed to DNL less than 65 dB than in locations exposed to DNL greater than 65 dB, loud and potentially disturbing noise events do occur. Some people are more noise-sensitive than others because of physical, psychological, and emotional factors. People with autism and people afflicted with post-traumatic stress disorder may be particularly sensitive to sudden loud noises such as those that occur near an air base. The DNL metric is useful for describing the noise environment at a location with a single number, but it does not provide a complete description of the noise environment. In accordance with current DoD policy, this EIS uses several supplemental noise metrics (e.g., number of events with potential to interfere with speech) to provide an expanded description of the noise experience.

Table 3.1-6. Day-Night Average Sound Level at Representative Noise-Sensitive Locations Under Pre-Hurricane and No Action Alternative Operations

Location Description	Pre-Hurricane	No Action
First Baptist Church of Parker	58.6	44.8
Allenton (town)	59.2	46.5
Saint Andrews State Park, Campground	45.4	33.6
Bayou Point (residences)	58.3	47
Long Point Condominiums	70.5	58.7
Mexico Beach (community)	58.1	44.9
Panama City (community)	65.5	50.7
Parker Elementary School	55.1	41.3
Piney Point (residences)	47.1	35.9
Saint Andrews State Park, Shell Island	64	42.1
Saint Andrews (community)	50.8	46.5
Tyndall AFB Dormitories	75.5	67.6
Tyndall Elementary School	75.2	61
Tyndall AFB on-base housing	63.6	48
Water's Edge (residences)	58.9	47.1

Key: AFB = Air Force Base

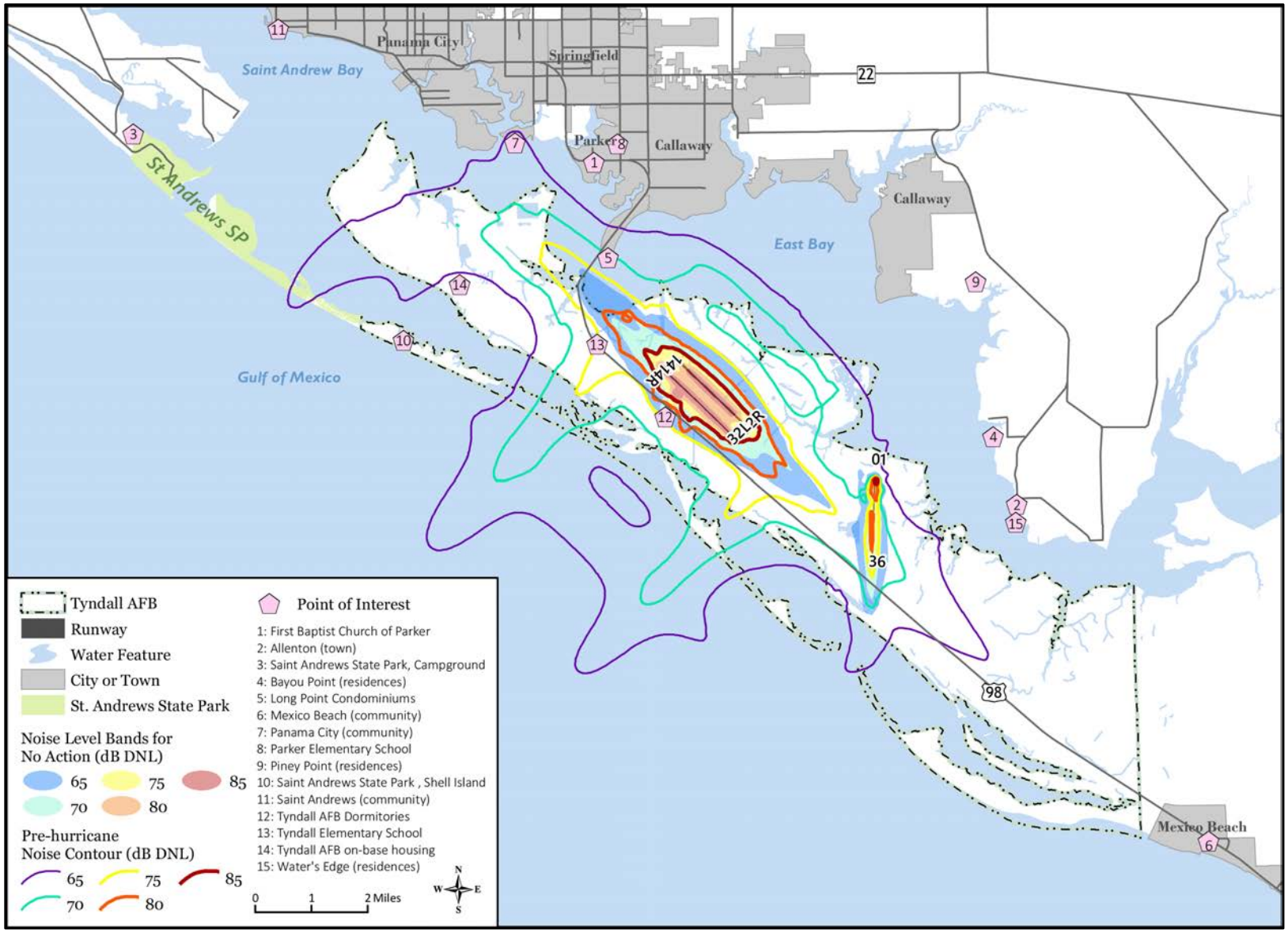

Figure 3.1-1. Noise Levels Under Pre-Hurricane and No Action Alternative Operations at Tyndall AFB with Nearby Representative Noise-Sensitive Locations

The number of noise events per average daytime hour with the potential to interfere with outdoor speech would be either one or two events, at the representative noise-sensitive locations studied under No Action Alternative operations (Table 3.1-7). For the purposes of this analysis, it was conservatively assumed that any event exceeding 50 dB has some potential to interfere at least momentarily with speech and other forms of communication involving listening. Flight paths are variable and speech-interference events sometimes occur far from standard flight patterns.

Table 3.1-7. Number of Outdoor Noise Events With Potential to Interfere With Speech (above 50 dB L_{max}) Under Pre-Hurricane and No Action Alternative Operations

Location Description	Pre-Hurricane	No Action
First Baptist Church of Parker	7	1
Allenton (town)	8	2
Saint Andrews State Park, Campground	5	1
Bayou Point (residences)	7	1
Long Point Condominiums	8	2
Mexico Beach (community)	4	1
Panama City (community)	8	2
Parker Elementary School	7	1
Piney Point (residences)	5	1
Saint Andrews State Park, Shell Island	7	1
Saint Andrews (community)	6	1
Tyndall AFB Dormitories	9	2
Tyndall Elementary School	8	2
Tyndall AFB on-base housing	7	1
Water's Edge (residences)	8	2

Key: AFB = Air Force Base

Noise interference with learning in schools is of particular concern because noise can interrupt communication or interfere with concentration. The DoD Noise Working Group guidelines recommend that exterior noise levels during the school day not exceed 60 dB 8-hour equivalent noise level (L_{eq-8hr}), as that would indicate that interior classroom noise levels likely exceed a recommended 40 dB maximum background noise level (DoD Noise Working Group, 2009). Exterior school-day noise levels are below the 60 dB L_{eq-8hr} criteria level at Parker Elementary School, but exceed 60 dB L_{eq-8hr} at Tyndall Elementary School (Table 3.1-8) under pre-hurricane (included as a point of reference) and No Action Alternative operations. The number of events at Tyndall Elementary School with potential to interfere with speech (above 50 dB L_{max}) per average daytime hour is one, with windows open or closed under No Action Alternative operations. Under pre-hurricane conditions, which are described for a point of reference, the number of events with potential to interfere with speech (above 50 dB L_{max}) at Tyndall Elementary School was six with windows open or five with windows closed.

Nighttime flying, which is required as training for certain missions, has an increased likelihood of causing sleep disturbance. The lack of quality sleep has the potential to affect health and concentration. The probability of being awakened at least once per night was calculated using a method described by the American National Standards Institute (American National Standards Institute, 2008). The method first predicts the probability of awakening associated with each type of flying event (higher SELs yield higher probability of awakening) and then sums the probabilities associated with all event types. The overall probability of awakening at least once per night reflects

all flying events that occur between 10:00 p.m. and 7:00 a.m., when most people sleep (Table 3.1-9). The analysis also accounts for standard building attenuation of 15 dB and 25 dB with windows open and closed, respectively. Sleep disturbance probabilities listed for parks and schools are not intended to imply that people regularly sleep in parks or schools, but instead are indicative of impacts in nearby residential areas. Flight operations between 10:00 p.m. and 7:00 a.m. made up less than 1 percent of total operations under pre-hurricane conditions (included as a point of reference) and under No Action Alternative operations. The estimated percentage of people awakened at least once per night by aircraft noise would be less than 2 percent for pre-hurricane and No Action Alternative operations.

Table 3.1-8. Noise Levels at Schools Near Tyndall AFB Under Pre-Hurricane and No Action Alternative Operations

Location Description	Outdoor L_{eq-8hr}		Speech-Interference Events per Hour with Windows Open		Speech-Interference Events per Hour with Windows Closed	
	Pre-Hurricane	No Action	Pre-Hurricane	No Action	Pre-Hurricane	No Action
Parker Elementary School	56.9	<45	4	1	1	0
Tyndall Elementary School	77	62.9	6	1	5	1

Key: < = less than; AFB = Air Force Base; L_{eq-8hr} = 8-hour equivalent noise level

Table 3.1-9. Percent of People Awakened by Aircraft Noise at Least Once per Night at Representative Locations

Location Description	Pre-Hurricane	No Action
First Baptist Church of Parker	1	0
Allenton (town)	1	0
Saint Andrews State Park, Campground	0	0
Bayou Point (residences)	1	0
Long Point Condominiums	2	0
Mexico Beach (community)	1	0
Panama City (community)	1	0
Parker Elementary School	1	0
Piney Point (residences)	0	0
Saint Andrews State Park, Shell Island	1	0
Saint Andrews (community)	1	0
Tyndall AFB Dormitories	2	0
Tyndall Elementary School	2	0
Tyndall AFB on-base housing	1	0
Water's Edge (residences)	1	0

Key: AFB = Air Force Base

Noise levels exceeding 80 dB DNL do not affect off-installation areas under pre-hurricane conditions (included as a point of reference) or No Action Alternative operations, and the risk of off-installation potential hearing loss is minimal in accordance with DoD policy (DoD Noise Working Group, 2013).

In on-base areas with high noise levels, existing USAF occupational noise exposure prevention procedures, such as hearing protection and monitoring, are undertaken in compliance with all applicable Occupational Safety and Health Administration (OSHA) and USAF occupational noise exposure regulations. In 1972, the National Institute for Occupational Safety and Health (NIOSH) published a criteria document with a recommended exposure limit of 85 dB as an 8-hour, time-weighted average. This exposure limit was re-evaluated in 1998 when NIOSH made recommendations that went beyond conserving hearing by focusing on the prevention of occupational hearing loss (NIOSH, 1998). Following the re-evaluation, using a new risk assessment technique, NIOSH published another criteria document in 1998 that reaffirmed the 85 dB recommended exposure limit (NIOSH, 1998). Active-duty and reserve components of the USAF, as well as civilian employees and contractor personnel working on USAF bases and Air Guard stations, must comply with OSHA regulations (29 CFR 1910.95, Occupational Noise Exposure); DODI 6055.12, Hearing Conservation Program; Air Force Occupational Safety and Health (AFOSH) Standard 48-20 (June 2006); and the Occupational Noise and Hearing Conservation Program (including material derived from the International Standards Organization 1999.2, Acoustics-Determination of Occupational Noise Exposure and Estimation of Noise Induced Impairment). Per AFOSH Standard 48-20, the Hearing Conservation Program is designed to protect workers from the harmful effects of hazardous noise by identifying all areas where workers are exposed to hazardous noise.

DoD policy for assessing hearing loss risk in the community pursuant to NEPA is to use the 80-dB DNL noise contour to identify populations at the most risk of potential hearing loss (DoD Noise Working Group, 2013). No residences on or off base are exposed to noise levels exceeding 80 dB DNL under the affected environment conditions. Therefore, the risk of noise-induced hearing loss in the community is small, and potential hearing loss calculation is not necessary.

Nonauditory health effects of long-term noise exposure (e.g., cardiovascular health risks) have not been documented at levels below those at which noise-induced hearing loss is a substantial risk.

3.1.2.1.3 Other Base Acoustics (Construction and Facility Operations)

Tyndall AFB is an active military installation, and the acoustic environment consists of sound sources to include installed equipment (e.g., heating ventilation and air conditioning), vehicle traffic, and construction activities (e.g., construction vehicles and equipment). These noise sources are quiet relative to aircraft operations noise.

3.1.2.2 Airspace and Ranges

3.1.2.2.1 F-35A Airspace

Compass Lake Work Area, Carabelle Work Area, W-151, and W-470 are intensively utilized military training airspace units (see Section 3.1.1); aircraft overflight noise is heard regularly beneath these airspace units. Noise levels generated by individual overflights of aircraft types commonly using these airspace units are listed in Table 3.1-10.

Compass Lake Work Area incorporates Tyndall B and H MOAs and overlaying ATCAAs, while Carabelle Work Area includes Tyndall E MOA and overlying ATCAA (see Figure 2.2-4). The

floor altitude of both work areas is 9,000 feet above MSL. The eastern portion of Compass Lake Work Area overlies Tyndall C MOA, which stretches from 300 AGL to 6,000 MSL. People beneath Tyndall C MOA hear aircraft operations at lower altitudes, and time-averaged noise levels beneath parts of Compass Lake that also underlie Tyndall C MOA are higher than noise levels beneath other parts of the work area. The tempo of flying operations in the work areas decreased with the cessation of 95 FS flying operations after Hurricane Michael, resulting in a decrease in time-averaged noise levels. Noise levels beneath overland training airspace under pre-hurricane conditions (included as a point of reference) and No Action Alternative operations are listed in Table 3.1-11. Ambient noise levels (i.e., noise levels when no aircraft operations are under way) in rural areas, such as those that make up the majority of the land beneath the work areas, are typically 45 dB. Where aircraft noise levels are below ambient noise levels, they do not contribute appreciably to overall noise levels, and L_{dnmr} is listed as less than 45 dB. Noise generated by training in offshore warning areas affects primarily transient receptors (i.e., people on boats); therefore, L_{dnmr} was not calculated for warning areas.

Table 3.1-10. Individual Overflight Noise Levels in Training Airspace

Aircraft (engine type)	Power Setting[1]	Power Unit	Speed (knots)	SEL Values (in dB) at Varying Distances (in feet)				
				500	1,000	2,000	5,000	10,000
Representative Training Airspace Flight Configuration								
F-35A[2]	90%	ETR	425	120	114	107	97	87
F-22	85%	ETR	350	118	110	102	90	80
T-38	90%	NC	300	88	80	72	58	46
A-10A	5,333	NF	300	97	91	83	66	53
F-15 (P220)	81%	NC	500	101	97	93	86	79
F-16	95.40%	NC	500	105	99	93	83	73
F/A-18E/F	90.50%	NC	500	115	109	103	92	81

Source: SELCALC3 using standard weather conditions of 59 degrees Fahrenheit and 70 percent relative humidity
Key: dB = decibel; ETR = engine thrust request; NC = engine core RPM; NF = engine fan RPM; RPM = revolutions per minute; SEL = Sound Exposure Level
Notes:
[1] Engine power settings are not constant during flight. Power settings shown are typical.
[2] Values are based on field noise-level measurements conducted at Edwards Air Force Base in 2013 (USAF, 2020b).

Table 3.1-11. Noise Levels Beneath Training Airspace Under Pre-Hurricane Conditions and No Action Alternative Operations

Airspace Area	Pre-Hurricane	No Action	
	L_{dnmr} (dBA)	L_{dnmr} (dBA)	Change (dBA)
Compass Lake Work Area (underlying Tyndall B MOA)	<45	<45	0
Compass Lake Work Area (underlying Tyndall C MOA)	51.1	48.5	-2.6
Carabelle Work Area	<45	<45	0

Key: < = less than; dBA = A-weighted decibel; L_{dnmr} = onset rate-adjusted monthly day-night average sound level; MOA = Military Operations Area
Note:
[1] L_{dnmr} is not calculated for overwater training areas, W-151 and W-470, because the L_{dnmr} noise metric is used.

Supersonic flight is not permitted in the work areas but is permitted in the warning areas at distances greater than 15 miles from shore and at altitudes greater than 10,000 feet above MSL (USAF, 2011b). Several of the fighter aircraft that operate in the warning areas are supersonic capable. The F-22, which is capable of supersonic flight without employing the afterburner,

conducts supersonic operations particularly frequently. Prior to Hurricane Michael, when the 95 FS and 43 FS were operating from Tyndall AFB, CDNL in open-water areas near the center of W-151 is estimated to have been 61.8 dB, with 12.5 booms per average day. No Action Alternative flight operations include fewer F-22 operations, reflecting cessation of 95 FS flying operations, and CDNL near the center of W-151 is projected to decrease to 57.4 dB with 5.3 booms per day. In open-water areas near the center of W-470, CDNL is estimated to have been 64.5 dB with 26.9 booms per average day, prior to Hurricane Michael. No Action Alternative operations result in 62.6 dB CDNL near the center of W-470, with 17.6 booms per average day (Table 3.1-12). Sonic booms are projected forward along the direction of flight, and their transmission through the atmosphere is affected by variable conditions, including winds and temperature gradients. Perceptible sonic booms can reach the shore when the supersonic flight segment is towards the shoreline and when atmospheric conditions are favorable for sonic-boom transmission. However, because supersonic operations are not permitted at closer than 15 NM from the shore or below 10,000 feet MSL, sonic booms with potential to be disturbing are infrequent on land.

Table 3.1-12. Offshore Sonic-Boom Noise Levels, Pre-Hurricane and No Action Alternative Operations

Descriptor	W-151		W-470	
	Pre-Hurricane	No Action Alternative	Pre-Hurricane	No Action Alternative
CDNL	61.8	57.4	64.5	62.6
Booms/day	12.5	5.3	26.9	17.6

Key: CDNL = C-weighted day-night average sound level

Avon Park Air Force Range, Grand Bay Range, and Pinecastle Range are used by a wide variety of aircraft types on a regular basis. Avon Park Air Force Range is used by 473 sorties per busy month, of which approximately half are fighter aircraft (USAF, 2013a). The Grand Bay Range is used for approximately 195,000 operations annually by aircraft including based A-10, C-130, and H-60 aircraft, as well as transients including fighter aircraft (USAF, 2014a). Pinecastle Range is expected to be utilized by approximately 2,100 sorties in Fiscal Year 2020, with a large fraction of the sorties being conducted by F-18 aircraft (Navy, 2017). Locations on and near these ranges is exposed to elevated aircraft-overflight and munitions noise levels on a regular basis. Sorties originating from Tyndall AFB make up a small percentage of total sorties flown at these ranges. As a result, the decrease in operations tempo at Tyndall AFB following Hurricane Michael has not resulted in substantial changes in overall operations tempo at the three training ranges.

3.1.2.2.2 MQ-9 Airspace

MQ-9 aircraft would primarily use W-151 and W-470. Existing noise levels in these airspace units are described in the section above titled “F-35A Airspace.”

3.1.3 Health and Safety, Tyndall AFB

The 325th Fighter Wing Safety Office (325 FW/SE) staff is responsible for the installation flight and ground safety program. The Safety Office’s mission is to implement proactive mishap prevention programs to protect Tyndall AFB’s people, equipment, and combat capability. Wing

activities include assessing unit safety programs, disseminating safety information, inspecting facilities, tracking trends, and providing safety expertise. When mishaps do occur, the Safety Office is the focal point for mishap reporting, investigation, and trend analysis.

3.1.3.1 Base Facilities Construction

Daily operations and maintenance operations on Tyndall AFB are performed in accordance with applicable USAF safety regulations, USAF technical guidance, and the standards stipulated in AFOSH requirements (see Appendix B, Section B.3.2, for a list of applicable regulatory drivers). Construction and demolition activities are common on Tyndall AFB and have associated inherent risks such as chemical (e.g., asbestos, lead, hazardous materials) and physical (e.g., noise propagation, falling, electrocution, collisions with equipment) sources.

Companies and individuals contracted to perform construction activities are given pre-briefs by USAF personnel before work begins to ensure that they understand their responsibilities with regard to OSHA and other safety requirements. Industrial hygiene programs address exposure to hazardous materials, use of personal protective equipment, and the availability and use of safety data sheets, the latter of which are also the responsibility of construction contractors to provide to workers. Federal civilian and military personnel that have a need to enter areas under construction must adhere to OSHA and AFOSH requirements, as well as applicable industrial hygiene programs. Individuals tasked to operate and maintain equipment, such as power generators, are responsible for following all applicable technical guidance, as well as adhering to established OSHA and USAF safety guidelines.

3.1.3.2 Airspace and Ranges

The affected environment for airspace and range training operations at Tyndall AFB includes flight safety and mishap prevention, bird/wildlife aircraft strike hazards (BASH), and the use of flares during training.

3.1.3.2.1 Flight Safety and Mishap Prevention

Flight safety is based on the physical risks associated with aircraft flight. In addition to regulatory drivers presented in Appendix B, Section B.3, military aircraft fly in accordance with FAA Regulations Part 91, *General Operating and Flight Rules*, which govern such things as operating near other aircraft, right-of-way rules, aircraft speed, and minimum safe altitudes. These rules include the use of testing and training flight areas, arrival and departure routes, and airspace restrictions as appropriate to help control air operations.

The primary safety concern regarding military aircraft operations is the potential for aircraft mishaps to occur. Mishaps may be caused by mid-air collisions with other aircraft or objects, weather, mechanical failures, pilot error, etc. Although mishap rates from previous years cannot predict future mishap rates, reviewing mishap historical data is helpful in providing perspective. Aircraft mishaps are categorized based on the extent of property damage, loss of life, or disability they cause. Class A mishaps are the most severe, with total property damage of $2 million or

more, a fatality, or permanent total disability. Due to the potential for impact severity, only Class A mishaps are discussed in this section.

Over the last 10 years (2010 to 2019), there have been two Class A mishaps at Tyndall AFB. During a training mission in November 2012, an F-22 crashed about 0.25 mile east of the base's drone runway. The pilot ejected safely, and no injuries were reported on the ground (USAF, 2012). Additionally, in November 2014, an F-16C Fighting Falcon of the 82nd Aerial Targets Squadron, 53 WEG, crashed into the Gulf of Mexico 57 miles south of Panama City, Florida, on a routine training mission out of Tyndall AFB. The pilot was killed in the crash (USAF, 2014b).

The USAF has implemented numerous procedures to minimize the potential for an aircraft mishap (see Appendix B, Section B.3); however, in the unlikely event of an aircraft emergency or mishap, Tyndall AFB maintains emergency and mishap response plans to mitigate and guide responses to aircraft accidents. These plans assign responsibilities and prescribe functional activities necessary to react to mishaps, whether on- or off-base. Response would normally occur in two phases. The initial response focuses on rescue, evacuation, fire suppression, safety, elimination of explosive devices, securing the area, and other actions immediately necessary to prevent loss of life or further property damage. The second phase is the mishap investigation, which involves an array of organizations whose participation would be governed by the circumstances associated with the mishap and actions required to be performed (DoD, 2018).

Many of the flying missions conducted by the 325 FW occur over the water. In case of an overwater mishap, the emergency teams work in conjunction with U.S. Coast Guard personnel especially trained to respond to aircraft mishaps. To deal with overland incidents, the Base has implemented a Wildland Fire Management Plan (USAF, 2017a) that presents procedures for the suppression and prevention of wildfires on Tyndall AFB. (Note: There have been isolated mission-related wildfires caused by manned aircraft and drones.) Fire management policy for all military administered lands are to implement a suppression strategy for all unplanned ignitions, comprising three levels of suppression response: confine, contain, and control. All three strategies require continuous observation of fire behavior. When possible, fires are managed in a control mode to minimize fire size. Considerations of contain and confine strategies are incorporated to provide for human safety and/or other aspects. If a wildfire exceeds the capacity of the installation to contain, personnel coordinate with local civilian firefighting agencies to respond. Tyndall AFB maintains mutual aid agreements with local fire departments, which detail each party's responsibility when responding to a fire (USAF, 2017a). The base also conducts aircraft mishap training exercises, where firefighting personnel are instructed on any special response procedures.

3.1.3.2.2 Bird/Animal Aircraft Strike Hazard (BASH)

The goal of BASH management is to preserve war fighting capabilities through the reduction of wildlife hazards to aircraft operations. Birds and wildlife have the potential to cause millions of dollars in damage to aircraft and the loss of human life. Over the last 10 years (2009 to 2018), Tyndall AFB averaged approximately 20 strikes per year. Not including a bird strike that occurred in 2016 that severely damaged an F-22 aircraft engine, the average annual repair costs related to BASH-related damage was approximately $3,600. The 2016 strike caused damage to the engine resulting in repair costs of approximately $800,000. None of these strikes resulted in a Class A mishap (USAF, 2019c).

The Tyndall AFB area primarily consists of unimproved land. Additionally, there are 213 acres of lakes (including 11 fishponds), 18 miles of beaches on the Gulf of Mexico, and 110 miles of bays and bayous surrounding Tyndall AFB on the south, west, and north. The forested areas, the grasslands on the airfields, ponds, and shoreline provide a large variety of habitats capable of supporting birds and animals that are hazardous to aircraft. Birds common to the Tyndall AFB area include blackbirds, cowbirds, starlings, gulls, egrets, cormorants, loons, pelicans, quail, wild turkey, various species of shorebirds, migrating waterfowl, and raptors. Many other non-avian animals, including deer, wild boar, alligators, and turtles, also pose threats to flight operation and must be considered. Additionally, rabbits and rodents can attract raptors to the airfield (USAF, 2018b).

The 325 FW/SEF (Flight Safety) is the office of primary responsibility for monitoring and implementation of the installation's BASH Plan (Plan 910), which provides guidance on implementation of the BASH program. The plan addresses exposure of local and transient aircraft to both indigenous wildlife populations and seasonal bird migrations at and near the base. The BASH program involves multiple components that include land management measures to minimize birds and other types of wildlife in and near the airfield, and procedures that address monitoring and notifications of bird/wildlife activity and strike risk (USAF, 2018b).

Tyndall AFB and transient pilots have access to the Avian Hazard Advisory System and Bird Avoidance Model, which are web-based tools that use historical and real-time data to help aviators assess the BASH risk for specific locations, including the airspaces addressed in this EIS. Tyndall AFB uses bird condition terminology, as described in Appendix B, Section B.3, to disseminate bird activity information and implement unit operational procedures.

3.1.3.2.3 Use of Defensive Flares

Under proposed activities, F-35A aircrews would train using defensive flares. When threatened by "enemy" radar, pilots must take evasive action to avoid detection and/or attack by adversary air defense systems, including the discharging of pyrotechnic flares. Flares are pyrotechnic devices used to defend against heat-seeking missiles, where the missile seeks out the heat signature from the flare rather than the aircraft's engines. The effective use of flares in combat requires training and frequent use by aircrews to master the timing of deployment, the capabilities of the devices, and to ensure safe and efficient handling by ground crews. Flares consist of highly flammable material that burns rapidly at extremely high temperatures and is designed to burn completely. Most flares burn in under 10 seconds, leaving only a small, round, plastic end cap as the only residue (U.S. Department of Commerce, 1997).

Flare deployment in authorized airspace is governed by a series of regulations that are based on safety and environmental considerations and limitations. Among these regulations are the following:

- AFI 13-201 establishes practices to decrease disturbances from flight operations and protect the public from the hazards and effects associated with flight operations.
- AFI 13-212 outlines procedures governing weapons range use of flares.
- AFI 11-214 delineates procedures for flare employment.

Additionally, Tyndall AFB has implemented numerous procedures for the safe use of flares in the various training airspaces. For example, flares may be employed within W-151 and W-470 provided the aircraft is above 1,500 feet AGL or the aircraft is below 1,500 feet AGL and at least 3 NM from any surface vessel, platform, or land mass. The use of flares is also prohibited over populated areas, personnel, or structures (USAF, 2016b).

3.1.4 Air Quality, Tyndall AFB

Air quality refers to concentrations of various air pollutants in the atmosphere. Air quality is defined by the size and topography of the air basin, the local and regional meteorological influences, and the types and concentrations of pollutants in the atmosphere, which are generally expressed in units of parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). One aspect of the significance of a pollutant concentration is to compare it to a national and/or state ambient air quality standard. These standards represent the maximum allowable atmospheric concentrations that may occur and still protect public health and welfare and include a reasonable margin of safety to protect the more sensitive individuals in the population. The USEPA established the National Ambient Air Quality Standards (NAAQS) to regulate the following criteria pollutants: ozone (O_3), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), particulate matter less than or equal to 10 microns in diameter (PM_{10}), particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$), and lead. The Florida Department of Environmental Protection (FDEP) relies on the NAAQS for purposes of regulating air quality within Florida. Table B.4-1 of Appendix B of this EIS presents the NAAQS.

The USEPA also regulates hazardous air pollutants (HAPs) that are known or are suspected to cause serious health effects or adverse environmental effects. The Clean Air Act identifies 188 substances as HAPs (e.g., benzene, formaldehyde, mercury, and toluene). HAPs are emitted from a range of industrial facilities and vehicles. The USEPA sets federal regulations to reduce HAP emissions from stationary sources in the National Emissions Standards for Hazardous Air Pollutants (NESHAP).

3.1.4.1 Base

The following section describes the air quality affected environment within the Tyndall AFB region and associated airspaces.

3.1.4.1.1 Region of Influence and Existing Air Quality

The ROI for air emissions resulting from implementation of the proposed F-35A Wing and MQ-9 Wing beddown and operations at Tyndall AFB would primarily affect air quality in southeast Bay County Florida and the adjoining offshore waters, namely Warning Areas W-151 and W-470, where proposed aircraft operations would occur below 3,000 feet AGL. Operational emissions in airspace over southwestern Georgia are not included because they are projected to occur above 3,000 feet AGL. Analysis of proposed aircraft operations is limited to operations that would occur within the lowest 3,000 feet of the atmosphere, as this is the typical depth of the atmospheric mixing layer where the release of aircraft emissions would affect ground-level pollutant

concentrations. In general, aircraft emissions released above the mixing layer would not appreciably affect ground-level air quality.

Identifying the ROI for air quality requires knowledge of the pollutant type, source emission rates, the proximity of project emission sources to other emission sources, and local and regional meteorology. For inert pollutants (such as CO and particulates in the form of dust), the ROI is generally limited to a few miles downwind from a source. The ROI for reactive pollutants such as O_3 can extend much farther downwind than for inert pollutants. The pollutant O_3 is formed in the atmosphere by photochemical reactions of previously emitted pollutants called precursors. Ozone precursors are mainly nitrogen oxides (NO_x) and photochemically reactive volatile organic compounds (VOCs). In the presence of solar radiation, the maximum effect of precursor emissions on O_3 levels usually occurs several hours after they are emitted and many miles from their source.

3.1.4.1.2 Regional Air Emissions

The USEPA designates all areas of the United States in terms of having air quality better (attainment) or worse (nonattainment) than the NAAQS. An area is in attainment of a NAAQS if its pollutant concentration remains below the standard value, as defined by the annual to tri-annual metrics described in Appendix B, Section B.4.1. Former nonattainment areas that have attained a NAAQS are designated as maintenance areas. Currently, the USEPA designates Bay County as in attainment of the NAAQS for all pollutants (USEPA, 2019a).

Table 3.1-13 summarizes estimates of annual emissions generated by activities within Bay County for calendar year 2017.

Table 3.1-13. Annual Emissions for Bay County, Florida, 2017

Source Type	Air Pollutant Emissions (tons per year)							
	VOCs	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	CO_2e (mt)	HAPs
Stationary Sources	1,430	3,774	4,194	2,011	987	828	6,544,552	845
Area Sources	27,305	6,770	2,002	35	6,731	1,553		2,709
On-Road Sources	1,079	12,453	1,929	19	130	58	950,310	292
Nonroad Sources	1,602	9,547	915	2	70	67	162,401	507
Total Emissions[1]	**31,416**	**32,545**	**9,040**	**2,066**	**7,918**	**2,506**	**7,657,264**	**4,353**

Source: (USEPA, 2020)

Key: CO = carbon monoxide; CO_2e (mt) = carbon dioxide equivalent in metric tons; HAPs = hazardous air pollutants; 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; SOx = sulfur oxides; VOCs = volatile organic compounds.

Note: [1] Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.

These data were obtained from the USEPA National Emissions Inventory and reflect the most recent annual emissions data available for Bay County emissions (USEPA, 2020). Stationary sources are point sources identifiable by name and location. Area sources are point sources of emissions too small to track individually, such as individual homes, small office buildings, or diffuse stationary sources (e.g., wildfires or agricultural tilling equipment). Mobile sources are vehicles or equipment with gasoline or diesel engines (e.g., an airplane or a ship). Two types of mobile sources are considered: on-road and nonroad. On-road mobile sources are vehicles such as cars, light trucks, heavy trucks, buses, engines, and motorcycles. Nonroad sources are aircraft,

locomotives, diesel and gasoline boats and ships, personal watercraft, lawn and garden equipment, agricultural and construction equipment, and recreational vehicles. The National Emissions Inventory data for Bay County presented in Table 3.1-13 includes Tyndall AFB emission sources, such as aircraft operations analyzed in the 2016 AICUZ (USAF, 2016a).

3.1.4.1.3 Tyndall AFB Emissions

Existing sources of emissions at Tyndall AFB include (1) aircraft operations and maintenance activities, (2) onsite private- and government-owned vehicles, (3) aerospace ground equipment (AGE), (4) nonroad equipment, and (5) stationary sources, such as paint booths; fuel storage tanks; external combustion equipment (boilers and paint booth heaters); and internal combustion engines (Tyndall AFB, 2019a). The installation emits HAPs during operational activities, which include storing fuel, using paints and solvents, and burning fossil fuels. Table 3.1-14 summarizes the annual emissions from stationary and mobile sources at Tyndall AFB during calendar year 2017, which comprises the air quality baseline and most recent full calendar year of operations prior to the effects of Hurricane Michael. The damage done by Hurricane Michael in October 2018 resulted in an immediate and drastic reduction in all operations and associated air emissions at Tyndall AFB and throughout Bay County. The majority of flying operations and associated equipment and personnel—two squadrons of F-22s and one squadron of T-38s—were relocated from Tyndall AFB to other bases (see Section 1.2.1), which reduced annual flying operations by approximately 49,700 per year, or 88 percent of the annual operations analyzed for aircraft based at Tyndall AFB in the 2016 AICUZ. This relocation reduced the number of employees and dependents at Tyndall AFB by approximately 1,400 USAF personnel and 1,904 dependents. Therefore, the current status quo of substantially reduced flying operations, USAF personnel, dependents, and their associated emissions at Tyndall AFB is not being used as the environmental baseline for the affected environment.

Table 3.1-14. Annual Emissions for Operations at Tyndall AFB, 2017 Baseline

Activity Type	Air Pollutant Emissions (tons per year)							
	VOCs	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	CO_2e (mt)	HAPs
Aircraft Operations	61.29	636.42	249.20	29.74	61.90	50.90	73,567	2.01
Aerospace Ground Equipment	15.68	28.41	58.80	3.93	5.85	5.71	2,839	0.26
Nonroad Equipment	11.15	30.67	137.01	9.05	9.72	9.72	474	0.19
On-road Vehicles	8.97	95.22	8.06	0.11	0.35	0.18	5,424	0.79
Permitted Stationary Sources	4.69	7.15	11.14	0.78	0.17			0.06
Total Tyndall AFB 2017 Emissions	**101.78**	**797.87**	**464.22**	**43.61**	**77.99**	**66.50**	**82,304**	**3.31**
Bay County 2017 Emissions	**31,416**	**32,545**	**9,040**	**2,066**	**7,918**	**2,506**	**7,657,264**	**4,353**
Tyndall AFB 2017 Emissions % of Bay County 2017 Emissions	**0.3%**	**2.5%**	**5.1%**	**2.1%**	**1.0%**	**2.7%**	**1.1%**	**0.1%**

Sources: Permitted stationary sources (Division of Air Resource Management, 2019), mobile sources (AFCEC, 2014) and (Leidos, 2020)

Key: AFB = Air Force Base; CO = carbon monoxide; CO_2e (mt) = carbon dioxide equivalent in metric tons; HAPs = hazardous air pollutants; 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_x = sulfur oxides; VOCs = volatile organic compounds

Table 3.1-15 presents emissions estimates for stationary and mobile sources at Tyndall AFB during calendar year 2019. Comparison of these data to those in Table 3.1-14 show how the damage done by Hurricane Michael substantially reduced operations and resulting emissions at Tyndall AFB.

Table 3.1-15. Annual Emissions for Operations at Tyndall AFB, 2019

Activity Type	Air Pollutant Emissions (tons per year)							
	VOCs	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	CO_2e (mt)	HAPs
Aircraft Operations	18.50	61.46	93.83	8.22	25.67	22.07	20,716	0.44
Aerospace Ground Equipment	1.21	3.10	14.13	0.96	1.04	1.04	695	0.02
Nonroad Equipment	7.67	21.09	94.20	6.22	6.68	6.68	326	0.13
On-road Vehicles	6.17	65.46	5.54	0.07	0.24	0.12	3,729	0.54
Permitted Stationary Sources	2.05	2.14	7.92	0.44	0.47			0.54
Total Tyndall AFB 2017 Emissions	**35.60**	**153.26**	**215.63**	**15.92**	**34.10**	**29.91**	**25,466**	**1.68**
Bay County 2017 Emissions	**31,416**	**32,545**	**9,040**	**2,066**	**7,918**	**2,506**	**7,657,264**	**4,353**
Tyndall AFB 2017 Emissions % of Bay County 2017 Emissions	**0.1%**	**0.5%**	**2.4%**	**0.8%**	**0.4%**	**1.2%**	**0.3%**	**0.04%**

Sources: Permitted stationary sources (Division of Air Resource Management, 2019), mobile sources (AFCEC, 2014) and (Leidos, 2020)
Key: AFB = Air Force Base; CO = carbon monoxide; CO_2e (mt) = carbon dioxide equivalent in metric tons; HAPs = hazardous air pollutants; 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_x = sulfur oxides; VOCs = volatile organic compounds

3.1.4.1.4 Greenhouse Gases

Greenhouse gases (GHGs) are gases that trap heat in the atmosphere. GHG emissions are generated by both natural processes and human activities. The accumulation of GHGs in the atmosphere regulates the earth's temperature. Human activities are contributing to climate change, primarily by releasing GHGs into the atmosphere. Climate change refers to any significant change in the measures of climate lasting for an extended period of time (USEPA, 2016). The U.S. Global Change Research Program (USGCRP) report, *Climate Science Special Report: Fourth National Climate Assessment* (USGCRP, 2017), states the following:

- Global annually averaged surface air temperature has increased by about 1.8 degrees Fahrenheit (°F) (1.0 degree Celsius [°C]) over the last 115 years (1901–2016). This period is now the warmest in the history of modern civilization.
- It is extremely likely that human activities, especially emissions of GHGs, are the dominant cause of the observed warming since the mid-20th century.
- Over the next few decades (2021–2050), annual average temperatures are expected to rise by about 2.5°F for the United States, relative to the recent past (average from 1976–2005), under all plausible future climate scenarios.
- Many other aspects of global climate are changing, including rising oceanic temperatures; melting glaciers; diminishing snow cover; shrinking sea ice; rising sea levels; ocean acidification; and increasing atmospheric water vapor.

- Global average sea level has risen by about 7 to 8 inches since 1900, a rate that is greater than during any preceding century in at least 2,800 years. Global sea level rise has already affected the United States; the incidence of daily tidal flooding is accelerating in more than 25 Atlantic and Gulf Coast cities. Global average sea levels are expected to continue to rise by at least several inches in the next 15 years and by 1 to 4 feet by 2100. A rise of as much as 8 feet by 2100 cannot be ruled out. Sea level rise will be higher than the global average on the East and Gulf Coasts of the United States.
- Annual trends toward earlier spring melt and reduced snowpack are already affecting water resources in the western United States and these trends are expected to continue. Under higher emission scenarios and assuming no change to current water resources management, chronic, long-duration hydrological drought is increasingly possible before the end of this century.
- The magnitude of climate change beyond the next few decades will depend primarily on the amount of GHGs (especially carbon dioxide [CO_2]) emitted globally. Without major reductions in emissions, the increase in annual average global temperature relative to preindustrial times could reach 9°F (5°C) or more by the end of this century. With significant reductions in emissions, the increase in annual average global temperature could be limited to 3.6°F (2°C) or less.

GHGs include water vapor, CO_2, methane (CH_4), nitrous oxide, O_3, and several hydrocarbons and chlorofluorocarbons. Each GHG has an estimated global warming potential (GWP), which is a function of its lifetime and ability to trap heat in the atmosphere. The GWP rating system is standardized to CO_2, which has a value of one. For example, CH_4 has a GWP of 28, which means that it has a global warming effect 28 times greater than CO_2 on an equal-mass basis (USGCRP, 2017). To simplify GHG analyses, total GHG emissions from a source are often expressed as a CO_2e. The CO_2e is calculated by multiplying the emissions of each GHG by its GWP and adding the results together to produce a single, combined emission rate representing all GHGs. While CH_4 and nitrous oxide have much higher GWPs than CO_2, CO_2 is emitted in such greater quantities that it is the overwhelming contributor to global CO_2e emissions from both natural processes and human activities.

The potential effects of GHG emissions generated by the project alternatives are by nature global. Given the global nature of climate change and the current state of the science, it is not useful at this time to attempt to link the emissions quantified for local actions to any specific climatological change or resulting environmental impact. Therefore, the quantitative analysis of CO_2e emissions in this EIS is for disclosing the local net effects (increase or decrease) of the proposed action and alternatives and for its potential usefulness in making reasoned choices among alternatives.

Climate change and severe weather were the basis for the AFCEC's *Severe Weather/Climate Hazard Screening and Risk Assessment Playbook* (AFCEC, 2020). The principles documented in this Severe Weather Playbook were used in the design of facilities for the reconstructed Tyndall AFB and would be applied to any new facilities associated with any new mission at Tyndall AFB. In the design and reconstruction of infrastructure and facilities at Tyndall AFB, in accordance with the Severe Weather Playbook, AFCEC first screened the hazards that could impact Tyndall AFB infrastructures and facilities. This effort focused on hurricanes, wind velocities, and storm surge. The next step was to assess the risks, especially in the light of Hurricane Michael and anticipated climate change through 2021. The next steps were implemented to design and construct

infrastructure and facilities which met or exceeded the hazards and risks. Section 2.2.4.1 identifies representative design actions taken to be consistent with the Severe Weather Playbook.

3.1.4.1.5 Applicable Regulations and Standards

The FDEP Division of Air Resource Management is responsible for enforcing air pollution regulations in Florida. The Division of Air Resource Management enforces the NAAQS by monitoring air quality and developing rules to regulate and to permit stationary sources of air emissions. The FDEP air quality regulations are found in Title 62 of the Florida Administrative Code (FAC) (FDEP, 2020a).

Air emissions of affected stationary sources at Tyndall AFB currently operate under a Minor Source Air Operation Permit 0050024-016-AF, as issued by the FDEP on September 30, 2015. This permit requires that the combined potential emissions from these sources not exceed major source thresholds that would require a Title V operating permit, including 100 tons per year (tpy) of any criteria pollutants or 10 tpy of any single HAP, or 25 tpy or more of HAPs in the aggregate. Stationary sources regulated under Permit 0050024-016-AF include those mentioned in the section above titled Tyndall AFB Emissions. Appendix B.4 of this EIS presents additional information on the regulatory setting of the Tyndall AFB project region.

3.1.4.2 Airspace and Ranges

Airspaces projected for use by proposed F-35A and MQ-9 aircraft operations and flight routes between these locations and Tyndall AFB would occur within Florida and its offshore waters and southwestern Georgia. The only locations within these areas where proposed aircraft operations would occur below 3,000 feet AGL are for F-35A operations within the offshore Warning Areas W-151 and W-470. These areas extend 3 NM or more offshore Florida into federal and/or international waters. All of these areas are unclassified or in attainment of all NAAQS.

3.1.5 Hazardous Materials and Waste, Tyndall AFB

Tyndall AFB has the facilities and established procedures and protocols for the use, handling, and management of hazardous materials and waste, including radar absorbing material, associated with the operations and maintenance of fifth-generation aircraft.

3.1.5.1 Hazardous Materials Management

A variety of products containing hazardous materials is used by Tyndall AFB as part of day-to-day operations. To administer these materials, Tyndall AFB has implemented a comprehensive hazardous materials management process, including the use of a HAZMAT Tracking Activity (HTA) The HTA encompasses a storage facility and an established set of procedures designed to control the acquisition, storage, issue, and disposition of serviceable hazardous materials (Tyndall AFB, 2019b).

Aircraft flight operations and maintenance and installation maintenance requires storage and use of hazardous materials such as flammable and combustible liquids. These materials include acids, corrosives, caustics, glycols, compressed gases, aerosols, batteries, hydraulic fluids, solvents, paints, pesticides, herbicides, lubricants, fire retardants, photographic chemicals, alcohols, and sealants. The existing storage tanks for Jet A fuel are operated under an SPCCP (USAF, 2016c).

3.1.5.2 Hazardous Waste Management

Tyndall AFB is a Large Quantity Generator of hazardous waste per USEPA regulations and maintains a USEPA Identification Number, FL1570024124. Tyndall AFB manages its hazardous waste in accordance with its Hazardous Waste Management Plan (HWMP) and in compliance with USEPA's regulations as contained in CFR, Title 40, Parts 261 through 280, and the FDEP regulations contained in Florida Statute Chapter 62-730 (Tyndall AFB, 2019b).

Hazardous waste is generated by aircraft, vehicle, and aviation support equipment maintenance activities and from petroleum, oils, and lubricants (POL) management and distribution. Types of hazardous and petroleum (non-hazardous) waste generated include used oil and filters, used antifreeze, used solvent, used sealants, reclaimed Jet A fuel, waste diesel and motor gasoline, waste Jet A fuel and fuel filters, paint waste, spent hydraulic fluid, waste corrosives, and fluorescent lamps and batteries (managed as universal waste). Tyndall AFB recycles all lubricating fluids, batteries, and oil filters (Tyndall AFB, 2019b).

Tyndall AFB has implemented policies and procedures that identify hazardous waste generation areas and address the proper labeling, storage, and handling of these wastes, as well as record keeping, spill contingency and response requirements, and education and training of appropriate personnel. All policies and procedures associated with the management of hazardous waste are outlined in the HWMP (Tyndall AFB, 2019b).

3.1.5.3 Environmental Restoration Program

The DoD developed the Environmental Restoration Program (ERP), formerly known as the Installation Restoration Program (IRP), in 1984 to identify, investigate, and remediate potentially hazardous material disposal sites on DoD property. The USAF initiated an IRP at Tyndall AFB in 1981. Investigation and cleanup activities have occurred under the requirements of Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Congress established the Military Munitions Response Program (MMRP) in 2001 under the ERP to address the issues of Unexploded Ordnance (UXO), Discarded Military Munitions (DMM), and Munitions Constituents on sites owned and operated by the DoD. There are currently 80 ERP sites at Tyndall AFB consisting of 13 that are currently regulated under CERCLA, 31 petroleum cleanup sites, 11 MMRP sites, and 25 closed sites (AFCEC, 2016). The Tyndall Site Management Plan identifies the status of the ERP sites and the MMRP for the installation. The purpose of the Site Management Plan is to outline the Tyndall AFB strategy and timeline for conducting a CERCLA investigation and remediation program for the base (AFCEC, 2016).

3.1.5.4 Contamination Sites

There are 17 ERP/contamination sites identified at the Tyndall AFB associated with historical operations near proposed construction projects associated with either the F-35A Wing or the MQ-9 Wing beddowns (Figure 3.1-2) (325 FW, 2019):

- ERP Site SS026 (also known as IRP Site 26) Vehicle Maintenance Area. This site is a large complex that includes vehicle wash racks, waste oil underground storage tanks (USTs), piping, trenches, oil/water separators (OWSs), a paint booth, and product USTs. A Remedial Investigation/Feasibility Study (RI/FS) is being conducted for this location (AFCEC, 2016). The footprints of the proposed F-35A Parking Apron and Operations and Maintenance Complex and the MQ-9 Gym Option 2 overlap this site.
- ERP Site SS015 (also known as IRP site 15) Petroleum and Oil Lubricants Area B. This site includes sludge trenches and the Building 509 former IRP Drum Holding Pad. An RI/FS is being conducted for this location (AFCEC, 2016). The footprint of the proposed F-35A Parking Apron and Operations and Maintenance Complex overlaps this site.
- ERP Site TU204 Building 182 Former UST site. This is a small (0.29-acre) site of a former UST that has been deferred to the FDEP POL program. The footprint of the proposed F-35A Parking Apron and Operations and Maintenance Complex overlaps this site.
- ERP OW047 Building 188 OWS. This is the location of a 10,200-gallon OWS that was closed in place in 2001. The site is currently in the RI scoping process. The footprint of the proposed F-35A Parking Apron and Operations and Maintenance Complex overlaps this site.
- ERP Site TU205 Former Building 239 Engine Test Cell. This is an 8-acre site that had USTs and an OWS as well as an associated chlorinated hydrocarbon plume (AFCEC, 2016). A RI/FS is being conducted for this location. The footprint of the proposed MQ-9 Operations and Maintenance Complex Option 1 overlaps this site.
- Building 319 Waste Accumulation Area. This site is a former 90-day Waste Accumulation Area facility. The site is currently in the RI scoping process. The footprint of the proposed MQ-9 Operations and Maintenance Complex Option 1 overlaps this site.
- ERP Site FT017 (also known as IRP Site 17) US-98 Fire Training Areas. This large site includes a former Fire Training Area, a former polychlorinated biphenyl (PCB) Transformer Site, and a Drum Burial Area. Potential perfluorooctane sulfonate and perfluorooctanoic acid (PFOS/PFOA) impacts at this site is being investigated as part of an RI (AFCEC, 2016). The footprint of the proposed MQ-9 Operations and Maintenance Complex Option 1 is adjacent to this site.

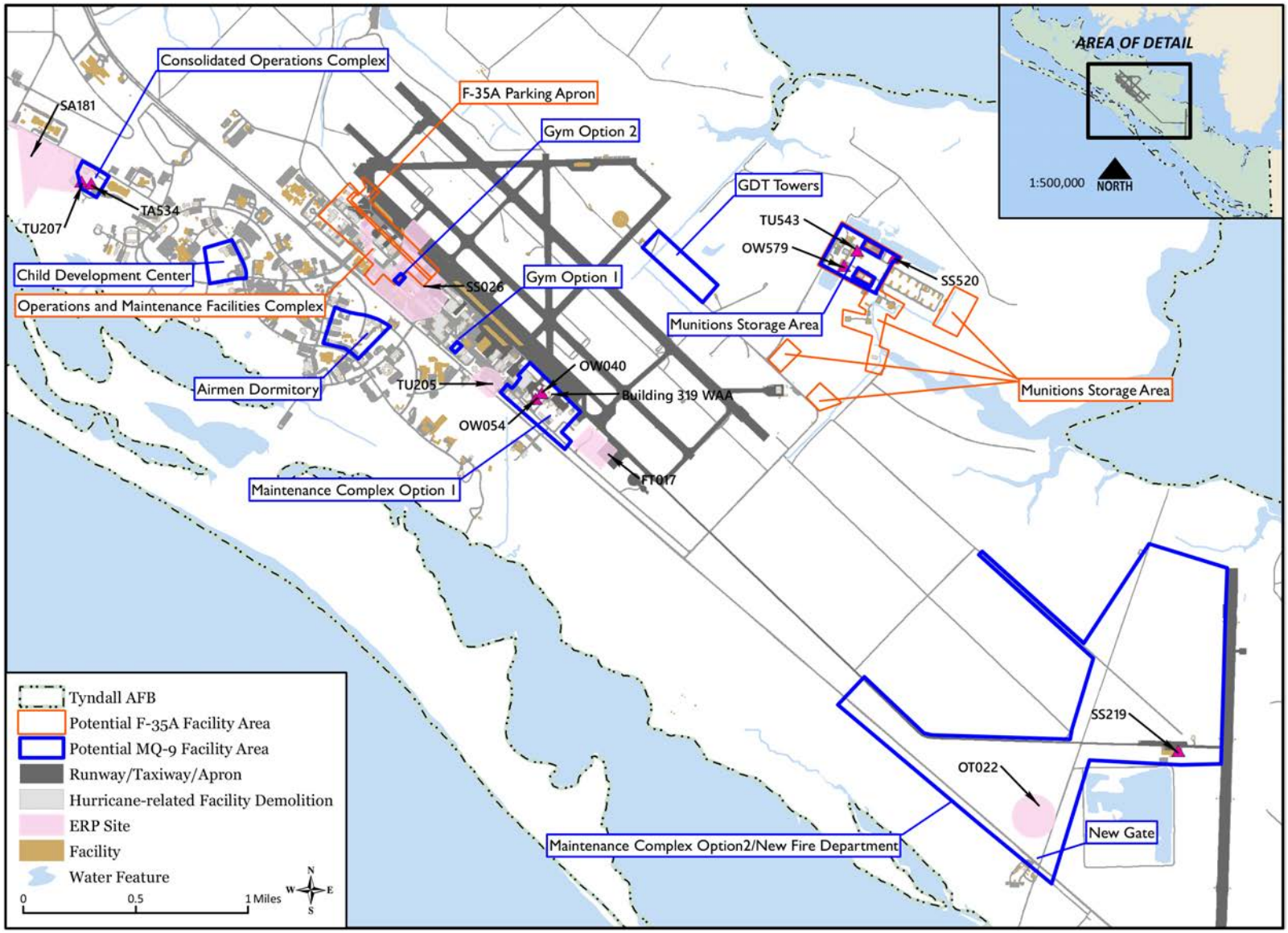

Figure 3.1-2. Tyndall AFB ERP Sites

- ERP Site OW040 Building 315 OWS. This 0.3-acre site is the location of a former 10,200-gallon OWS. The site is currently in the RI scoping process. The footprint of the proposed MQ-9 Operations and Maintenance Complex Option 1 overlaps this site.
- ERP Site OW054 Building 316 Fuel Barn. This 0.1-acre site is the location of a former OWS. A Site Rehabilitation Completion Order from FDEP has been received for this site. The footprint of the proposed MQ-9 Operations and Maintenance Complex Option 1 overlaps this site.
- ERP Site TU207 Building 1274. This 0.9-acre site is the location of two former above ground storage tanks (ASTs). This is a non-CERCLA site. The footprint of the proposed MQ-9 Consolidated Operations Complex overlaps this site.
- ERP Site SA181 Tower Range. This site is an active 52.6-acre small arms firing range. An RI/FS is being conducted and remediation for this site is anticipated to be complete by the end of Fiscal Year 2020. The footprint of the proposed MQ-9 Consolidated Operations Complex is adjacent to this site.
- ERP Site TA534 Building 1280 AST. This 0.2-acre site is the location of three ASTs. A Site Rehabilitation Completion Order from FDEP is anticipated for this site.
- ERP Site OW579 Building 7028 OWS. This 0.1-acre site is the location of a former 500-gallon OWS that was removed in 2014. This site is anticipating an NFA. The footprints of the proposed F-35A and MQ-9 MSAs overlap this site.
- ERP Site TU543 Building 7020. This 0.02-acre site is the location of a former 550-gallon UST. A Site Rehabilitation Completion Order from FDEP has been received for this site. The footprints of the proposed F-35A and MQ-9 MSAs overlap this site.
- ERP Site OT022 Pesticide Disposal Area. This 0.5-acre site was reportedly used for burial of pesticides. An RI was conducted, and this site is anticipating an NFA. The footprints of the MQ-9 Maintenance Complex Option 2 overlap this site.
- ERP Site SS219 Wash Rack. Contaminants were encountered at this 1.3-acre site during construction activities. A Site Rehabilitation Completion Order from FDEP has been received for this site. The footprints of the MQ-9 Maintenance Complex Option 2 overlap this site.
- ERP Site SS520 Spill Site Area. This 0.35-acre site is where a diesel spill occurred in the early 1990s. A cleanup excavation was conducted at the site and a Site Rehabilitation Completion Order from FDEP has been received. The footprints of the proposed F-35A and MQ-9 MSAs overlap this site.

3.1.6 Soils and Geologic Resources, Tyndall AFB

3.1.6.1 Geology

The surface geology of Tyndall AFB consists of Quaternary (1.8 million years to the present) sediments composed largely of fine to coarse-grained sands, silty sands, and silty clay. Near Tyndall AFB, the uppermost deposits are moderately permeable with varying amounts of interstitial silt and clay and occasional hardpan layers. Nearest to the Gulf of Mexico, in southern portions of the peninsula, are Holocene (0.01 million years to the present) sediments; in northern portions of the peninsula are undifferentiated sediments consisting of silica-rich material, organics and freshwater carbonates of Pleistocene/Holocene age (2.6 million years to the present). Underlying the surface are the Lower Miocene (11.6 to 5.3 million years ago) units of the Intracoastal Formation, a very sandy, microfossil bearing, poorly consolidated limestone interlaced with silica-rich fine-grained deposits (USGS, 2020a; Tyndall AFB, 2019c).

Sinkholes form when CO_2 reacts with rain to create a weak acid that slowly dissolves limestone bedrock, creating cracks and fissures that compromise underground structural support and result in a collapse of the land surface. While sinkholes are common throughout Florida, none have been historically recorded at Tyndall AFB and very few have been reported in Bay County (FDEP, 2020b; Tyndall AFB, 2019c).

3.1.6.2 Soils

A soil-mapping unit represents an area characterized by one major kind of soil, or an area characterized by several kinds of soils (often referred to as a series). Many of the soil map units described in this section contain minor soils that are encompassed within the map unit. This section presents properties of the soil type that comprise the majority of each soil map unit to provide an indication of the conditions and limitations of soils found in the project area. Minor soils contained within predomination soil types in any given area can have different properties and limitations that can only be determined by onsite examination.

Thirteen distinct soil series and numerous distinct soil-mapping units are present on Tyndall AFB. Soils at Tyndall AFB are predominately sandy, acidic, poorly drained, and are relatively close to the underlying water table. Characteristics of the predominant soil series in areas affected by Proposed Action ground activities of the Proposed Action are summarized in the Soil Survey of Bay County Florida (USDA, 1984), Official Series Descriptions of the Natural Resources Conservation Service (NRCS) (NRCS, 2020a), and the NRCS Web Soil Survey online data resource (NRCS, 2020b) (Figure 3.1-3). Much of the land in developed portions of the installation are categorized by the NRCS as urban land, which is defined as areas that are 75 percent or more covered with streets, houses, parking lots, runways, or other related facilities.

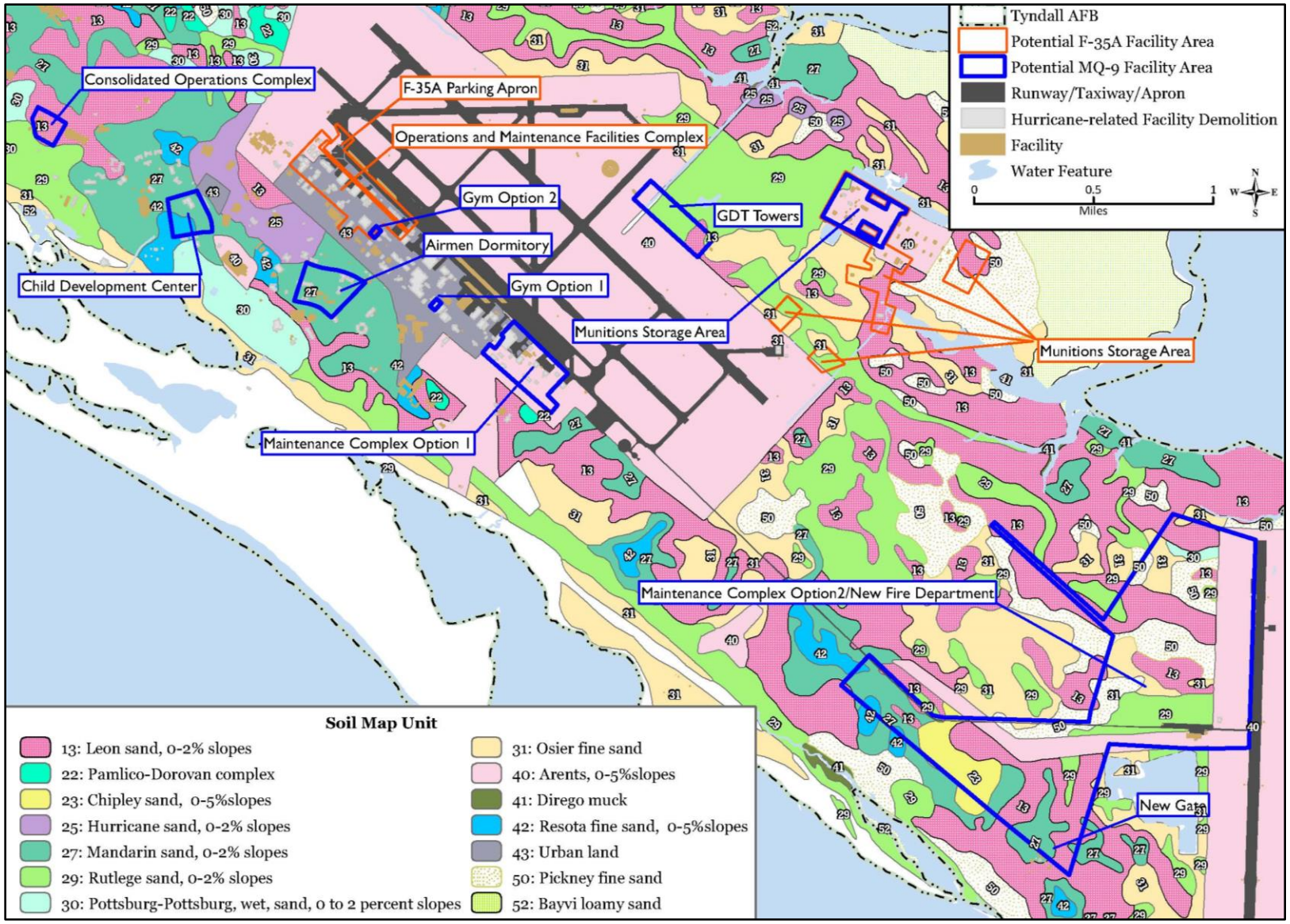

Figure 3.1-3. Soil Types in Areas of Disturbance for Facilities Associated With F-35 Beddown

Prime Farmland

The Farmland Protection Policy Act (7 U.S.C. 4201) requires federal agencies to evaluate the adverse effects of their activities on farmland, which includes prime and unique farmland and farmland of statewide and local importance, and to consider alternative actions that could avoid adverse effects. Prime farmland is defined as land that possesses the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and exists in a condition that is available for such uses. The NRCS has not classified any of the soil types found near the proposed action as prime farmland (NRCS, 2020b).

3.1.7 Water Resources, Tyndall AFB

3.1.7.1 Surface Water

Tyndall AFB is located within the St. Andrew Bay watershed. Major surface water features of this watershed include the Gulf of Mexico, St. Andrew Bay (including West, East, and North Bays), St. Joseph Bay, Deer Point Reservoir, and St. Andrew Sound. Tyndall AFB has several freshwater lakes; some were artificially created by excavation or impoundment, and others (coastal dune lakes) developed naturally due to coastal land processes. The largest natural lake on Tyndall AFB is Felix Lake, a noncoastal dune lake in the northern part of the base. Other notable surface water bodies on or near Tyndall AFB include Wild Goose Lagoon, Blind Alligator Bayou, Strange Bayou, Fred Bayou, Pearl Bayou, Freshwater Bayou, Sheephead Bayou, and Smack Bayou. In general, surface water drains to the north in areas north of (US-98) and to the south in areas south of US-98. There are no named rivers on Tyndall AFB, but several unnamed sinuous watercourses branch inland from the major bayous (Tyndall AFB, 2019c).

Table 3.1-16 details waterbodies that receive runoff from Tyndall AFB that are listed as CWA Section 303(d) impaired waters.

Table 3.1-16. Tyndall AFB Clean Water Act 303(d) Waters

Waterbody ID	Water Segment Name	Impairment
1061E	St. Andrews Bay (Mouth)	Nutrients (total nitrogen)
1061F	East Bay (E)	Bacteria (in shellfish) and nutrients (total nitrogen)

Source: (FDEP, 2019)

Tyndall AFB operates under a general stormwater National Pollutant Discharge Elimination System (NPDES) Phase II Municipal Separate Storm Sewer System (MS4) Permit (FLR04E004) issued to the base by the State of Florida. As a condition of this permit, Tyndall AFB implements multiple stormwater BMPs to control stormwater discharges including conducting inspections on all sites that require an NPDES Construction General Permit. Tyndall AFB conducts industrial activities as an air transportation facility and, therefore, has obtained a Florida NPDES Multi-Sector Generic Permit for Stormwater Discharge Associated with Industrial Activity (FLR05H999-001). To satisfy the requirements of the Multi-Sector Generic Permit, the USAF has prepared and implemented a Storm Water Pollution Prevention Plan (SWPPP). The plan presents an assessment of potential stormwater pollution sources as well as specifies and implements BMPs to maximize stormwater quality.

3.1.7.2 Groundwater

Tyndall AFB is included in the Apalachicola Embayment Groundwater Region and the Northwest Florida Water Management District. Three aquifers underlie Tyndall AFB: the surficial aquifer, intermediate aquifer, and Floridan aquifer.

The surficial aquifer system near the base is made of highly transmissive, well-sorted, fine- to medium-grained sands, which extend as deep as 110 feet. Groundwater occurs under confined table conditions at depths of 1 to 10 feet below land surface. The water table is relatively flat at Tyndall AFB, but it fluctuates up to 5 feet in response to seasonal rainfall and tidal cycles. Regionally, surficial aquifer groundwater flows south toward the Gulf of Mexico; however, locally shallow groundwater flows toward nearby bayous, streams, and ditches (ATSDR, 2005). Tyndall AFB has two wells used for irrigation that are screened in the surficial aquifer.

The intermediate aquifer system is approximately 200 feet thick and is highly effective as a confining unit. Limiting the amount of recharge to the Floridan aquifer system, the intermediate aquifer is relatively stagnant, which results in the presence of highly mineralized water in the basal portion of the aquifer (ATSDR, 2005).

The Floridan aquifer consists primarily of limestone and dolomite; this aquifer supplies most of the water used for domestic, urban, and agricultural purposes in the state. At Tyndall AFB, the Floridan aquifer typically occurs at approximately 250 to 350 feet below land surface and is approximately 800 to 1,600 feet thick (USGS, 1990). Tyndall has three permitted drinking water wells that are screened in the Floridan aquifer; these wells supply potable water to several areas on the base. However, most of the potable water used by the base is supplied by the Bay County Utility Services Department, which uses Deer Point Lake as its water supply source (Tyndall AFB, 2019c).

3.1.7.3 Floodplains

Many of the shoreline areas of Tyndall AFB (both bay and coastal areas) are within the 100-year floodplain. The base is vulnerable to flooding from tropical storms and hurricanes due to associated torrential rainfall and tidal surges. Figure 3.1-4 shows the locations of floodplains on Tyndall AFB. Compliance with EO 11988, *Floodplain Management*, is required. The key elements which are presented in AFCEC's *Severe Weather/Climate Hazard Screening and Risk Assessment Playbook* (AFCEC, 2020) were incorporated into design guidance and directives for reconstruction of Tyndall AFB infrastructure and facilities (Tyndall AFB, 2020c). Design elements now incorporate the Tyndall AFB Design Flood Elevation (DFE) design guidance for infrastructure and facilities to make the base resilient to future severe weather events. The now established DFE for the Gulf side of Tyndall AFB is 19 feet above today's MSL; and the East Bay side has a DFE of 14 feet above MSL. The DFE levels were derived from the highest regionalized sea level rise scenario for the year 2100 (representing a global scenario of 2.0 meters by 2100) and the Federal Emergency Management Agency (FEMA). Section 2.2.4.1 explains that facility design reflects both overall climate change and recent hurricane experience. The flood elevation guidance for current and planned construction will result in the best use of taxpayer dollars while constructing a resilient 21st Century Installation (USAF, 2019b).

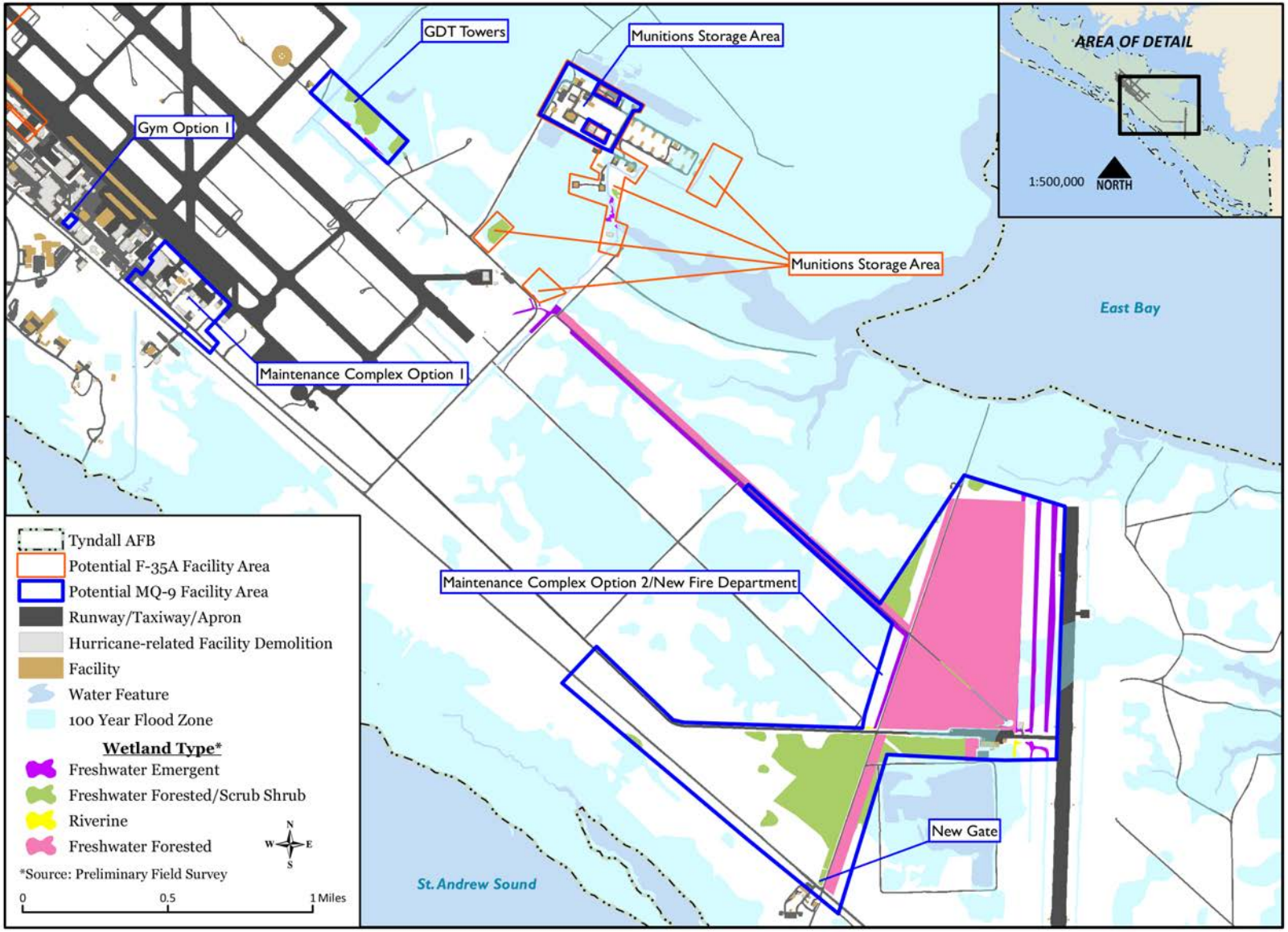

Figure 3.1-4. Location of Wetlands and 100-Year Floodplain at Tyndall AFB

3.1.7.4 Coastal Zone Management

Florida has a federally approved Coastal Zone Management Program. The FDEP is the lead agency for coastal management and is responsible for enforcing the plan. Florida's Coastal Management Program was established in 1978 to protect and manage Florida's coastal zone and the resources that lie within. Florida's coastal zone includes the area encompassed by all 67 counties in the state and its territorial seas to 3 NM from Florida's east coast but excludes all federal facilities including Tyndall AFB. Federal actions undertaken at Tyndall AFB that have reasonably foreseeable effects on Florida's coastal zone must be consistent with Florida's 24 enforceable policies, which are included in the Florida Statutes. The enforceable policies most relevant to the proposed MQ-9 Wing beddown are Chapter 373, Water Resources; Chapter 376, Pollutant Discharge Prevention and Removal; Chapter 379, Fish and Wildlife Conservation; Chapter 403, Environmental Control; and Chapter 582, Soil and Water Conservation.

3.1.8 Biological Resources, Tyndall AFB

The ROI for biological resources is defined as the land area (habitats) that would potentially be affected by infrastructure and construction projects on the base, and the land area potentially affected by aircraft operations in the airfield and airspace (Figure 2.3-1 and Figure 2.3-3).

3.1.8.1 Base

Flora

Tyndall AFB is located in the Florida Coastal Lowlands-Gulf Section of the Coastal Plain Mixed Forest Province (McNab, 1996). Vegetation in this region historically consisted of oak-hickory-pine forest, southern floodplain forest, and live oak-sea oats communities. Many of the upland and flatwoods have been converted to commercial slash pine plantations or longleaf pine restoration sites. The majority of present-day Tyndall AFB consists of forested and wetland cover types (Table 3.1-17).

Table 3.1-17. General Tyndall AFB Cover Types

General Cover Type[1]	Acreage
Military Lands	4,491
Forested Lands	13,793
Wetlands	11,704
Coastal Barrier Islands	3,128

Source: (Tyndall AFB, 2019c)
Note:
[1] Does not include all cover types on Tyndall AFB.

Military lands consist of mostly improved and semi-improved grounds that are urbanized, with mowed grassland or landscaped vegetation within the developed portions of the base.

Undeveloped sections are dominated by forested lands and wetlands, which comprise approximately 77 percent of the installation and consist of a number of different community types. Coastal barrier islands comprise the remaining approximately 9 percent of the installation. Common community types include, but are not limited to, mesic/wet slash flatwoods/estuarine

tidal marsh, coastal uplands, slash scrub, and slash/sand pine plantation. Detailed information on these community types is contained in the Tyndall AFB INRMP (Tyndall AFB, 2019c).

Fauna

Information on wildlife occurring on Tyndall AFB is provided in the INRMP (Tyndall AFB, 2019c). Common wildlife documented on the base includes a wide variety of birds, mammals, reptiles, and invertebrate species adapted to the various vegetative communities on the installation. Common game species include white-tailed deer (*Odocoileus virginianus*), wild turkey (*Meleagris gallopavo*), and eastern gray squirrel *(Sciurus carolinensis*). Representative bird species include belted kingfisher (*Megaceryle alcyon*), red-winged blackbird (*Agelaius phoenicius*), and red-shouldered hawk (*Buteo lineatus*). Representative mammals include cottontail rabbit (S*ylvilagus floridanus*), cotton rat (*Sigmodon hispidus*), Virginia opossum (*Didelphis virginiana*), and gray fox (*Urocyon cinereoargenteu*). Reptiles recorded at the installation include black racer (*Coluber constrictor*), cottonmouth (*Agkistrodon piscivorus conanti*), and five-lined skink (*Eumeces fasciatus*).

Wetlands

According to the INRMP, wetlands comprise approximately 40 percent of Tyndall AFB (Tyndall AFB, 2019c) and consist of both freshwater (palustrine) and marine (estuarine) systems. Prior to Hurricane Michael, freshwater forested wetlands were the predominant wetland type. In some areas of the installation, the removal of the overstory canopy has resulted in a conversion of these forested wetlands to scrub shrub wetlands. Wetlands are illustrated in Figure 3.1-4.

Sensitive Species

Seven federally listed endangered and seven federally listed threatened species have been observed at Tyndall AFB (Table 3.1-18), and another six federally listed species have the potential to occur on the installation. In addition to federally listed species, a number of state listed species are known to occur on the installation, as well as species protected under the Florida Black Bear Conservation Rule and the Bald and Golden Eagle Protection Act (BGEPA) (Table 3.1-18). Migratory birds at Tyndall AFB are federally protected under the Migratory Bird Treaty Act.

Table 3.1-18. Federally and State Listed Species with Potential to Occur at Tyndall AFB, Florida

Common Name	Scientific Name	Status[2]	Habitat	Potential Occurrence on Tyndall AFB
Mammals				
Choctawhatchee beach mouse[1]	*Peromyscus polionotus allophrys*	FE	Barrier island	O
Florida black bear	*Ursus americanus floridanus*	FBBRC	Swamps, forest	O
St. Andrew beach mouse[1]	*Peromyscus polionotus peninsularis*	FE	Barrier island	O
West Indian manatee	*Trichechus manatus*	FE	Marine	O
Birds				
American oystercatcher	*Haematopus palliates*	ST	Shoreline	O

Table 3.1-18. Federally and State Listed Species with Potential to Occur at Tyndall AFB, Florida

Common Name	Scientific Name	Status[2]	Habitat	Potential Occurrence on Tyndall AFB
Bald eagle	*Haliaeetus leucocephalus*	BGEPA	Coastline, lakes	O
Black skimmer	*Rhychops niger*	ST	Shoreline	O
Brown pelican	*Pelecanus occidentalis*	SSC	Barrier island, bays	O
Least tern	*Sternula antillarum*	ST	Barrier island, shoreline	O
Little blue heron	*Egretta caerulea*	ST	Marshes, ponds, lakes	O
Piping plover[1]	*Charadrius melodus*	FT	Barrier island	O
Red knot	*Calidris canutus rufa*	FT	Barrier island, shoreline	O
Reddish egret	*Egretta rufescens*	ST	Brackish marsh, shallow coastline	O
Snowy egret	*Egretta thula*	SSC	Marshes, lakes, ponds, coastline	O
Snowy plover	*Charadrius alexandrinus tenuirostris*	ST	Barrier islands	O
Southeastern American kestrel	*Falco sparverius paulus*	ST	Open, partly open habitat	O
Tricolored heron	*Egretta tricolor*	ST	Marshes, ponds	O
White ibis	*Eudocimus albus*	SSC	Marshes, lakes	O
Wood stork	*Mycteria americana*	FT	Marshes, lakes	P
Reptiles				
American alligator	*Alligator mississippiensis*	FT (S/A)	Lakes, marshes	O
Eastern indigo snake	*Drymarcon corais couperi*	FT	Forest, prairies, marshes	P
Florida pine snake	*Pituophis melanoleucus mugitus*	ST	Upland forests	U
Gopher tortoise	*Gopherus polyphemus*	FC	Longleaf pine, sand pine scrub	O
Green sea turtle	*Chelonia mydas*	FT	Marine, barrier island	O
Kemp's Ridley sea turtle	*Lepidochelys kempii*	FE	Marine	O
Leatherback sea turtle	*Dermochelys coriacea*	FE	Marine, barrier island	O
Loggerhead sea turtle[1]	*Caretta caretta*	FT	Marine, barrier island	O
Amphibians				
Gopher frog	*Rana capito*	SSC	Longleaf pine, sand pine scrub	U
Reticulated flatwoods salamander	*Ambystoma bishopi*	FE	Slash/longleaf pine, wetland	P
Fish				
Atlantic Sturgeon[1]	*Acipenser oxyrinchus (oxyrhynchus desotoi)*	FT	Marine, large rivers	O
Crustaceans				
Panama City Crayfish	*Procambarus econfinae*	PT	Wetland forest	P
Flowering Plants				
Apalachicola aster	*Eurybia spinulosa*	SE	Wet prairie	O

Table 3.1-18. Federally and State Listed Species with Potential to Occur at Tyndall AFB, Florida

Common Name	Scientific Name	Status[2]	Habitat	Potential Occurrence on Tyndall AFB
Apalachicola dragonhead	*Physostegia godfreyi*	ST	Wet prairie	O
Chapman's crownbeard	*Verbesina chapmanii*	ST	Wet prairie	O
Chapman's butterwort	*Pinguicula planifolia*	ST	Wet prairie	O
Florida skullcap	*Scutellaria floridana*	FT	Flatwoods/wetlands	P
Dew thread sundew	*Drosera filiformis*	SE	Wet prairie	O
Giant water dropwort	*Oxypolis greenmanii*	SE	Wet prairie, ditches	O
Godfrey's Butterwort	*Pinguicula ionantha*	FT	Flatwoods/wetlands	O
Godfrey's golden aster	*Chrysopsis godfreyi*	SE	Dunes	O
Gulf coast lupine	*Lupinus westianus*	ST	Scrub, dunes	O
Harper's beauty	*Harperocallis flava*	FE	Wet prairie	P
Harper's yellow-eyed grass	*Xyris scabrifolia*	ST	Wet prairie	O
Karst pond yellow-eyed grass	*Xyris longisepala*	SE	Upland lake margin	O
Large-leaved jointweed	*Polygonella macrophylla*	ST	Scrub	O
Purple pitcher plant	*Sarracenia rosea*	ST	Wet prairie	O
Parrot pitcher plant	*Sarracenia psittacina*	ST	Wet prairie, bogs	O
Quillwort yellow-eyed grass	*Xyris isoetifolia*	SE	Wet prairie	O
Small spreading pogonia	*Cleistes bifaria*	SE	Flatwoods/wetlands	O
Snakemouth orchid	*Pogonia ophioglossoides*	ST	Wet prairie, bogs	O
Southern milkweed	*Asclepias viridula*	ST	Wet prairie, ditches	O
Southern red lily	*Lilium catesbaei*	ST	Wet prairie	O
Spoon-leafed sundew	*Drosera intermedia*	ST	Wet prairie	O
Telephus spurge	*Euphorbia telephioides*	FT	Pine flatwoods	O
Thick-leaved water willow	*Justicia crassifolia*	FE	Wet prairie	O
White Birds-in-a-nest	*Macbridea alba*	FT	Wet prairie	P
White-flowered wild petunia	*Ruellia noctiflora*	SE	Wet prairie	O
Wiregrass gentian	*Gentiana pennelliana*	SE	Pine flatwoods	O
Yellow-flowered butterwort	*Pinguicula lutea*	ST	Pine flatwoods	O

Sources: (Tyndall AFB, 2019c; USFWS, 2020a; Florida Natural Areas Inventory, 2020)
Key: AFB = Air Force Base; BGEPA = Bald and Golden Eagle Protection Act; FE = Federally Endangered; FT = Federally Threatened; FC = Federal Candidate; PT = Proposed Threatened; S/A – Similar Appearance; SSC = Species of Special Concern; FBBRC = Florida Black Bear Conservation Rule; O = Observed; P = Potential; U = Unlikely; SE = State Endangered (Florida); ST = State Threatened (Florida); USFWS = U.S. Fish and Wildlife Service
[1] Critical habitat within the ROI
[2] Federally listed species are also protected under state designations.

3.1.8.2 Airspace and Ranges

Flora

The airspace proposed for use as part of this action is located above the Florida Coastal Lowlands-Gulf, the Coastal Plains Middle, and the Coastal Plains and Flatwoods Sections of the Coastal Plain Mixed Forest Province (McNab, 1996). Vegetation in this region historically consisted of oak-hickory-pine forest, southern mixed forests, southern floodplain forest, and coastal forest. Much of the natural vegetation in this region has been cleared for pine plantations, citrus production, or other agricultural uses (McNab, 1996).

Fauna

Fauna in the region include white-tailed deer, bobcat (*Lynx rufus*), gray fox, raccoon (*Procyon lotor*), cottontail rabbit, eastern gray squirrel, striped skunk (*Mephitis mephitis*), swamp rabbit (*Sylvilagus aquaticus*), and many small rodents and shrews. Resident and migratory nongame bird species are numerous, as are species of migratory waterfowl. In flooded areas, ibises, cormorants, herons, egrets, and kingfishers are common. Songbirds include the red-eyed vireo (*Vireo olivaceus*), northern cardinal (*Cardinalis cardinalis*), tufted titmouse (*Baeolophus bicolor*), ruby-throated hummingbird (*Archilochus colubris*), eastern towhee (*Pipilo erythrophthalmus*), blue-gray gnatcatcher (*Polioptila caerulea*), and Carolina wren (*Thryothorus ludovicianus*). Reptiles and amphibians include the box turtle (*Terrapene carolina*), common garter snake (*Thamnophis sirtalis*), eastern diamondback rattlesnake (*Crotalus adamanteus*), timber rattlesnake (*Crotalus horridus*), and American alligator (*Alligator mississippiensis*) (McNab, 1996).

Sensitive Species

Twenty (20) federally listed endangered and 21 federally listed threatened species have the potential to occur in habitat under the airspace proposed for use (Table 3.1-19). In addition, one federally listed candidate species and one proposed threatened species have the potential to occur in habitat under the airspace proposed for use. In addition to federally listed species, a number of state listed species are known to occur in the ROI, as well as species protected under the Florida Black Bear Conservation Rule and the BGEPA (Table 3.1-19). Migratory birds within the ROI are also federally protected under the Migratory Bird Treaty Act.

Table 3.1-19. Federally and State Listed Species with Potential to Occur under the Airspace Proposed for Use

Common Name[2]	Scientific Name	Status
Mammals		
Choctawhatchee beach mouse[1]	*Peromyscus polionotus allophrys*	FE
Florida bonneted bat	*Eumops floridanus*	FE
Florida panther	*Puma concolor coryi*	FE
Gray bat	*Myotis grisescens*	FE
Puma	*Puma concolor*	FT (S/A)
Florida black bear	*Ursus americanus floridanus*	FBBRC
St. Andrew Beach Mouse[1]	*Peromyscus polionotus peninsularis*	FE
Southeastern beach mouse	*Peromyscus polionotus niveiventris*	ST
Southeastern pocket gopher	*Geomys pinetis*	GT
Sherman's fox squirrel	*Sciurus niger shermani*	SSC
West Indian manatee[1]	*Trichechus manatus*	FE
Birds		
American oystercatcher	*Haematopus palliates*	ST
Audubon's crested caracara	*Polyborus plancus audubonii*	FT
Bachman's sparrow	*Peucaea aestivalis*	GR
Bald eagle	*Haliaeetus leucocephalus*	BGEPA
Black skimmer	*Rhychops niger*	ST
Brown pelican	*Pelecanus occidentalis*	SSC
Eastern black rail	*Laterallus jamaicensis* ssp. *Jamaicensis*	PT
Everglade snail kite	*Rostrhamus sociabilis plumbeus*	FE
Florida grasshopper sparrow	*Ammodramus savannarum floridanus*	FE
Florida scrub-jay	*Aphelocoma coerulescens*	FT
Florida burrowing owl	*Athene cunicularia floridana*	ST

Table 3.1-19. Federally and State Listed Species with Potential to Occur under the Airspace Proposed for Use

Common Name[2]	Scientific Name	Status
Florida sandhill crane	*Antigone canadensis pratensis*	ST
Henslow's sparrow	*Ammodramus henslowii*	GR
Ivory-billed woodpecker	*Campephilus principalis*	FE
Least tern	*Sternula antillarum*	ST, GR
Little blue heron	*Egretta caerulea*	ST
Limpkin	*Aramus guarauna*	SSC
Piping plover[1]	*Charadrius melodus*	FT
Red-cockaded woodpecker	*Picoides borealis*	FE
Red knot	*Calidris canutus rufa*	FT
Reddish egret	*Egretta rufescens*	ST
Roseate spoonbill	*Ajaia ajaja*	ST
Snail kite	*Rostrhamus sociabilis plumbeus*	ST
Snowy egret	*Egretta thula*	ST
Snowy plover	*Charadrius alexandrinus tenuirostris*	ST
Southeastern American kestrel	*Falco sparverius paulus*	ST
Swallowed tail kite	*Elanoides forficatus*	GR
Tricolored heron	*Egretta tricolor*	ST
White ibis	*Eudocimus albus*	SSC
Whooping crane	*Grus americana*	EXPN
Wood stork	*Mycteria americana*	FT
Reptiles		
Alligator snapping turtle (Suwanee)	*Macrochelys temminckii*	GT
American alligator	*Alligator mississippiensis*	FT (S/A)
Atlantic salt marsh snake	*Nerodia clarkii taeniata*	ST
Barbour's map turtle	*Graptemys barbouri*	GT
Bluetail mole skink	*Eumeces egregious lividus*	FT
Eastern Indigo Snake	*Drymarcon corais couperi*	FT
Florida pine snake	*Pituophis melanoleucus mugitus*	ST
Gopher Tortoise	*Gopherus polyphemus*	FC
Green Sea Turtle	*Chelonia mydas*	FT
Hawksbill sea turtle	*Eretmochelys imbricata*	FE
Kemp's Ridley sea turtle	*Lepidochelys kempii*	FE
Leatherback sea turtle	*Dermochelys coriacea*	FE
Loggerhead sea turtle[1]	*Caretta caretta*	FT
Mimic glass lizard	*Ophisaurus mimicus*	GR
Sand skink	*Neoseps reynoldsi*	FT
Short-tailed snake	*Stilosoma extenuatum*	ST
Southern hognose snake	*Heterodon simus*	GT
Suwannee cooter	*Pseudemys concinna suwanniensis*	SSC
Amphibians		
Frosted flatwoods salamander[1]	*Ambystoma cingulatum*	FT
Georgia blind salamander	*Eurycea wallacei*	GT
Gopher frog	*Rana capito*	SSC, GR
Striped newt	*Notophthalmus perstriatus*	GT
Reticulated flatwoods salamander[1]	*Ambystoma bishopi*	FE
One-toed amphiuma	*Amphiuma pholeter*	GR
Fish		
Alabama shad	*Alosa alabamae*	GT

Table 3.1-19. Federally and State Listed Species with Potential to Occur under the Airspace Proposed for Use

Common Name[2]	Scientific Name	Status
Atlantic sturgeon[1]	*Acipenser oxyrinchus (oxyrhynchus desotoi)*	FT
Blackbanded sunfish	*Enneacanthus chaetodon*	GE
Bluenose shiner	*Pteronotropis welaka*	ST, GT
Bluefin killifish	*Lucania goodie*	GR
Bluestripe shiner	*Cyprinella callitaenia*	GR
Broadstriped shiner	*Pteronotropis euryzonus*	GR
Goldstripe darter	*Etheostoma parvipinne*	GR
Halloween darter	*Percina crypta*	GR
Highscale shiner	*Notropis hypsilepis*	GR
Robust redhorse	*Moxostoma robustum*	GE
Tessellated darter	*Etheostoma olmstedi*	SSC
Spotted bullhead	*Ameiurus serracanthus*	GR
Suwannee bass	*Micropterus notius*	GR
Crustaceans		
Dougherty burrowing crayfish	*Cambarus doughertyensis*	GE
Muckalee crayfish	*Procambarus gibbus*	GT
Oconee burrowing crayfish	*Cambarus truncatus*	GT
Panama City Crayfish	*Procambarus econfinae*	PT
Sly crayfish	*Procambarus versutus*	GR
Clams		
Altamaha arcmussel	*Alasmidonta arcula*	GT
Apalachicola floater	*Utterbackiana heardi*	GR
Chipola slabshell[1]	*Elliptio chipolaensis*	FT
Choctaw bean[1]	*Villosa choctawensis*	FE
Delicate spike	*Elliptio arctata*	GE
Fat threeridge[1]	*Amblema neislerii*	FE
Fuzzy pigtoe[1]	*Pleurobema strodeanum*	FT
Gulf moccasinshell[1]	*Medionidus penicillatus*	FE
Inflated spike	*Elliptio purpurella*	GT
Ochlockonee moccasinshell	*Medionidus simpsonianus*	FE
Oval pigtoe[1]	*Pleurobema pyriforme*	FE
Purple bankclimber[1]	*Elliptoideus sloatianus*	FT
Rayed creekshell	*Strophitus radiatus*	GT
Shinyrayed pocketbook[1]	*Lampsilis subangulata*	FE
Southern kidneyshell[1]	*Hamiota australis*	FT
Southern sandshell[1]	*Hamiota australis*	FT
Suwannee moccasinshell	*Medionidus walker*	FT
Tapered pigtoe[1]	*Fusconaia burkei*	FT

Source: (USFWS, 2020b)

Key: BGEPA = Bald and Golden Eagle Protection Act; FE = Federally Endangered; FT = Federally Threatened; FC = Federal Candidate; PT = Proposed federally Threatened; SSC = Species of Special Concern; FBBRC = Florida Black Bear Conservation Rule; SE = State Endangered (Florida); ST = State Threatened (Florida); GT = Georgia Threatened; GR = Georgia Rare; EXPN = Experimental Population; USFWS = U.S. Fish and Wildlife Service

Notes:

[1] Critical habitat for this species occurs under the airspace proposed for use

[2] As impacts associated with the airspace will primarily relate to noise, no vegetative species are included in this table.

The ROI also includes existing airspace above the Gulf of Mexico. This airspace is located above areas used by species protected under the Marine Mammal Protection Act (MMPA). Twenty-eight (28) different species of marine mammals are known to occur in the Gulf of Mexico (NOAA, 2012; NOAA, 2018a; NOAA, 2018b).

3.1.9 Cultural Resources, Tyndall AFB

3.1.9.1 Base

The Area of Potential Effects (APE) for cultural resources is based on the type of potential impacts that might occur within the area. The APE for direct impacts is the area directly affected by construction activities that could physically alter, damage, or destroy all or part of a cultural resource. For the F-35A Wing beddown, this includes the areas of proposed disturbance shown on Figure 2.2-1 to account for the proposed F-35A Parking Apron, the Operations and Maintenance Facilities Complex, and the MSA. For the MQ-9 Wing beddown, this includes the areas of proposed disturbance shown on Figure 2.3-1 to account for the proposed Consolidated Operations Complex, the Child Development Center, the Airmen Dormitory, the Gym Option, the Gym Option 2, the Maintenance Complex Option 1, the Maintenance Complex Option 2/New Fire Department, the New Gate, the MSA, and the GDT Towers.

The APE for indirect visual effects is the same APE for direct impacts, plus the addition of a 1/2-mile buffer to account for the potential introduction of a visual or atmospheric element that could alter the setting of a NRHP-listed or -eligible architectural resource by introducing a visual component that is out of character for the period the resource represents. Finally, the APE for indirect noise effects consists of the 65 dB DNL noise contour for proposed airfield operations, as shown on Figure 3.1-5, to account for potential noise and/or vibration issues that could affect the setting or otherwise damage an NRHP-listed or -eligible architectural resource.

3.1.9.1.1 Archaeological Resources

Since the beginning of cultural resources investigations in the vicinity of Tyndall AFB in 1902, 109 archaeological sites have been identified on land owned or controlled by Tyndall AFB. Of these 109 sites, 21 have been determined to be NRHP-eligible and 5 are considered potentially eligible (USAF, 2019d). Archaeological site types range from prehistoric artifact scatters, middens, campsites, and shell middens to historic-period artifact scatters, camps, building remains, and historic wells (USAF, 2019d).

The APE for direct impacts for both the F-35A Wing beddown and the MQ-9 Wing beddown (including both optional sites) was surveyed in 2019; no archaeological sites were identified (USAF, 2020c). In particular, the proposed F-35A Parking Apron and Operations and Maintenance Facilities Complex areas are highly disturbed from an archaeological perspective and largely built on imported fill material. Likewise, portions of the proposed F-35A MSA are built on imported fill material, with other portions for the planned expansion heavily vegetated and inundated with standing water. Similarly, the proposed MQ-9 Consolidated Operations Complex, the Child Development Center, the Airmen Dormitory, the Gym Option, the Gym Option 2, the Maintenance Complex Option 1, and the MSA areas are highly disturbed from an archaeological perspective and largely built on imported fill material.

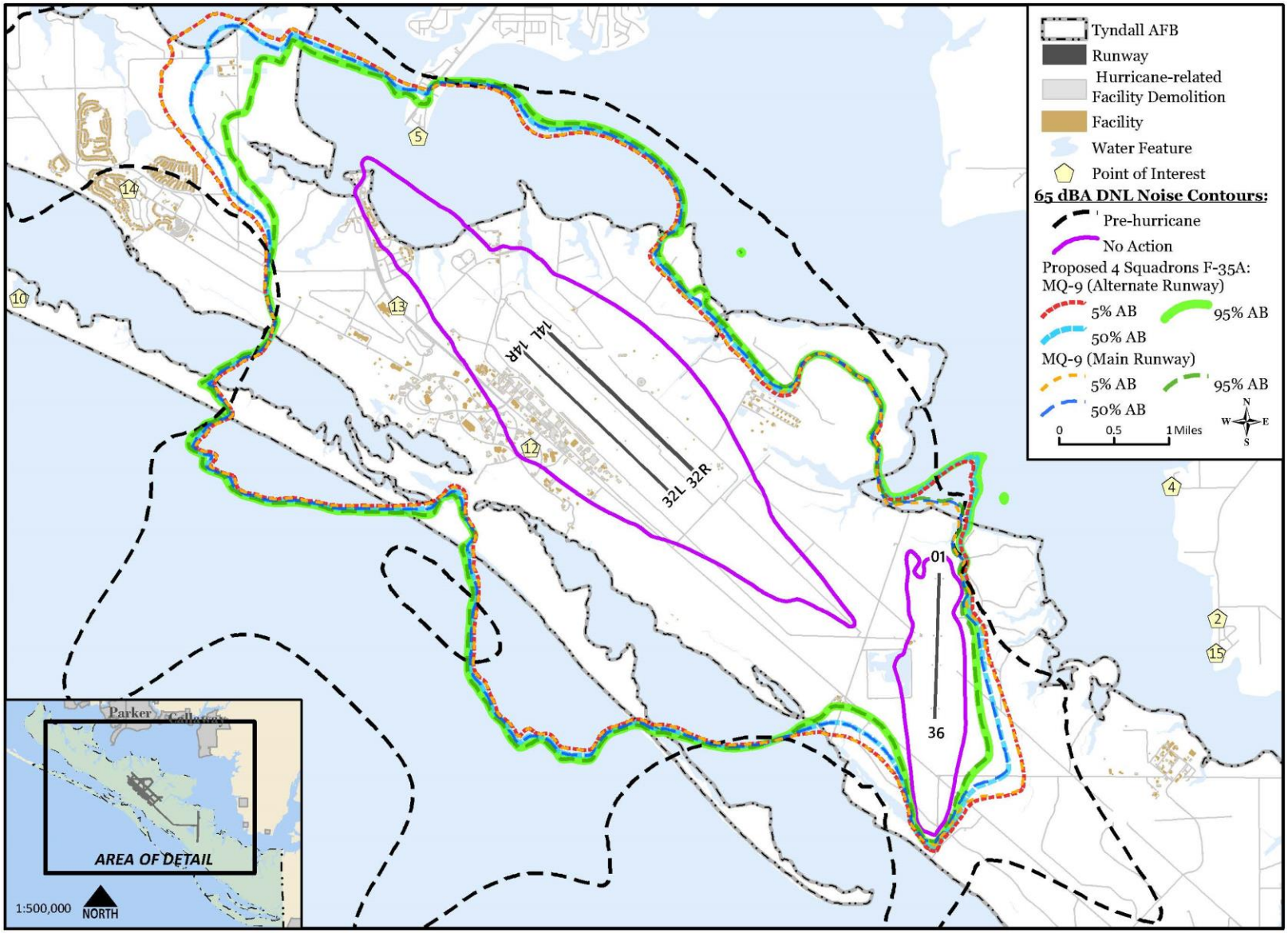

Figure 3.1-5. Area of Potential Effects for Indirect Noise Effects for Tyndall AFB Proposed Actions (65 dB DNL Noise Contours for Proposed Operations)

The proposed MQ-9 Maintenance Complex Option 2/New Fire Department, the New Gate, and the GDT Towers are located in areas of dense vegetation with a very shallow water table and large amounts of standing water. These highly disturbed areas have a lower likelihood for the presence of unrecorded archaeological resources.

3.1.9.1.2 Architectural Resources

Prior to Hurricane Michael in 2018, there were four historic buildings present on Tyndall AFB that were evaluated as eligible for listing on the NRHP—Building 156 (Hangar 3), a World War II (WWII) hangar, Building 280 (Hangar 4) built in 1955, Building 1476, a WWII structure, and Building 703, the base chapel (USAF, 2019d). Building 156 (Hangar 3) was partly within the APE for direct impacts for the proposed F-35A Operations and Maintenance Facilities Complex. All four buildings were heavily damaged by the hurricane and are listed in the "Demolition of Hurricane-damaged Facility" category. Buildings 156, 280, and 1476 have since been removed, and the only extant NRHP-eligible building is the base chapel (Building 703). Section 106 consultation with the SHPO is in progress to resolve the adverse effects of the demolition of Building 703 (USAF, 2020a). No other NRHP-eligible or -listed buildings or structures are located within the direct or indirect APEs for either the F-35A or the MQ-9 Wing beddowns (USAF, 2019d; NRIS, 2019).

3.1.9.1.3 Traditional Cultural Properties

Tyndall AFB consults with six federally recognized Indian tribes on actions with the potential to affect protected tribal resources, tribal treaty rights, or Indian lands significantly. Consultation letters have been sent to the following tribes to determine if they have any traditional cultural properties on the installation: the Miccosukee Tribe of Indians of Florida, the Muscogee (Creek) Nation, the Poarch Band of Creek Indians, the Seminole Nation of Oklahoma, the Seminole Tribe of Florida, and the Thlopthlocco Tribal Town. To date, no identification of traditional cultural properties or sacred sites has occurred on base. The Cultural Resources Management (CRM) program at Tyndall AFB recognizes that in the event such traditional cultural properties or sacred sites are identified during the consultation process, the CRM program would collaborate with the tribes in the management and protection of such sites.

3.1.9.2 Airspace and Ranges

Eight NRHP-listed properties are located underneath the MOAs proposed for F-35A training operations (Table 2.2-6, Table 3.1-20).

Table 3.1-20. NRHP-Listed Resources Under the Airspace

Airspace	NRIS Reference	Property Type	Property Name
Carrabelle Work Area	80000951	Resource District	Apalachicola Historic District
	78000941	Structure	Crooked River Lighthouse
	91002063	Structure	The Governor Stone (schooner)
	72000316	Building	Raney, David G., House
	72000317	Building	Trinity Episcopal Church
	72000318	Resource Site	Fort Gadsden Historic Memorial
Compass Lake Work Area	83003554	Building	Moss Hill Church
	80000943	Building	Old Calhoun County Courthouse

Source: (NRIS, 2019)
Key: NRHP = National Register of Historic Places; NRIS = National Register Information System

These properties consist of the following: the Apalachicola Historic District, with more than 900 historic homes and buildings dating from the 1830s; the Crooked River Lighthouse on Dog Island (constructed in 1895); the Governor Stone, a two-masted cargo schooner built in 1877; the David G. Raney House, a historic home built in 1840; the Apalachicola Trinity Episcopal Church (built in 1839); the Fort Gadsden Historic Memorial, the site of a fort built by the British during the War of 1812 (and destroyed in 1816) and another built by the United States in 1818; the Moss Hill Church (built in 1857); and the Old Calhoun County Courthouse (built in 1804) (NRIS, 2019).

3.1.10 Land Use and Recreation, Tyndall AFB

3.1.10.1 Base

Tyndall AFB is located in the Florida panhandle in the southeast part of Bay County. In October 2018, Hurricane Michael caused damage to every building on the base, and many buildings were destroyed. Many of the missions supported by Tyndall AFB were temporarily or permanently relocated.

Following Hurricane Michael, the USAF established multiple task forces to assist the 325 FW in restoring the installation. The planning task force was to focus on installation facilities and infrastructure. The plan to repair, reshape, and rebuild Tyndall AFB included supporting the DoD-wide installation planning philosophy to develop a sustainable platform to support the effective execution of assigned missions as efficiently as possible.

Tyndall AFB occupies about 29,100 acres on a long peninsula along the Gulf of Mexico, extending about 18 miles from east to west and about 3 miles from north to south. St. Andrews Bay and East Bay, to the north, separates the base from the mainland. US-98 connects the base to the mainland communities to the north at the DuPont Bridge. The closest community is the City of Parker and the largest city is Panama City. To the east, the closest communities are Mexico Beach, St. Joe Beach, and Port St. Joe along the Gulf of Mexico shoreline. All the communities were severely damaged by the hurricane.

Tyndall AFB Land Use

Approximately 80 percent of Tyndall AFB is undeveloped. US-98 bisects the base from east to west, dividing the base into the flightline side and the support side. The flightline side has two parallel runways and a smaller north/south runway, which is restricted to drone operations and flight infrastructure such as the fuels depot, aircraft hangars and parking, maintenance shops, and munitions storage and loading areas. The support side included the base commissary, Base Exchange, Wing HQ, administrative functions, mission support, Tyndall Elementary School, and privatized military family housing (USAF, 2011a). The hurricane destroyed or damaged many of these facilities.

Following the hurricane, the USAF prepared a recovery plan (AFCEC, 2019a) to develop and plan for future options. The plan is forward-looking and addresses the needs of a future base configuration that could include the F-35A and/or MQ-9 missions as well as several of the former units and tenants.

In 2016, Tyndall AFB published its updated AICUZ study to support a community-sponsored Joint Land Use Study. The study promotes compatible development within the AICUZ area of influence

in order to protect the installation from land use development that is incompatible with installation operations. The noise modeling for the 2016 study used the operational data for the current F-22 and T-38 missions at Tyndall. The study was prepared to promote long-term compatible land use on and near the base in Bay County, Florida (USAF, 2016a). In April 2019, Bay County approved the initial steps to start work on a Joint Land Use Study/Compatible Use Plan with Tyndall AFB and local cities. This effort will continue ongoing efforts by Tyndall AFB and surrounding jurisdictions to coordinate land use planning to ensure mutually compatible development that is supportive of the mission of the base. The completed Joint Land Use Study/Compatible Use Plan is anticipated in the summer of 2020.

Figure 3.1-6 shows the current and recent past noise exposure at the base. The pre-hurricane 2016 AICUZ condition had about 31,640 acres within the 65 dB DNL noise exposure footprint, and about 55 percent of this area was over the installation (USAF, 2016a). The 2016 AICUZ categorized about 25 acres of the off-base land within this footprint as residential. Applying AICUZ compatibility guidelines, residential use is not recommended in areas with noise exposures of 65 dB DNL or higher.

Figure 3.1-6 shows that this residential land is along the shores of the peninsula where US-98 merges onto the bridge crossing over East Bay to the base. The 65 dB DNL contours for the pre-hurricane AICUZ condition also include an industrial area on the southern shore of Panama City and a portion of St. Andrews State Park on the barrier island south of the base. The remainder of the area exposed to noise levels greater than 65 dB DNL is either open water or owned by DoD. The No Action Alternative, which represents conditions during base reconstruction when there are limited aircraft operations, has 4,404 acres within the 65 dB DNL footprint, centered closely around the main runway on base, with 247 acres extending off-base over water.

The 2016 AICUZ also addresses runway safety conditions at the airfield. Figure 3.1-6 shows that the Accident Potential Zones (APZs) and Clear Zones (CZs) do not extend onto the mainland area. APZ II and I extend into East Bay, and APZ II extends over a portion of DuPont Bridge. Transportation land use and water-based activities are acceptable within these hazard zones. The noise footprint, defined by the 65 dB DNL contour in the 2016 study, is somewhat smaller than the previous study in 2008, reflecting the contractions and expansions that respond to mission changes over time. In Table 3.1-5, the noise exposure in the affected environment is the No Action Alternative noise condition.

Surrounding Area Land Use and Planning

The planning area for the 2016 AICUZ study included the communities of Panama City, Parker, Callaway, Mexico Beach, and unincorporated areas of Bay County. That study is the source for much of the description of the land use, plans, and zoning that follows. Note that the land use patterns, planned future use, and zoning for this area remain the same following the hurricane; however, some areas experienced severe damage. Rebuilding is ongoing, specifically at Allenton, Bayou Point, Water's Edge, and Piney Point, but not all areas have regained their pre-hurricane conditions. The incorporated areas near the installation (Parker, Panama City, Callaway, and Smithfield) are responsible for land use planning and land use controls in their jurisdictions. Bay County has adopted plans and zoning for unincorporated areas.

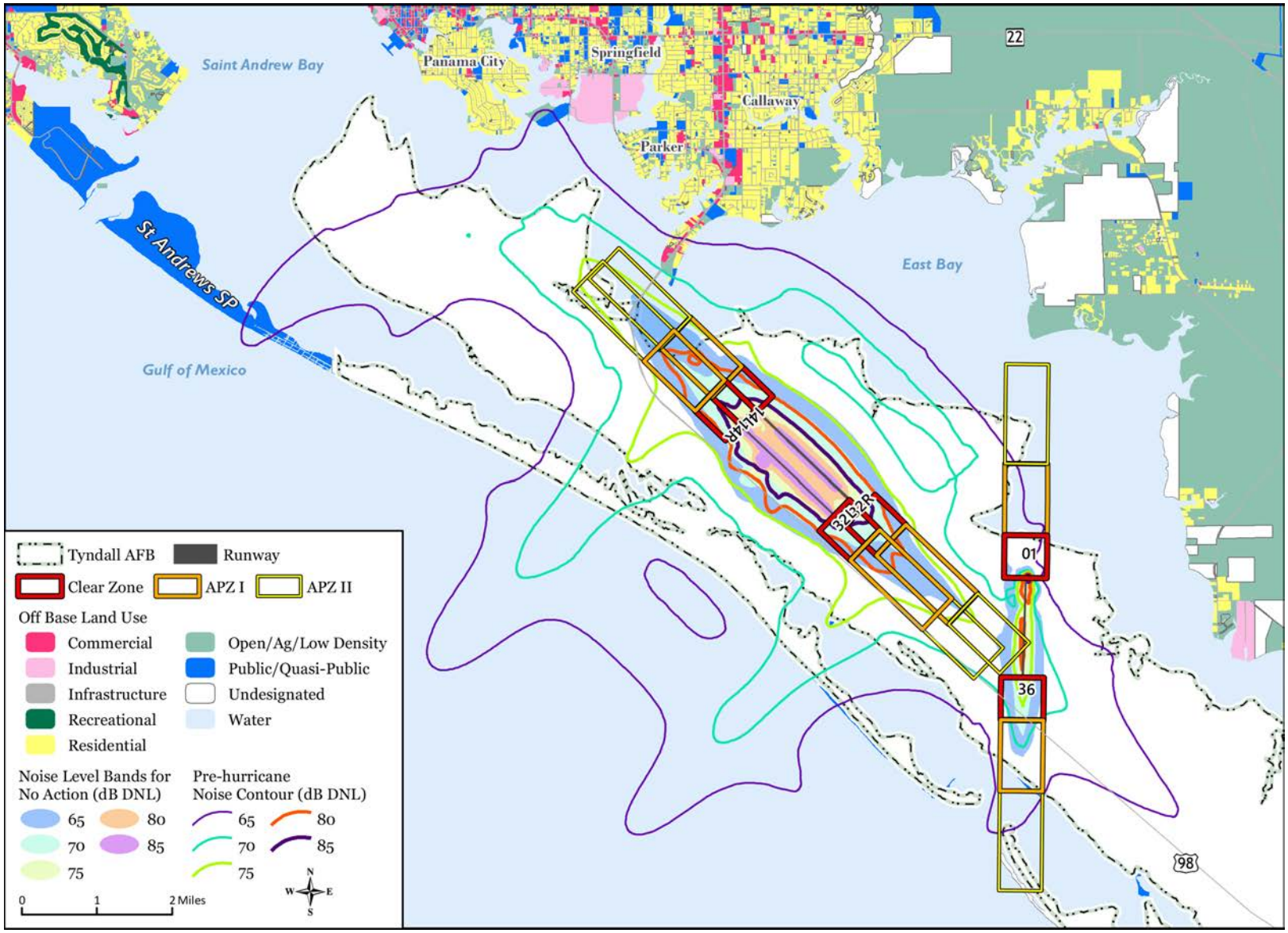

Figure 3.1-6. Pre-Hurricane and No Action Alternative Noise Exposure at Tyndall AFB and Surrounding Land Use

The shoreline areas, along the east side of the East Bay, are mostly undeveloped and managed for conservation and recreation, with residential development along several bayous. To the west, the waterfront areas of Panama City, Parker, and Callaway, north of St. Andrew Bay, have a mixture of industrial, commercial, and residential uses. Tourist-based commercial and residential uses occur near Mexico Beach, south of the base.

St. Andrews State Park is located on the barrier island southwest of Tyndall AFB, in the Gulf of Mexico. US-98 links to regional primary and secondary transportation routes (including State Road 22 and U.S. Highway 231) with access to Panama City and Bay County. These routes contain the majority of commercial and public properties. Residential units are located along the secondary and tertiary routes throughout the region (USAF, 2016a).

The Bay County Comprehensive Plan, updated in 2018, includes a Future Land Use Map that assigns land use designations (e.g., residential, commercial) to all parcels of land in unincorporated Bay County. The plan has overlays for areas that warrant specific restrictions. The Tyndall AICUZ study area is one of these overlays. Policy 3.41 of the plan addresses AICUZ recommendations, particularly related to obstructions and uses in the CZs and APZs. The policy prohibits "development that would threaten the integrity and mission of Tyndall AFB" (USAF, 2016a; Bay County, 2018).

Panama City's Comprehensive Plan identifies long-range intentions for future development and contains elements on land use, transportation, community facilities, urban design and housing. The Future Land Use Map and zoning are very similar. Typically, the planning department updates the Comprehensive Plan every 5 to 10 years. Subsequently, the city commission adopts updated plan elements. The most recent document of record is the October 2018 Panama City Comprehensive Plan (Panama City Planning Department, 2018). The portions of Panama City nearest to Tyndall AFB are categorized as various densities of residential, mixed use, heavy industrial, recreation, and public/institutional.

The City of Parker completed its 2025 Comprehensive Plan in 2010. The plan's Land Use Element states, "The City shall regulate land use through designation of land use districts on a [Future Land Use Map]. The [Future Land Use Map] shall be used to determine the location and extent of development within the City consistent with conservation of natural resources and availability of public facilities and services" (City of Parker, 2010). The City of Parker maintains policies that limit incompatible development within the Tyndall AFB airport influence area and include sound attenuation practices for noise-impacted areas. Noise disclosure must be made in areas exposed to DNL greater than or equal to 65 dB, as depicted on the adopted AICUZ overlay, and official notification to the city must occur if structures are proposed that meet and/or exceed the federal notification criteria (such as height) pursuant to 14 CFR Part 77.13.

Land use in the City of Callaway is a mix of low- and high-density residential, conservation, and commercial (City of Callaway, 2009). The City of Callaway adopted the Comprehensive Plan 2025 in 2009. The plan encourages a strong economic base; preservation of Callaway's natural, cultural, and historic assets; promotion of sustainable development; and provision for a strong, safe, and healthy environment for its residents. The Future Land Use Map delineates the desired future land-use patterns for the city (USAF, 2016a).

The City of Mexico Beach updated its Comprehensive Plan in 2019. The Land Use Element of the Comprehensive Plan maintains a Future Land Use Map that designates future land use types, including residential, tourist-residential, commercial, recreation, conservation, and public/institutional. Mexico Beach continues to consider new proposals to address hurricane safety measures (such as building elevations above storm surge levels). The city values its small-scale charm as intrinsic to its tourist-dependent economy and maintains its current height restrictions on development (City of Mexico Beach, 2019).

Zoning is the legal regulation of property use to protect the health, safety, and welfare of citizens; protect property rights; conserve resources; and avoid incompatible uses. In Florida, counties and cities enact zoning ordinances to implement respective comprehensive plan objectives. The 2016 AICUZ study notes that current zoning has mostly been updated and enacted to reflect Future Land Use Maps of the surrounding jurisdictions and are, therefore, almost identical.

As documented in the 2016 AICUZ study, areas along the eastern shore of East Bay are zoned primarily for open/agricultural/low density uses, and areas zoned for residential uses surround the mouth of several bayous. Within unincorporated Bay County, Shell Island, situated on a barrier island (and part of St. Andrews State Park) southwest of the base, is zoned for public/quasi-public use. Zoning within the waterfront areas north of St. Andrews Bay in Panama City, Parker, and Callaway reflects existing land uses, primarily a mixture of industrial, commercial, and residential uses.

In the City of Parker, some areas along US-98 are zoned for commercial/mixed-use development. These areas could develop or redevelop with higher-density residential and commercial uses without requiring any changes to the current zoning. This is also the case in Mexico Beach, where areas that are currently open space/agricultural/low density are zoned for commercial use (USAF, 2016a).

Table 3.1-21 shows that 217 acres of off-base land (excluding water areas) were exposed to noise levels between 65 and 79 dB DNL (pre-hurricane). Of this land, incompatible residential use occurred on 25 acres, mostly on the peninsula where US-98 leads to the DuPont Bridge. Undeveloped open space and water bodies serve as natural and functional buffers between the installation and off-base communities and land uses. The AICUZ guidelines recommend that residential use is not compatible with these levels.

Figure 3.1-6 shows the AICUZ areas exposed to 65 dB DNL and greater. The footprint includes a mixture of industrial, commercial, open/agriculture/low-density, public/quasi/public, and residential. Shell Island, southwest of the base, is a long peninsula that is popular for recreation. A small area of land exposed to these levels along the North Bay in the southern part of Panama City supports a spur line of Bay Line Railroad, a paper manufacturing plant, and a chemical plant. Land use and zoning along US-98 near the DuPont Bridge (in the city of Parker) are a mixture of uses including commercial, residential, open space, and public/quasi/public land (with a park and public dock). The zoning of some parcels in this area allow for future residential development (USAF, 2016a). Hurricane Michael did considerable damage in this area, some of which remains unrestored. The area remains vulnerable to storm surges and extreme weather events.

Table 3.1-21. Pre-Hurricane Off-Base Noise Levels by Land Use (Acres) –Tyndall AFB

Off–Base Land Use	Area (acres)					
	65–69 dB	70–74 dB	75-79 dB	80–84 dB	85–89 dB	Total
Commercial	17	0	0	0	0	17
Industrial	1	0	0	0	0	1
Open/agricultural/low density	32	1	0	0	0	33
Public/quasi-public	96	3	0	0	0	99
Residential	24	1	0	0	0	25
Transportation	17	8	3	0	0	28
Undesignated	12	2	0	0	0	14
Subtotal	199	15	3	0	0	217
Water	10,519	2,936	465	8	0	13,928
Total	**10,718**	**2,951**	**468**	**8**	**0**	**14,145**

Key: dB = decibels

Table 3.1-22 shows that there are 247 acres currently within the 65 dB DNL footprint that are off base, of which 245 acres is over water. Only 2 acres of off-base transportation land experiences noise levels of 65 dB DNL or higher. The noise levels are compatible with transportation use.

Table 3.1-22. Noise Levels Affecting Surrounding Land Area – No Action Alternative

Off-Base Land Use	Noise Level (dB DNL) (Acres)				
	65–69	70–74	75–79	80–84	≥85
Commercial	0	0	0	0	0
Industrial	0	0	0	0	0
Open/Agriculture/Low Density	0	0	0	0	0
Public/Quasi-Public	0	0	0	0	0
Residential	0	0	0	0	0
Transportation	2	0	0	0	0
Undesignated	0	0	0	0	0
Water	245	0	0	0	0
Total	**247**	**0**	**0**	**0**	**0**

Key: ≥ = greater than or equal to; dB = decibel; DNL = day-night average sound level

According to the Tyndall AFB Installation Development Plan (IDP), Tyndall AFB cooperates and consults with local communities regarding mutual planning for compatible land use in the area near the base. Bay County and the Cities of Parker, Callaway, Springfield, Mexico Beach, and Panama City also play a major role by supporting the Tyndall AFB AICUZ program in its ongoing planning and zoning decisions. In the future, the base will continue to work with its neighbors to explore and strengthen options that address development density, intensity, use, and noise-attenuation requirements within safety and high-noise zones to prevent incompatible development (USAF, 2015).

Recreation at Tyndall AFB and Surrounding Areas

The location of Tyndall AFB along the Gulf of Mexico provides many recreational opportunities on base and in the surrounding areas. Water surrounds the base to the north, south, and west, and there are several lakes on the installation. The military and civilian personnel and dependents, military retirees, and the public have access to large portions of the base (particularly the

undeveloped areas) for hunting, fishing, beach activities, nature viewing, camping, picnicking, kayaking/canoeing, hiking, and biking. Some activities have developed facilities (for example, boat ramps, campsites, trails). Most activities require access and/or activity permits for specific uses (e.g., hunting and fishing). The Outdoor Recreation Management Plan provides details about facilities, activities, permits, and access requirements for recreation on the base (USAF, 2018c).

The Florida Fish and Wildlife Conservation Commission (FWC) categorizes about 14,500 acres on Tyndall AFB as a Type II Wildlife Management Area (WMA). In Type II WMAs, the landowner (in this case, the base), in cooperation with the commission, operates public recreation and hunting.

Nearby, to the west of the base on the mainland, St. Andrews State Park and coastline areas provide outdoor recreation opportunities including boating, surfing, hiking, camping, fishing, swimming, scuba diving, and snorkeling. The 700-acre park is between Panama City and the base (USAF, 2011a). The park is partially on the mainland and includes Shell Island, which is accessible by shuttle boats. The park provides some of the finest white sand beach along the coast.

The mainland (north of East Bay and around St. Andrews Bay) is interspersed with undeveloped, mostly forested land, some of which is used for outdoor recreation. Water-based activities are popular along the bayous and in the bays. Hunting, fishing, and water sports are among the most popular recreational activities. Many homes and developments along the bay shoreline have boat docks.

In addition to natural areas and large parks, the surrounding communities have smaller parks with playgrounds and picnic facilities, and many commercial businesses provide recreational amenities and services such as gyms, swimming pools, marinas and docks, charter boats, running tracks, and ball courts. These support both local residents and a tourist population.

3.1.10.2 Airspace and Ranges

Land Use Under Training Airspace and Ranges

A full spectrum of land uses underlie the Tyndall AFB MOAs (including the Carrabelle and Compass Lake Work Areas) and restricted airspace used by Tyndall-based aircraft for training (see Figure 2.2-3). The areas are characteristically low-density in population with small rural communities. The Tyndall AFB MOAs overlie several counties in northwest Florida, including portions of Bay, Calhoun, Franklin, Gulf, Jackson, Liberty, and Washington Counties. Of these counties, Bay County has the highest population density, with the others being characteristically low-density. Warning Areas, W-151 and W-470, overlie the Gulf of Mexico. There is a variety of public use of these open waters for fishing, transportation, and recreation.

The F-35A squadrons would also use several ranges outside the local Tyndall training airspace for training. Grand Bay Range is northeast of Valdosta, Georgia, just east of Moody AFB in southern Lanier County. The restricted airspace and Moody MOAs overlie mostly forested, rural landscape with small communities. Dense forested land surrounds the training range. The Banks Lake National Wildlife Refuge is on the north side of the main target areas.

The U.S. Navy Pinecastle Range is located in Marion County, Florida. Lakes and forest, mostly within the Ocala National Forest, surround it. The surrounding area is rural with very low population. Nearby non-military uses include forestry and logging, and quarrying. The Ocala National Forest has high annual-visitation rates and offers hiking, hunting, camping, and utilization of the Florida National 28 Scenic Trail. The Pinecastle Range Complex is managed under the Range AICUZ Program. The Range AICUZ program classifies range and adjacent lands into Range Compatibility Zones and provides various land use recommendations for these areas.

Avon Park Bombing Range is located in central Florida near MacDill Auxiliary Airfield. The facility comprises about 106,000 acres and has several targets, a runway, and mock villages used by several units from regional military installations. About 80 percent of the land area of the bombing range supports multiple uses, including cattle grazing, outdoor recreation (mostly hunting, fishing and birding), and timber harvesting. The USAF controls access to ensure safety and to avoid conflict with the primary use for military training operations. Associated restricted airspace and MOAs extend over a wide area of central Florida over lakes, forests, marshland, agricultural land, and small communities.

Section 3.1.2.2 describes the acoustic environment underlying the training airspace and training ranges. Areas underlying the Tyndall training airspace experience subsonic noise from military overflight that contributes about 1 to 6 dB L_{dnmr} above ambient noise levels without aircraft noise. Ambient noise levels (i.e., noise levels when no aircraft operations are underway) in rural areas, such as those that make up the majority of the land beneath the work areas, are typically about 45 dB. Where aircraft noise levels are below ambient noise levels, they do not contribute appreciably to overall noise levels and L_{dnmr} is listed as less than 45 dB. In Section 3.1.2.2, Table 3.1-11 shows current noise levels underlying the Compass Lake Work Area ranges from less than 45 to 51.5 dB L_{dnmr}, and less than 45 dB L_{dnmr} under Carabelle Work Area.

Off-shore and overland military-use airspace has underlying areas managed by various federal, state, and local agencies. Uses of the underlying water areas in the Gulf of Mexico include oil extraction, commercial and recreational fishing, charter cruises, transportation, and some conservation operations. On the mainland, state and federal agencies manage some areas as Special Use Land Management Areas (SULMAs) to conserve particular ecological, biological, and recreational resources. These include many designated forests, parks, monuments, and wildlife preserves. Of the Tyndall training airspace, only Carabelle Work Area (and underlying Tyndall C MOA) overlies SULMAs (see Table 3.1-23). The table provides the total acreage for each of these SULMAs and the portion underlying the training airspace.

Table 3.1-23. Special Use Land Management Areas Underlying Carabelle Work Area

Airspace	SULMA Name	Total Acres	Affected Acres
Carrabelle Work Area	Apalachicola National Forest	633,590	246,052
	Mud Swamp/New River Wilderness (Apalachicola National Forest)	807	807
	Tates Hell-New River Purchase Unit (U.S. Forest Service)	6,952	6,952
	John Gorrie Museum State Park	1	1
	Three Servicemen Memorial (managed by Orman House)	1	1
	Orman House Historic State Park	9	9

Key: SULMA = Special Use Land Management Areas

Wilderness areas, such as the Mud Swamp/New River Wilderness, are managed to protect their pristine qualities and lack of man-made intrusions. Quiet soundscapes are valuable attributes of wilderness areas.

Recreation Under Training Airspace

Much of the land underlying training airspace, both private and public domain, provides opportunities for outdoor recreational activities. The range of landscapes and ecosystems support hunting, and fishing, hiking, natural environments, camping, off-road vehicle use, picnicking, and enjoyment of natural surroundings. Boating, fishing, and water sports are popular activities on lakes, bayous, creeks, and rivers. State and local commissions and departments oversee and regulate permits and licenses, and set catch and bag limits for hunting and fishing. Regulations define precisely where and when participants may hunt or fish in order to conserve ecological balance for the public benefit.

3.1.11 Infrastructure, Tyndall AFB

3.1.11.1 Potable Water System

Tyndall AFB obtains its potable water supply from Bay County, Florida, which sources its water supply from Deer Point Reservoir located approximately 15 miles north of the base. The current contract with Bay County provides up to 1.9 million gallons per day (MGD), and average water usage at Tyndall AFB is 0.706 MGD (USAF, 2015). The potable water supply used by the base is pumped across the DuPont Bridge to a 5-million gallon AST.

The tank and a booster pump station are operated by Bay County and located on land leased by the county from the USAF. The water is pumped from the tank through a county-owned 16-inch pipeline onto Tyndall AFB (USAF, 2011a). The base taps into the pipeline at three locations along US-98. Water from the county pipeline is pumped into the base's water distribution system through pressure-reducing valves and into two above ground water storage tanks. Water facilities on base are owned and maintained by Gulf Coast Electric Cooperative (GECE), through a privatization agreement executed in 2011.

The Bay County Water Treatment Plant uses a conventional treatment process consisting of coagulation, flocculation, sedimentation, filtration, pH adjustment, disinfection, fluoridation, and corrosion control (USAF, 2019e). In 2018, drinking water at Tyndall AFB had one exceedance of turbidity standards when the treatment facility suffered extensive damage during Hurricane Michael. Otherwise, drinking water sampling did not identify any exceedances of federal maximum contaminant levels for any measured contaminants (USAF, 2019e). The base uses two ASTs to provide emergency potable water storage capacity with a total capacity of approximately 400,000 gallons:

- The tank at Facility 733 with a capacity of 250,000 gallons
- The tank at Facility 2892 with a capacity of 150,000 gallons

In addition to the potable water supply, the base maintains three additional storage tanks (with pump stations) to meet fire suppression requirements for specific facilities. These three tanks have a total capacity of 791,000 gallons, which is supplied by the water distribution system:

- Tank 236 has a capacity of 500,000 gallons.
- Tank 502 has a capacity of 246,000 gallons.
- Tank 9754 has a capacity of 35,000 gallons.

In addition to the potable water supplied by Bay County, the Air Force Research Laboratory (AFRL) and the full-scale drone areas obtain potable water from separate groundwater wells maintained by Gulf Coast Electric Cooperative and Tyndall AFB. The AFRL well (Building 9705) was heavily damaged by Hurricane Michael and has not been operational since (USAF, 2019e). There are also three non-potable groundwater wells that can be used on an emergency basis to supply non-potable water to the base.

3.1.11.2 Sanitary Sewer System

Tyndall AFB uses an existing gravity sewer system to handle the base wastewater flow. The sewer system consists of building sewers, laterals, mains, manholes, cleanouts, lift stations, OWSs, grease traps, and septic tanks. Areas serviced by septic systems include the 9700 area, the AFRL, the Full Scale Drone area, and the Sub-Scale Drone area (Tyndall AFB, 2019c). Eight wastewater lift stations on the base are used to convey wastewater to the Bay County Advanced Wastewater Treatment Plant (AWWTP), which is an activated sludge, biological-nutrient-removal, five-stage treatment facility with a capacity of 7.0 MGD. Tyndall AFB is allowed by contract to discharge a monthly average of up to 1.26 MGD of wastewater to the Bay County AWWTP. The average discharge is 0.76 MGD with peak flows reaching 1.35 MGD (USAF, 2015). To reduce the infiltration volumes into the sewer system during heavy rainfall events, the base has implemented repair and replacement projects to reduce peak flows.

3.1.11.3 Stormwater Drainage System

Stormwater at Tyndall AFB is regulated under the Multi-Sector Generic Permit (Facility ID: FLR05C304) issued by FDEP and the Industrial Sector "S" Air Transportation Facilities of the NPDES to operate facilities and discharge industrial stormwater from the flightline side of the base to surface waters. Four of the seven existing outfalls discharge into Shoal Point Bay north of the installation; the remaining three outfalls discharge into Little Cedar Bayou, St. Andrews Sound, and East Bay (USAF, 2015). Tyndall AFB also has an MS4 permit from FDEP to discharge stormwater to surface waters. Under the MS4 permit, Tyndall AFB has 34 permitted outfalls discharging into East Bay, St Andrew Bay, St. Andrew Sound, and Crooked Island Sound (Tyndall AFB, 2019c).

The base has developed and implemented an SWPPP to comply with the conditions of the permit and serve as a guide to base personnel who are responsible for ensuring that there is minimal stormwater pollution due to activities on the base. The SWPPP is amended whenever there is a change in facility design, construction, operation, or maintenance that materially affects the potential for stormwater contamination at the facility. These amendments are implemented to the

maximum extent practical. More detail on the stormwater drainage system and outfall areas is provided in Section 3.1.7.1.

3.1.11.4 Solid Waste Management

Tyndall AFB does not operate an onsite solid waste facility (landfill), so it uses a contractor for refuse collection and nonhazardous solid waste disposal. Dumpsters are located throughout the base for collection of office wastes and inert industrial solid waste. All solid waste is collected and transported offsite for disposal at either the Bay County Waste-to-Energy Facility or the Steelfield Road Landfill (USAF, 2019f). Tyndall AFB has developed and implemented an Integrated Solid Waste Management Plan (ISWMP) to reduce the waste stream by reducing the amount of waste generated at the source and by reusing and recycling materials to reduce the amount of waste disposed of at a landfill (USAF, 2019f). Solid waste diversion (e.g., wastes sent to recycling) totaled 297 tons (27 percent) for municipal wastes and 3,544 tons (77 percent) for construction and demolition waste (USAF, 2019f).

3.1.11.5 Electrical System

Gulf Coast Electric Cooperative supplies Tyndall AFB with electricity delivered via two 46-kilovolt (kV) lines to an electrical substation on the west end of the base, which steps the voltage down to a 12.47-kV level for distribution within the base (USAF, 2011a). Gulf Coast Electric Cooperative owns and maintains the electrical distribution system within the base and is under contract to provide 729,000 kilowatt-hours per day. Tyndall AFB's average daily demand for electricity was 230,175 kilowatt-hours (USAF, 2015).

3.1.11.6 Natural Gas System

Tyndall AFB purchases odorized natural gas from TECO Peoples Gas, which is delivered to the base through a utility-owned regulator station that reduces the pressure from 120 pounds per square inch gauge (psig) to 55 psig for distribution on the base. The base's natural gas distribution system consists of approximately 14 miles of steel and polyethylene pipes (USAF, 2011a). Natural gas is not stored on base. Tyndall AFB's natural gas average daily demand was 192,000 cubic feet with a supply of 1,440,000 cubic feet per day (USAF, 2015).

3.1.12 Transportation, Tyndall AFB

3.1.12.1 Roadway Network

This section describes the affected environment for the transportation system and conditions for highways and intersections around Tyndall AFB. Tyndall AFB has four Entry Control Facilities (ECFs) from US-98. Three ECFs, the Airey, Sabre, and Tyndall Gates, handle 99 percent of installation traffic. The fourth ECF, the Cleveland Gate, handles commercial vehicle inspections.

US-98 is a four-lane, divided highway that bisects Tyndall AFB from east to west. Some heavy vehicles traverse US-98, but passenger vehicles are the primary users. Due to the location of the

base and access patterns, traffic in the area primarily consists of base personnel traveling for base operations. While some personnel reside on base, commuters to the base travel primarily from Port St. Joe, located to the east, and Panama City, located to the west. The peak hours of travel are from 6:45 a.m. to 7:45 a.m. and from 4:00 p.m. to 5:00 p.m. Commuters traveling from the west cross the Tyndall DuPont Bridge. The bridge is an arched structure over the East Bay and has the potential for sight distance challenges for drivers if traffic is queued to the bridge. Figure 3.1-7 illustrates the local area intersections and road segments evaluated in this EIS.

The analysis quantitatively evaluates the network of surrounding roadways, with qualitative evaluation of the on-base network. An ongoing 2019 study (USAF, 2019g) collected traffic data at several key intersections around and on the base, and this EIS focuses primarily on two key intersections and one road segment for analysis:

- US-98 at Tyndall Drive and Airey Avenue near the main gate (signalized intersection)
- US-98 at Garfield Avenue near a secondary, limited use gate (stop controlled T-intersection)
- US-98 both east and west of the intersection with Tyndall Drive and Airey Avenue

As USAF personnel screen vehicles at the Airey (Main) gate, the entry control operation meters traffic accessing the on-base roadway network, resulting in less potential for congested conditions once drivers clear the gate. However, entry control processing has the potential to queue traffic onto US-98 from Tyndall Drive, creating potential issues for the off-base roadway network. As traffic leaves the base, queuing at the primary off-base intersections may also cause traffic congestion around the gate and on the internal base roadways near the main gate.

The traffic analysis included in this EIS assumes 97 percent of trips to Tyndall AFB are from the west, while 3 percent are from the east. Section 3.1.13 details the population and personnel assumptions for the affected area. These numbers will likely vary and could result in lessened future traffic impacts if personnel housing shifts occur (changes to proposed housing areas, more personnel housed on-base, etc.), as outlined in Chapters 4 and 5.

3.1.12.2 Affected Environment

Control Delay – the total delay brought about by the presence of a traffic control device (80 seconds and 50 seconds for a signalized and stop-controlled to fail, respectively).

Volume-to-Capacity (V/C) Ratio – a ratio of the traffic demand to signal cycle capacity for signalized intersections; or, for roadway segments, the ratio of the traffic demand to the roadway lane capacity. A V/C ratio greater than 1.0 indicates that the cycle capacity or road segment capacity is fully utilized (approaching unstable conditions).

Using 2019 data collected at each intersection (USAF, 2019g), this EIS evaluates the affected environment based on common traffic flow parameters for both interrupted (signalized and stop-controlled intersections) and uninterrupted (multi-lane highways) flow facilities. For interrupted flow facilities, the analysis uses control delay and volume-to-capacity (V/C) ratio as the primary metrics to define the level of service (LOS) of each facility. For uninterrupted flow facilities, the analysis uses density and V/C. These metrics provide a summary of the operational conditions of roads and intersections in the area for comparison with the proposed action alternatives. Regarding impacts, key stakeholders who have interest, own, and/or maintain these facilities include the USAF, the Florida Department of Transportation (FDOT), the Federal Highway Administration (FHWA), and city and county agencies in the area.

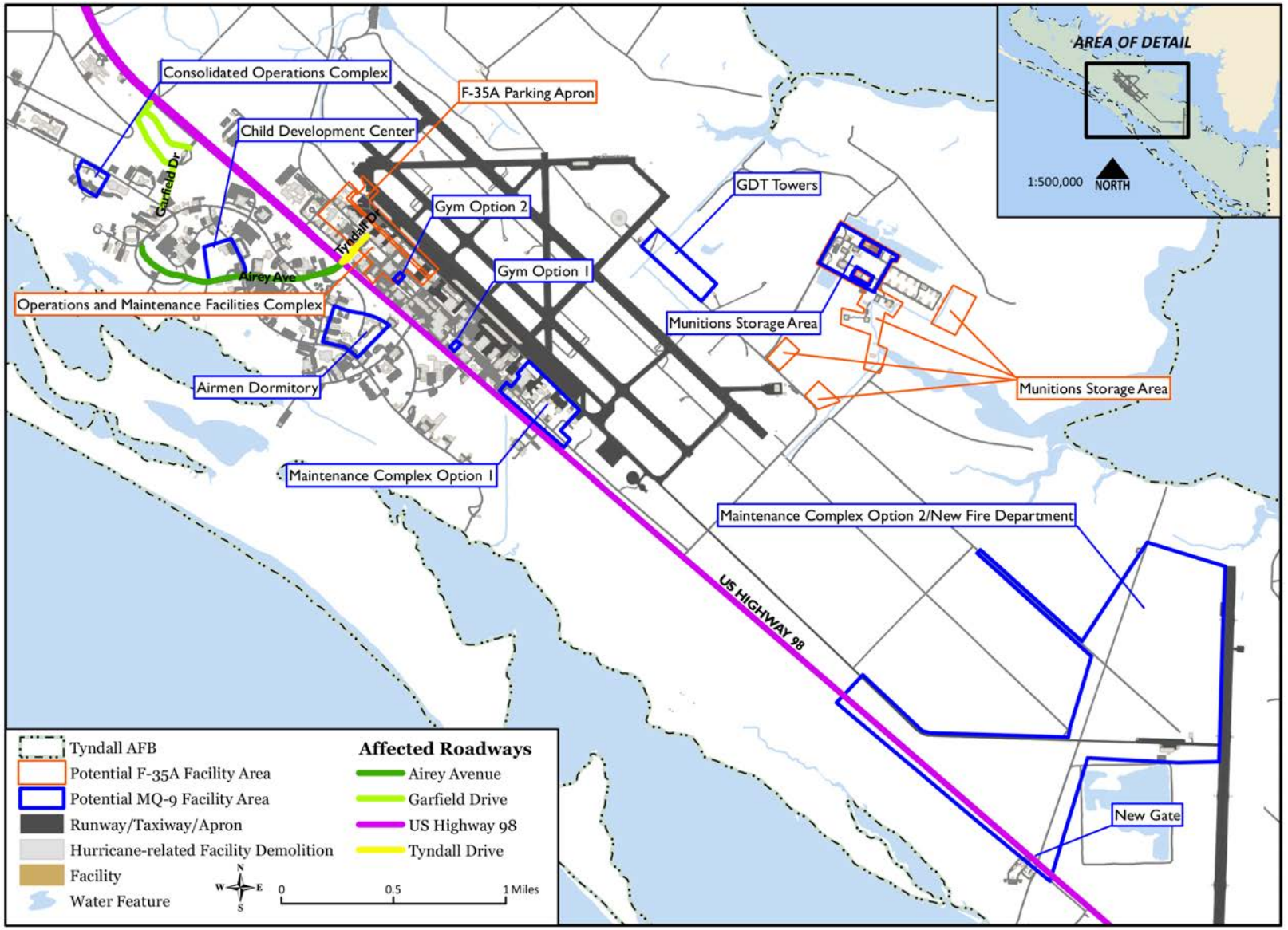

Figure 3.1-7. Tyndall AFB Roadway Network Study Area

While the focus of this EIS is on operational impacts given the data available, stakeholders should also consider the safety performance of the highway facilities. For example, traffic queues from the main gate can cause impacts to adjacent intersections, and rear-end crashes can increase due to queues. Sight distance, roadside hazards, speed variability, and existing crash trends can all contribute to safety performance.

LOS is a qualitative measurement of operation conditions based on factors such as speed, travel time, freedom to maneuver, traffic interruptions, comfort and convenience, and safety. The Highway Capacity Manual (TRB, 2010) defines six categories of LOS that reflect the operating conditions for the facility and the magnitude of traffic congestion. The Highway Capacity Manual assigns letter designations "A" to "F", with "A" representing free-flow operating conditions, and "F" representing congested conditions. Table 3.1-24 further describes traffic operating conditions for the LOS categories.

Table 3.1-24. Level of Service Descriptions

LOS	Operating Conditions	Delay
A	Highest quality of service; free traffic flow, low volumes and densities; little or no restriction on maneuverability or speed.	None
B	Stable traffic flow; speed becoming slightly restricted; low restriction on maneuverability.	None
C	Stable traffic flow, but less freedom to select speed, change lanes, or pass; density increasing. LOS A though C often meet transportation agency LOS threshold of acceptability.	Minimal
D	Approaching unstable flow; speeds tolerable but subject to sudden and considerable variation; less maneuverability and driver comfort.	Minimal
E	Unstable traffic flow with rapidly fluctuating speeds and flow rates; short headways, low maneuverability, and lower driver comfort.	Significant
F	Forced traffic flow; speed and flow may drop to zero with high densities.	Considerable

Source: (TRB, 2010)
Key: LOS = Level of Service
Note:
[1] The Highway Capacity Manual produces metrics but does not evaluate how significant LOS F conditions are, only that a facility has reached LOS F.

Transportation agencies define the acceptable thresholds for LOS as a policy decision. Larger urban areas may set lower thresholds due to significant volumes of traffic during peak hours, while lower traffic areas may reach an unacceptable condition with a higher LOS. LOS E is the condition at which the facility has reached capacity. The LOS for a road segment is based on density as well as the processing capacity for the highway (typically 1,800 to 2,000 passenger cars per hour per lane for a multi-lane highway).

The EIS analyzes two intersections and one road segment near Tyndall AFB due to most traffic accessing the base at the Airey (Main) gate. The intersection of US-98 and Garfield Avenue is a one-way, stop-controlled intersection, and the Cleveland gate near this location is limited in use and generates insignificant traffic. To leave the base at this location, drivers must turn right or left onto US-98, and significant traffic on the mainline roadway would hinder the ability for drivers to turn left. However, the divided nature of US-98 allows for phased left turns (i.e., crossing one lane and stopping, then merging into westbound traffic). Given this limited level of use, current operations at this intersection are free flow for the mainline traffic.

The intersection of US-98, Tyndall Drive, and Airey Avenue is a primary use intersection for access to the northern and southern sections of Tyndall AFB. The posted speed limit for US-98 at this location is 50 mph. Generally, US-98 has two through lanes in each direction; however, at this intersection, US-98 eastbound has one through lane and a double left turn lane onto Tyndall Drive. The four-lane highway cross section continues east beyond the intersection.

The EIS analyzes the primary intersection, as well as the primary road segment, using the Highway Capacity Software Version 7 (McTrans, 2017). This software enables analysis of control delay, LOS, and V/C ratio for intersections and road segments. Control delay is the component of delay that results from the type of control at the intersection (e.g., a traffic signal or a stop sign), as measured by comparison with the uncontrolled condition. Capacity is the maximum rate of flow that can pass through an intersection under prevailing traffic and road conditions. The sum of all critical movements (i.e., left turns, right turns, or through movements) on a critical lane basis is used to determine the total intersection V/C ratio and corresponding LOS. An intersection or road is at capacity (V/C ratio of 1.0) when flow decreases due to congested conditions. This V/C ratio is based on traffic volumes by lane, signal phase timing patterns, and approach lane configuration. Analysis of multi-lane highways is based on density of traffic, while analysis of two-lane highways is based on the percent time spent following and average travel speed. This relationship illustrates why a highway can experience a lower LOS while maintaining a lower V/C ratio.

Table 3.1-25 summarizes the results of the traffic analysis based on 2019 traffic count data, existing lane configurations, and optimal signal timing and phasing (USAF, 2019g).

The intersection of US-98, Tyndall Drive, and Airey Avenue operated at an acceptable LOS during the 2019 conditions. Right turns from US-98 onto Airey Avenue most significantly affect intersection LOS during the morning peak period, and left turns onto US-98 from Airey Avenue most significantly affect intersection LOS during the afternoon peak period. However, the intersection as well as the worst-case US-98 segment operate at an acceptable LOS during the baseline condition. Based on the V/C ratio for the intersection, and the fact that the right turn lane has a finite length and only one lane exists for through traffic, right turns onto Airey Avenue from US-98 during the morning peak hour likely impact through movements.

Table 3.1-25. Intersection and Road Segment LOS and Performance Metrics (Tyndall AFB)

Intersection or Road Segment	Time Period	2019			
		LOS	V/C Ratio	Control Delay	Highest Contributing Lane Group
US-98 and Tyndall Drive and Airey Avenue	a.m. p.m.	C C	0.93 0.94	21.7 sec/veh 31.8 sec/veh	US-98 right turns onto Airey Avenue Airey Avenue left turns onto US-98
US-98 Near Tyndall Drive	a.m. p.m.	B B	0.45 0.35	NA	NA

Source: (USAF, 2019g)

Key: LOS = Level of Service; NA = not applicable; sec/veh = seconds per vehicle; US-98 = U.S. Highway 98; V/C = volume-to-capacity

Notes:

[1] For signalized intersections, one-lane group may cause a significant impact to the overall LOS for the intersection. The table shows this lane group for each analysis period. The V/C ratio is for the highest lane group (worst case).

[2] The table reports the worst-case US-98 road segment, while the analysis includes each segment east and west of the intersection for the morning and afternoon peak periods.

In an effort to improve regional transportation and installation security, the FDOT and Tyndall AFB jointly decided to advance the construction of a single-point urban interchange at US-98 and Tyndall Drive. The project has been funded by the FDOT/FHWA, and an environmental assessment for the interchange has been completed. Construction will commence in May 2020.

The FDOT has also proposed a new roadway, the Gulf Coast Parkway, from US-98 to U.S. Highway 231. The parkway will route through traffic to a large loop north of the installation. FDOT and Tyndall AFB also are working to elevate US-98 over the Tyndall AFB Airey (Main) Gate and Louisiana Avenue to reduce congestion and provide a connection between the Flightline and Support Districts.

3.1.13 Socioeconomics, Tyndall AFB

The ROI for the socioeconomic analysis focuses on Bay County, Florida, the area most affected by actions at Tyndall AFB. The No Action Alternative conditions for Tyndall AFB and Bay County are projected from a combination of the available 2017 and 2018 published data and any data published in 2019, which are presented in Section 3.1.13.1. Employment, population, housing, and related socioeconomic data for Bay County as of 2017 and 2018 are presented in Section 3.1.13.1. The projected No Action Alternative conditions for employment, population, housing, schools, and public services are calculated from that available data as well as any data published in 2019 and are presented in Section 3.1.13.2.

3.1.13.1 Socioeconomic Resources as of 2017-2018

This section uses the most complete data available from either 2017 or 2018 to describe employment characteristics, population, housing, schools, and public services that might be affected by the proposed F-35A Wing beddown and/or the MQ-9 Wing beddown.

Economy, Employment, and Income

Tyndall AFB has a major influence on the regional economy. The 2017 Florida Defense Factbook calculated that the DoD in Bay County supported 22,720 jobs, totaled $1,090.7 million in defense spending, and had an overall economic impact of $2,527.8 million (Enterprise Florida, 2017). The 2017 Economic Impact Analysis Report on Tyndall AFB, calculated payroll, expenditures, and indirect jobs (see Table 3.1-26).

The largest Bay County employment sectors in 2018 were the government and government enterprises sector, the retail trade sector, and the construction sector (Table 3.1-27).

Projections for 2023 represent the affected environment for this EIS for purposes of the socioeconomics analysis. Projections for 2030 are used to reflect a stabilized economy after the decline in construction and transportation once full implementation of the Proposed Actions and reconstruction of Tyndall AFB are completed. The stabilized Bay County economy is assumed to have increases in the leisure and hospitality sectors as the economy adjusts after project implementation. The 2018 Bay County estimates for median household income, per capita income, and the average annual unemployment rate are presented in Table 3.1-28.

Table 3.1-26. Economic Impact of Tyndall AFB, Fiscal Year 2017

Category	Total
Annual Payrolls By Classification	
Appropriated Fund Military	$275,787,349
Appropriated Fund Civilians	$84,347,100
Non-Appropriated Fund, Contract Civilians, and Private Business	$10,747,784
Total Annual Payroll	**$370,882,233**
Annual Expenditures	
Construction	$25,065,855
Services	$38,121,225
Materials, Equipment, and Supply Procurement	$86,256,638
Total Annual Expenditures	**$149,713,717**
Value of Indirect Jobs	
Estimated Number of Indirect Jobs Created	1,908
Average Annual Pay for the Local Community	$39,520
Total Annual Dollar Value of Jobs Created	**$75,404,160**
Total Economic Impact of Tyndall AFB	**$596,000,110**

Source: (USAF, 2017b)
Key: AFB = Air Force Base

Table 3.1-27. Employment by Industry in Bay County (2018 and Projected)

	2018 Pre-Hurricane[1]	Projected 2023 No Action[2]	2030 Projected[3]
Bay Co Population	167,283	186,500	193,700
Total Employment by Industry	77,725	100,339	99,348
Natural Resources and Mining	311	401	360
Construction	4,897	8,421	5,670
Manufacturing	3,031	3,213	3,575
Trade, Transportation, and Utilities	15,234	19,666	18,210
Information	777	1,002	1,020
Financial Activities	4,197	5,418	5,558
Professional & Business Services	9,716	12,842	12,948
Education & Health Services	10,959	14,148	14,200
Leisure & Hospitality	13,757	16,060	18,318
Other Services	2,099	2,709	2,844
Government	12,747	16,456	16,645

Sources:
[1] 2018 data: (Florida EDR, 2018)
[2] No Action: from combining Florida Economic and Demographic Research (EDR) percentages and Bureau of Economic Analysis IMPLAN, with 1.5 jobs per household
[3] 2030 Projected: adapted from Florida EDR with 1.43 jobs per household (Bay County was 1.14 in 2018)

Table 3.1-28. Selected Economic Characteristics, Bay County, Florida, and United States

Geographic Area	Average Annual Unemployment Rate (2018)	Per Capita Income (2018)	Median Household Income (2018)
Bay County	6.0%	$28,017	$51,829
Florida	6.3%	$30,197	$53,267
United States	5.9%	$32,621	$60,293

Sources: (USCB, 2018b; USCB, 2018c)

Population

Table 3.1-29 presents the 2017 military, military dependents, and appropriated fund civilians employed at Tyndall AFB. The annual payroll was $370.8 million (USAF, 2017b).

Table 3.1-29. Pre-Hurricane Personnel Estimates at Tyndall AFB

Personnel Type	Number
Appropriated Fund Military	3,644
Active Duty Military Dependents	5,058
Appropriated Fund Civilians	1,304
Non-Appropriated Fund Civilians	709
Total Personnel Including Dependents	**10,715**

Source: (USAF, 2017b)
Note: A non-appropriated fund position is a government position funded through sources other than DoD appropriations budget.

Table 3.1-30 presents the population in Bay County in 2018 and the average population annual growth rate since 2010 (USCB, 2010b; USCB, 2018d). Bay County grew slower than the state of Florida and faster than the United States as a whole.

Table 3.1-30. Population Estimates in Bay County, Pre-Hurricane

Location	2010	2018	Average Annual Growth (2010–2018)
Bay County	169,272	182,482	0.94%
Florida	18,843,326	20,598,139	1.12%
United States	309,349,689	322,903,030	0.54%

Sources: (USCB, 2010b; USCB, 2018d)

Housing

The number of dorm rooms to be reconstructed at Tyndall AFB is undergoing design review as of spring 2020. The EIS analysis uses a reasonable estimate of persons in dorms at the conclusion of base reconstruction. Approximately 34.6 percent of military personnel stationed at Tyndall AFB in 2017 resided in 568 on-base dorm rooms or 867 privatized housing units. The on-base units housed an estimated total population of 2,987 USAF personnel and dependents (see Table 3.1-31). Table 3.1-32 presents the distribution of off-base personnel.

Table 3.1-31. Total Military Housing at Tyndall AFB, Pre-Hurricane

Housing Type	2018		
	# of Units	Average U.S. Air Force Persons per Unit	Total Personnel
Dorm Rooms	568	1	568
Privatized Housing	867	1.09	945
Total[1]	**1,435**	**-**	**1,513**

Note:
[1] Total shown based on the following assumptions: each dorm room is occupied by one USAF personnel, and USAF personnel only residing in on-base housing is calculated by multiplying the total privatized housing units by 1.09 residents married to another USAF person.

Table 3.1-32. Distribution of Military Personnel in 2018

Location	Total Military Personnel
On-Base	34.6%
Off-Base	65.4%
Total	**100.0%**
Off-Base by Area	
Panama City proper (west side)	61%
Panama City (east side)	19%
Lynn Haven	12%
Panama City Beach	2%
Rural area north of Panama City	3%
Gulf County (primarily Port St. Joe)	3%

Source: (USAF, 2007)

Table 3.1-33 provides selected housing characteristics for Bay County and for Panama City and Lynn Haven where the majority of off-base military personnel reside. (See Figure 3.1-1.) Panama City, in close proximity to Tyndall AFB, has a higher renter to owner-occupied ratio than neighboring communities, consistent with communities that have a large proportion of transient military personnel in close commuting distance to the military installation. In 2018, Panama City had lower cost owner-occupied housing units and rents than the county as a whole.

Table 3.1-33. Selected Housing Characteristics for Bay County, Pre-Hurricane

Geographic Area	Total Housing Units	Occupied	Owner Occupied	Renter Occupied	Homeowner Vacancy Rate	Rental Vacancy Rate	Median Value of Owner-Occupied Units	Median Gross Rent ($)
Florida	9,348,689	7,621,760	65.0%	35.0%	2.3%	8.4%	196,800	1,128
Bay County	102,266	70,199	63.5%	36.5%	2.8%	24.5%	172,600	1,009
Panama City	17,983	15,197	49.0%	51.0%	3.4%	11.4%	153,600	903
Lynn Haven	8,476	7,632	67.8%	32.2%	3.9%	6.8%	191,800	1,071

Source: (USCB, 2018e)

Education

The Bay District Schools provide educational services to the county. Enrollment dropped by 12.4 percent, or 3,500 students, after the hurricane. In fall 2018, there were 1,865 teachers and 28,129 students enrolled throughout the school district (FDOE, 2019a). Enrollment in the Bay County School District had increased between 2014 and 2018 at an annual rate of 0.44 percent. Table 3.1-34 shows the total fall enrollment during the last five school years as reported by the Florida Department of Education.

Table 3.1-34. Student Enrollment in the Bay County School District

District	School Year				
	2014– 2015	2015–2016	2016–2017	2017–2018	2018–2019
Bay County	27,641	27,781	28,027	28,076	28,129

Source: (FDOE, 2019b)

Tyndall Elementary on Tyndall AFB is part of the Bay County School District and serves students from kindergarten through fifth grade. Before the hurricane, there were 51 teachers and 737 students enrolled in Tyndall Elementary (FDOE, 2019c).

Public Services

Public services include emergency, police, and medical services. Emergency services in Bay County include the fire services division, emergency management division and the emergency medical services division. There is an average of 2.53 nonfederal doctors per 1,000 people in the state of Florida (Statemaster.com, 2020).

The Bay County Sheriff's Department serves 9 communities with a total of 525 staff for a ratio of 2.91 officers per 1,000 residents (Bay County Sheriff's Office, 2019). The number of full-time sworn officers per 1,000 U.S. residents reported in the nation between 1992 and 2012 varies between 2.19 and 2.39 (U.S. Department of Justice, 2016).

The Bay County fire service division provides response services to rural and suburban unincorporated areas of the county. Bay County has a ratio of 1.4 firefighters per 1,000 people. Southern states in the United States have median rates of career firefighters per 1,000 people ranging between 1.23 to 1.73 (National Fire Protection Association, 2019).

Base services at Tyndall AFB include medical, safety, dining, and recreational facilities. The 325th Medical Group provides medical services to military personnel, retirees, and dependents. Pre-hurricane there were 5 buildings for medical support, 2 buildings for medical treatment, 3 dining facilities, and 71 recreational facilities (USAF, 2017b).

3.1.13.2 Conditions During Base Reconstruction

This section draws from the affected environment information presented in Section 3.1.13.1 and adjusts the affected environment, to the extent possible, to reflect the conditions in 2019-2020 following Hurricane Michael. After October 2018, there were substantial hurricane induced changes in the affected environment at Tyndall AFB and off-base. For example, thousands of residents were forced to leave Bay County in 2018 and 2019 after the hurricane destroyed or severely damaged off-base housing stocks and business enterprises. This reduced the Bay County population, economic activity, students, and services. To the extent possible, available data and estimates are applied to adjust socioeconomic conditions to 2019-2020 and present the updated affected environment described in this section. This updated information forms the basis for realistic estimates of environmental effects presented in the socioeconomics consequences sections of this EIS.

Economy, Employment, and Income

The economic impact of the damage caused by Hurricane Michael continues to grow but 2019 estimates suggest that the hurricane resulted in 17,171 lost jobs, $2,935.53 million in output, $703 million in personal income, and $1,7921.27 million in value-added throughout the 11 county region that was affected, with the primary impact to Bay County (University of West Florida, 2019).

Employment rates often experience a decline immediately following a natural disaster but then experiences job growth with cleanup and construction. Bay County experienced an immediate decline as the area's economy relies on the government and government enterprises, retail, leisure, and hospitality industries. Table 3.1-27 presents employment projections for Bay County in 2019 and 2023 when base reconstruction is scheduled to be completed. Construction is expected to increase more rapidly than manufacturing, wholesale trade, retail trade, or other services.

Population

As a result of the damage from Hurricane Michael to Tyndall AFB, two squadrons of F-22s were relocated from Tyndall AFB. This reduced Tyndall AFB employment by approximately 1,400 USAF personnel and 1,904 dependents. Table 3.1-35 provides a summary of base personnel at Tyndall AFB halfway through reconstruction.

Table 3.1-35. Personnel Estimates at Tyndall AFB During Reconstruction

Personnel Type	Number (Pre-Hurricane)	Number during Reconstruction
Appropriated Fund Military	3,644	2,200
Active Duty Military Dependents	5,058	3,154
Appropriated Fund Civilians	1,304	1,304
Non-Appropriated Fund Civilians	709	709
Total Personnel	**5,657**	**4,213**
Total Personnel Including Dependents	**10,715**	**7,367**

Note:
[1] Based on the pre-hurricane dependent multiplier of 1.36 dependents per approximately 1,400 appropriated fund military personnel that would be associated with the F-22 Aircraft.

The estimated distribution of off-base personnel takes into consideration potential relocation to areas less impacted by the hurricane. The projected distribution of military personnel residing in the community is presented in Table 3.1-36.

Table 3.1-36. Projected Distribution of Military Personnel

Location	Total Military Personnel		
	Pre-Hurricane	Projected	Change
Off Base by Area			
Panama City proper (west side)	61%	58%	-3%
Panama City (east side)	19%	16%	-3%
Lynn Haven	12%	15%	3%
Panama City Beach	2%	5%	3%
Rural area north of Panama City	3%	3%	0%
Gulf County (primarily Port St. Joe)	3%	3%	0%

The decline in population in Bay County between 2018 and 2019 is a direct result of the population displaced by Hurricane Michael. In 2019, the population in Bay County was estimated at 167,283 people (BEBR, 2020). Table 3.1-37 shows the year over year population growth is estimated to be up to 3.3 percent per year, or four to five times higher than historic population growth rates.

Table 3.1-37. Population Estimates in Bay County

Year	Estimated Population	Year-Over-Year Growth
2018	182,482	-
2019	167,283	-8.33%
2020	170,963	2.20%
2021	175,237	2.50%
2022	180,494	3.00%
2023	186,451	3.30%
2024	190,180	2.00%
2025	191,891	0.90%
2026	192,083	0.10%
2027	192,275	0.10%

Sources: (USCB, 2018d; BEBR, 2020; Florida EDR, 2019)

Housing

Table 3.1-38 presents the estimated number of on-base military personnel and dependents pre-hurricane and during the reconstruction. Approximately 1,297 military personnel of the 2,200 military personnel would reside on-base and 903 personnel would reside off base. Taking into consideration the 9 percent of military personnel that are married to other military personnel (Air Force Personnel Center, 2020), there would be demand for 828 off-base housing units prior to establishment of an F-35A Wing or an MQ-9 Wing.

Table 3.1-38. Total Military Housing at Tyndall AFB

Housing Type	Pre-Hurricane				During Reconstruction			
	# of Units	Average Persons per Unit	Total Persons (personnel and dependents)	Total Personnel on Base[3]	# of Units	Average Persons per Unit	Total Persons (personnel and dependents)	Total Personnel on Base[3]
Dorm Rooms[1]	568	1	568	568	650	1	650	650
Privatized Housing[2]	867	2.58	2,230	945	593	2.58	1,529	647
Total	**1,435**	**-**	**2798**	**1,513**	**1,243**	**-**	**2,179**	**1,297**

Notes: Totals shown are based on the following assumptions:
[1] Each dorm room is occupied by one USAF personnel.
[2] Each privatized housing unit is occupied by 2.58 residents, which included USAF personnel and dependents.
[3] USAF personnel only residing in on-base housing is calculated by multiplying the total privatized housing units by 1.09 residents.

Hurricane Michael destroyed or damaged 32,000 housing units in Bay County. An increase in housing demand in 2019 was due to an influx of construction workers to the area and renters who have chosen to buy after facing large rent price increases and real-estate speculation. Table 3.1-39 provides a summary of single-family housing characteristics in October 2019 compared to October 2018. A monthly supply of inventory below 5.5 months traditionally indicates a seller's market (Florida Realtors, 2019).

Rental rates in the area have dramatically increased with some people finding it more affordable to buy than to rent. Details provided by Tyndall Housing indicate that in 2019 on average a 1,500-square-foot single family home renting for between $1,700 to $2,500 with a one-bedroom/studio renting for $650 and a two-bedroom renting for $1,100 (Tyndall AFB, 2019d). Rent for apartments

are anticipated to increase by $150 to $200 more in the next year with beachside apartments up $1,500 per month for a one-bedroom/one-bathroom. Housing demand will likely cause prices to continue to increase for the next several years before leveling off (see Chapter 5).

Table 3.1-39. Summary of Housing Characteristics One Year After Hurricane Michael in Bay County

Indicator	October 2018	October 2019	Year-Over-Year Change
Closed Sales	97	348	258.8%
Paid in Cash	25	88	252.0%
Median Sales Price	$245,000	$235,788	-3.8%
Dollar Volume	$28.0 million	$88.6 million	216.7%
Median Time to Contract	43 days	21 days	-51.2%
Median Time to Sale	89 Days	66 Days	-25.8%
New Listings	126	474	276.2%
Inventory (Active Listings)	1,088	1,170	7.5%
Monthly Supply of Inventory	3.9	3.6	-7.7%

Source: (Florida Realtors, 2019)

Education

Every school in Bay County experienced some level of damage from Hurricane Michael and, as a result, total student enrollment in the county dropped by over 3,500 students after the hurricane. The district lost $12.4 million in revenue compared to 2018–2019 and is expected to lose $24.8 million in revenue during 2019–2020 school year as a result of decreased enrollment (Bay County School District, 2020). The district also temporarily closed and consolidated several schools, implemented a district-wide spending freeze and decreased employees by 228 (Bay County School District, 2020). Table 3.1-40 shows the total projected enrollment in the Bay County School District.

Table 3.1-40. Projected Student Enrollment in in the Bay County School District

District	School Year								
	Pre-Hurricane (2018–2019)	2019–2020	2020–2021	2021–2022	2022–2023	2023–2024	2024–2025	2025–2026	2026–2027
Bay County	28,129	23,927	24,933	25,949	26,968	27,508	27,975	28,395	28,821

Tyndall Elementary School is located on the installation. In 2019, the Bay District School Board approved expanding the elementary from kindergarten through eighth grade. Beginning in 2020, the school will rebuild to add a grade level each year and be a "K-8" school as part of base reconstruction.

Public Services

The reconstructed Tyndall AFB will include multiple services and facilities for USAF personnel and others with access to the base. Off base, there will be a demand for community services. The demand for public service personnel immediately following the hurricane dropped as a result of the decline in population and the public service personnel who were required to relocate as a result of their place of work or homes being damaged or destroyed. Table 3.1-41 shows the estimated number of police, fire, and medical professionals needed per year in Bay County to meet the current national averages.

Table 3.1-41. Projected Public Services in Bay County

Year	Population	Police		Fire		Medical	
		Multiplier[1]	Total Personnel	Multiplier[1]	Total Personnel	Multiplier[1]	Total Personnel
2019	167,283	2.19	366	1.5	251	2.53	423
2020	170,963	2.19	374	1.5	256	2.53	433
2021	174,553	2.19	382	1.5	262	2.53	442
2022	178,045	2.19	390	1.5	267	2.53	450
2023	181,605	2.19	398	1.5	272	2.53	459
2024	184,693	2.19	404	1.5	277	2.53	467
2025	187,463	2.19	411	1.5	281	2.53	474
2026	190,275	2.19	417	1.5	285	2.53	481
2027	193,129	2.19	423	1.5	290	2.53	489

Note:
[1] Based on national averages

3.1.14 Environmental Justice, Tyndall AFB

EO 12898 requires agencies to make achieving environmental justice part of their mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. In addition to environmental justice populations, EO 13045 directs federal agencies to identify and assess environmental health and safety risks that may affect children 17 years of age and under. The USAF also identifies populations over 65 years of age to assess environmental health and safety risks to elderly populations. This Environmental Justice section for Tyndall AFB addresses the effects on the minority and low-income populations covered under environmental justice guidelines and also addresses potential environmental effects on children and the elderly.

3.1.14.1 Estimated Sensitive Populations in the Community of Comparison and Region of Influence in 2018

There are no data on the minority and low-income populations in Bay County after the hurricane or during reconstruction of the base. The best information from the 2018 sources are used as the basis for estimating sensitive populations who lived/will live in the identified areas after the hurricane. Table 3.1-42 identifies the total population in the county as well as the total minority and low-income populations in the county as of 2018.

Table 3.1-42. Environmental Justice Communities in Bay County, Florida

Geographic Region	Total Population	Minority		Population for Whom Poverty Status is Determined[1]	Low-Income	
		Number	Percent		Number	Percent
Bay County	182,482	42,831	23.5%	179,926	26,376	14.7%
Florida	20,598,139	9,253,878	44.9%	20,178,544	2,983,851	14.8%
United States	322,903,030	125,721,853	38.9%	314,943,184	44,257,979	14.1%

Sources: (USCB, 2018c; USCB, 2018d)
Note:
[1] Does not include people in institutional group quarters, college dormitories, military barracks, living situations without conventional housing (excluding those in shelters), and unrelated individuals under age 15 (such as foster children) and is therefore different from "Total Population."

Table 3.1-43 identifies the total number of children (under 18) and elderly (65 years of age and older) in the county. The population for Florida and the nation are also shown for comparison.

Table 3.1-43. Children and Elderly Populations in Bay County, Florida

Geographic Region	Total Population	Children (under 18 years)		Elderly (65 years or older)	
		Number	Percent	Number	Percent
Bay County	182,482	39,406	21.6%	30,160	16.5%
Florida	20,598,139	4,148,552	20.1%	4,064,376	19.7%
United States	322,903,030	73,553,240	22.8%	49,238,581	15.2%

Source: (USCB, 2018d)

The environmental justice analysis focuses on the off-base populations, especially any individuals exposed to aircraft noise levels of 65 dB DNL; see Appendix B, Section B.13.3). The conditions are based on the 2016 AICUZ and the 5-year American Community Survey 2014–2018 population estimates. Disproportionate impacts would be anticipated if the percent of the minority population or low-income population in the ROI, defined as census tract 9, block group 1 would be greater than the community of comparison, defined as census tract 9. As shown on Figure 3.1-8 and displayed in Table 3.1-44, estimates for sensitive populations in 2018 do not indicate disproportionate noise effect on minority or low-income populations.

Table 3.1-44. Environmental Justice Communities in 2018

Geographic Region	Total Population	Minority		Dispro-portionate	Population for Whom Poverty Status is Determined	Low-Income		Dispro-portionate
		Number	Percent			Number	Percent	
Census Tract 9, Block Group 1 (ROI)	2,111	304	14.4%	No	2,111	315	14.9%	No
Community of Comparison								
Census Tract 9 (COC)	4,488	958	21.3%	-	4,432	735	16.6%	-

Sources: (USCB, 2018c; USCB, 2018d)
Key: COC = Community of Comparison; ROI = region of influence

Table 3.1-45, Table 3.1-46, and Table 3.1-47 identify the number of environmental justice populations, children, and elderly affected by noise levels of 65 dB DNL or greater in 2018. Children and elderly populations were exposed to aircraft noise levels of 65 dB DNL or greater (Figure 3.1-9).

The APZs did not extend into residential land use and, therefore, no populations reside under the APZs under pre-hurricane conditions.

Table 3.1-45. Children and Elderly Population in the ROI in 2018

Geographic Region	Total Population	Children (under 18 years)		Elderly (65 years and older)	
		Number	Percent	Number	Percent
Census Tract 9, Block Group 1 (ROI)	2,111	411	19.5%	434	20.6%

Source: (USCB, 2018d)
Key: ROI = region of influence

Table 3.1-46. Environmental Justice Populations Affected by Aircraft Noise in the ROI in 2018

Average Noise Levels	Total Affected Off-Base Population	Minority		Low-Income	
		Number	Percent	Number	Percent
65–69 dB	184	26	14.4%	27	14.9%
70–74 dB	6	1	14.4%	1	14.9%
75–79 dB	0	0	0.0%	0	0.0%
80–84 dB	0	0	0.0%	0	0.0%
85+ dB	0	0	0.0%	0	0.0%
Total >65 dB DNL	**190**	**27**	**14.4%**	**8**	**14.9%**

Key: > = greater than; dB = decibels; DNL = day-night average sound level; ROI = region of influence

Table 3.1-47. Children and Elderly Populations Affected by Aircraft Noise in the ROI in 2018

Average Noise Levels	Total Affected Off-Base Population	Children		Elderly	
		Number	Percent	Number	Percent
65–69 dB	184	36	19.5%	38	20.6%
70–74 dB	6	1	19.5%	1	20.6%
75–79 dB	0	0	0.0%	0	0.0%
80–84 dB	0	0	0.0%	0	0.0%
85+ dB	0	0	0.0%	0	0.0%
Total >65 dB DNL	**190**	**37**	**19.5%**	**39**	**20.6%**

Key: > = greater than; dB = decibels; DNL = day-night average sound level; ROI = region of influence

3.1.14.2 Estimated Population in the Community of Comparison and Region of Influence During Base Reconstruction

Table 3.1-48 shows the total population projected for Census Tract 9 (Community of Comparison [COC]) and Census block group 1 in Census Tract 9 (ROI) during reconstruction of Tyndall AFB. The population is based on a 2018–2019 decline of 20 percent in the population followed by year-over-year growth similar to the county growth identified in Table 3.1-37.

Table 3.1-48. Population in the Community of Comparison and Region of Influence During Reconstruction

Geographic Region	2018	2019[1]	2020	2021	2022	2023
Census Tract 9, Block Group 1 (ROI)	2,111	1,689	1,726	1,762	1,798	1,834
Census Tract 9 (COC)	4,488	3,590	3,669	3,746	3,821	3,897

Source: (USCB, 2018d)
Key: COC = Community of Comparison; ROI = region of influence
Note:
[1] Based on a 20 percent decline in population post hurricane.

The proportions of minority and low-income populations in the ROI and COC and children and the elderly are estimated to be similar as shown in Section 3.1.14.1. A large number of older lower-priced residential units in the noise contour zones were severely damaged and destroyed. Whether the units could be rebuilt depends on many factors, including whether it would be possible to bring them up to current building codes. Units in the ROI that are up to code are more expensive to rent than the pre-hurricane residences. Therefore, it is likely that numbers or percentages of environmental justice and other populations residing off base would move to other areas.

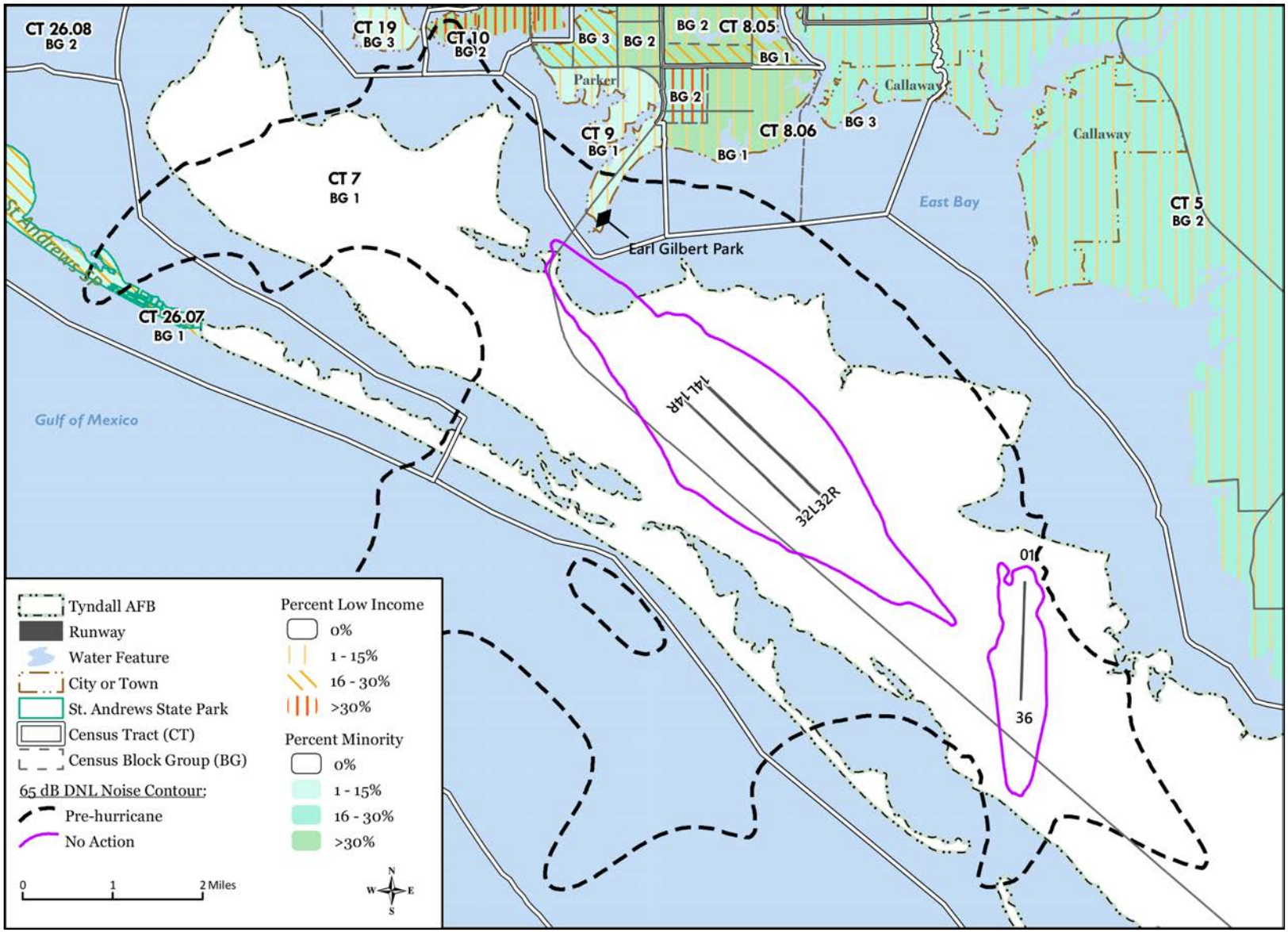

Figure 3.1-8. Environmental Justice Region of Influence for Tyndall AFB

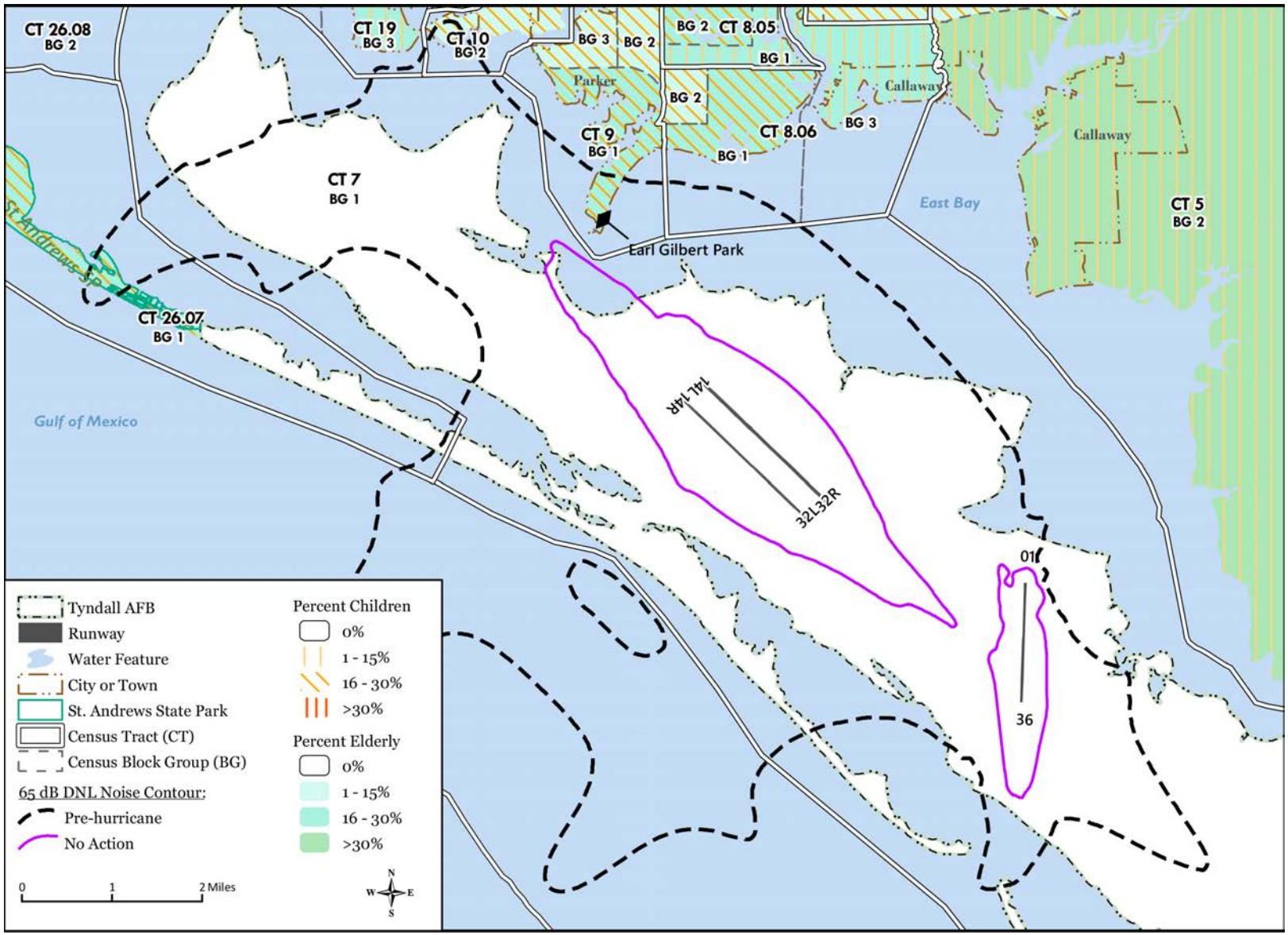

Figure 3.1-9. Children and Elderly Populations in the Region of Influence for Tyndall AFB

3.2 VANDENBERG AFB

3.2.1 Airspace Management and Air Traffic Control, Vandenberg AFB

Vandenberg AFB is located within an airspace environment that consists of the different airspace categories and classifications shown in Figure 2.2-3 and explained in Appendix B. The following describes the existing airfield, regional, and training airspace in which the MQ-9 would operate at this alternative location.

3.2.1.1 Base

Vandenberg AFB supports a variety of aircraft operations to include unmanned aircraft systems (UAS) and spacelift missions. This airfield has one runway (12/30, 15,000 feet) where the vast majority of aircraft departures/arrivals are to the northwest using Runway 30. An Instrument Landing System and Tactical Air Navigation System provide the capability for aircraft to navigate to the active runway during marginal weather conditions or for training purposes. Vandenberg AFB had approximately 5,250 airfield operations in 2018.

The Vandenberg AFB control tower manages flight operations within the Class D airspace that extends from the surface up to 2,900 feet MSL within a 4.3 NM radius of the airfield. This tower is operational Monday through Friday, 8:00 a.m. to 5:00 p.m., and closed on weekends and holidays unless otherwise publicized by Notice to Airmen (NOTAM). The tower coordinates IFR arriving/departing traffic with the Santa Barbara Terminal Radar Approach Control (TRACON), which has responsibility for this regional airspace environment as discussed below.

Due to the hazardous nature of missile and rocket launches at Vandenberg AFB, the base/airfield area is overlain by two restricted areas (R-2516 and R-2517), shown in Figure 2.3-6, that restrict and protect this airspace environment when these operations are in progress. R-2517 is active continuously while R-2516 is activated only as needed to support launch operations. These RAs and other SUA supporting Vandenberg AFB test and training operations are discussed below.

Vandenberg AFB has established local operating procedures that govern airfield and airspace operations within this local air traffic environment. The nature of the operations conducted at Vandenberg AFB and the manner in which they are scheduled, managed, and controlled has minimal effects on other civilian air traffic in this area.

Vandenberg AFB Regional Airspace

The regional airspace environment includes several civil airports where commercial and general aviation aircraft operate throughout the airspace surrounding Vandenberg AFB. These airports include Santa Barbara, Santa Maria, San Luis Obispo, Santa Ynez, and Lompoc. Collectively, these airports and other public and private airfields serve a variety of personal aircraft, helicopters, small business jets, and commercial passenger aircraft, as well as parachute jump school and glider activities. The density of VFR flight operations and relatively close proximity of the airports within this region require strict adherence to see and avoid procedures.

The regional airspace encompassing Vandenberg AFB, the above-listed airports, and other public and private airfields in this coastal area is controlled by the Los Angeles Air Route Traffic Control Center. This center has delegated a terminal airspace area to the Santa Barbara TRACON, which is responsible for providing ATC services to airport and enroute IFR airport air traffic within this delegated area, which includes Vandenberg AFB operations. This terminal area reverts back to the center's control during those times that the TRACON is not operational (11:00 p.m. to 6:00 a.m.).

Several federal airways and jet routes transit along the coastline and inland that accommodate IFR flights operating respectively below and above 18,000 MSL while enroute through this region. These federal airways/jet routes are located outside the SUA boundaries where this IFR traffic is separated from military operating within the active SUA areas.

3.2.1.2 Airspace and Ranges

Section 2.3.4.2 and Figure 2.3-5 and Figure 2.3-6 identify the SUA areas directly supporting Vandenberg AFB aircraft, missile, and other flight activities and those other SUA areas north and south of the base that would also be used for MQ-9 operations. Table 3.2-1 notes the vertical parameters and controlling ATC agency for each area.

Table 3.2-1. Vandenberg AFB Training Airspace Descriptions

Airspace	Floor/Ceiling Altitudes (Feet AGL/MSL)	Controlling Agency
Vandenberg AFB		
R-2516	Surface to unlimited	Frontier Control
R-2517	Surface to unlimited	
R-2534A/B	500 AGL to unlimited	FAA Los Angeles Center
W-532N/S, W-537, other adjacent Warning Areas	Surface to unlimited	
Camp Roberts/Hunter Liggett		
Hunter High MOAs	11,000 to, but not including, 18,000 MSL	FAA Oakland Center
Hunter Low A/B/C MOAs	200/2,000/3,000 AGL to, but not including, 11,000 MSL	
Hunter Low D/E MOA	1,500 AGL – 3,000/6,000 MSL	
R-2504A	Surface to, but not including, 6,000 MSL	
R-2504B	6,000–15,000 MSL	
R-2513	Surface to 23,000 MSL	
San Clemente Range		
R-2535A/B	Surface to 100,000 MSL	FAA Los Angeles Center
W-532, W-537, W-289S	Surface to unlimited	

Key: AFB = Air Force Base; AGL = above ground level; FAA = Federal Aviation Administration; MOA = Military Operations Area; MSL = mean sea level

As mentioned previously, R-2516 and R-2517 overlie Vandenberg AFB where they extend from the surface to unlimited altitudes and are used to support missile/rocket launches. Frontier Control, a military radar unit at Vandenberg AFB, manages operations within these two restricted areas. R-2516, the adjacent W-537, and other WAs would be used to support high altitude MQ-9 pattern operations within this airspace. No COA would be required to operate between the airfield and these restricted airspace areas.

The MQ-9 would also use the Camp Roberts Army Base/Hunter Liggett SUA complex north of Vandenberg AFB that consists of the Hunter High MOAs. Transit to this complex, either directly from Vandenberg AFB or via the WAs, would require a COA while operating in unrestricted airspace. All SUA areas have higher altitudes that would typically be flown by the MQ-9.

MQ-9 operations could also be conducted in the Navy San Clemente Range south of Vandenberg AFB where MQ-9s would transit through W-532S, W-537, and W-289S enroute to/from R-2535A/B. This transit route would not require a COA.

During those times any of these SUA areas are active, nonparticipating aircraft are restricted from operating within these areas. The active status of each area is available through ATC and Flight Service Station advisories, NOTAMs, and other means.

3.2.2 Noise, Vandenberg AFB

Noise sources on Vandenberg AFB include aircraft and spacecraft operations, as well as assorted ground activities.

3.2.2.1 Aircraft/Spacecraft Acoustics

There are not any aircraft units at Vandenberg AFB at present, but the airfield supports transient aircraft operations on a regular basis. Materials and personnel supporting the Vandenberg space-launch mission are transported to and from Vandenberg AFB aboard cargo-type aircraft such as the C-5 and C-21. The airfield is also used by transient aircraft of all types (e.g., T-38 and single-engine, propeller-driven aircraft) as a stopover location during cross-country flights, as an unfamiliar airfield for practice approaches, or as a diverted landing location during severe weather. Noise levels generated by individual overflights of several representative transient aircraft types are listed in Table 3.2-2.

The number of transient aircraft operations and the types of aircraft conducting the operations varies from month to month according to the needs of aircrews and current events. For example, the airfield supports fire-suppression aircraft during wildfires. In total, the airfield supports approximately 7,000 airfield operations annually. Spacecraft launches are conducted from launch complexes scattered throughout the installation at locations that are distant from human populations. Safety concerns are the primary reason for this geographical separation, but the distance also allows launch noise to attenuate before reaching noise-sensitive locations such as residences. Although spacecraft launches are loud events, they are infrequent relative to aircraft operations, which occur on a daily basis. Aircraft noise levels exceed 65 dB CNEL only in the immediate vicinity of the Vandenberg AFB runway, and do not extend off base (Figure 3.2-1). All off-installation land uses are compatible with DoD noise-land use guidelines. The noise metric CNEL is used in the state of California in place of DNL, and DoD land use recommendations for DNL are also applied to the same numeric CNEL values. People living outside of the 65 dB CNEL contour also sometimes experience potentially disturbing aircraft overflights and can become annoyed by the noise. A person's reaction to noise is dependent on several non-acoustic factors, including the person's perception of the importance of the activity generating the noise and the activity the person is involved in at the time the noise occurs. Several social surveys have found

that people are more likely to become annoyed by aircraft noise at higher DNL (or CNEL) and are less likely to become annoyed at lower DNL (or CNEL) (Schultz, 1978; Finegold, Harris, & Von Gierke, 1994; Miedema & Vos, 1998).

Table 3.2-2. Individual Overflight Maximum Noise Level (L_{max}) Generated By Representative Aircraft Types as Vandenberg AFB

Aircraft (engine type)	Power Setting[1]	Power Unit	L_{max} Values (in dB) at Varying Distances (in feet)				
			500	1,000	2,000	5,000	10,000
Takeoff/Departure Operations							
C-5B	4.50	EPR	114	106	97	82	68
T-38 (non-afterburner)	99%	RPM	109	101	91	76	63
C-21	90%	NC	89	82	74	62	51
Single-engine, fixed-pitch propeller	100%	RPM	77	70	63	53	45
Landing/Arrival Operations							
C-5B	2.39	EPR	111	104	95	79	61
T-38	96%	RPM	96	88	79	66	54
C-21	68%	NC	77	70	62	50	40
Single-engine, fixed-pitch propeller	30%	RPM	59	53	46	36	29

Source: Omega10 using standard weather conditions of 59 degrees Fahrenheit and 70 percent relative humidity.
Key: AFB = Air Force Base; dB = decibel; EPR = engine pressure ratio; L_{max} = Maximum Noise Level; NC = engine core RPM; RPM = revolutions per minute
Note:
[1] Engine power settings are not constant during flight. Power settings shown are typical.

Representative noise-sensitive locations on and near Vandenberg AFB selected for additional noise analysis are depicted in Figure 3.2-2. Noise-level information provided for these representative noise-sensitive locations is similar to that of nearby areas.

Calculated CNEL at the representative noise-sensitive locations is less than 45 dB (Table 3.2-3. Aircraft noise levels less than 45 dB CNEL are below ambient noise levels and do not add measurably to the overall noise environment.

Table 3.2-3. Baseline CNEL, Potential Speech-Interference Events per Average Daytime Hour School-day Noise Levels, and Probability of Sleep Disturbance at Representative Locations on and Near Vandenberg AFB

Location Description (EIS)	CNEL	Outdoor Speech-Interference Events per Hour[1]	Average Noise Level During the School Day (dBA L_{eq-8hr})	Probability of Sleep Disturbance[1]
Lompoc (residential area)	<45	0	<60	0
Crestview Elementary School	<45	0	<60	0
Maple High School	<45	0	<60	0
Parade Ground (on base)	<45	1	<60	0
Lompoc Federal Prison	<45	0	<60	0

Key: AFB = Air Force Base; dBA = A-weighted decibel; CNEL = Community Noise Equivalent Level; EIS = Environmental Impact Statement; L_{eq-8hr} = 8-hour equivalent noise level
Note:
[1] Where the number of potential speech-interference events or percentage probability of awakening rounds to zero, the number "0" is listed.

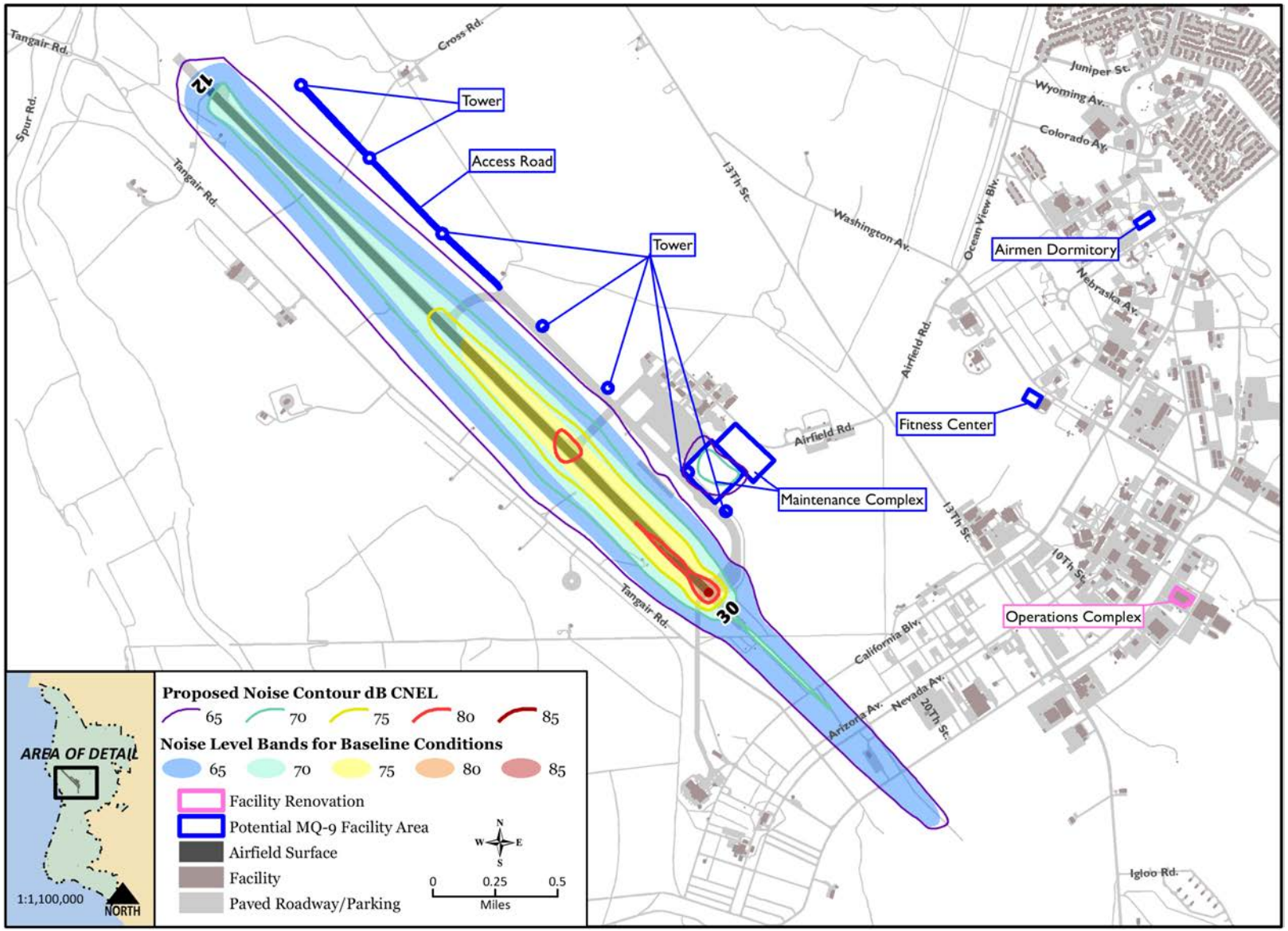

Figure 3.2-1. Affected Environment Noise Levels at Vandenberg AFB

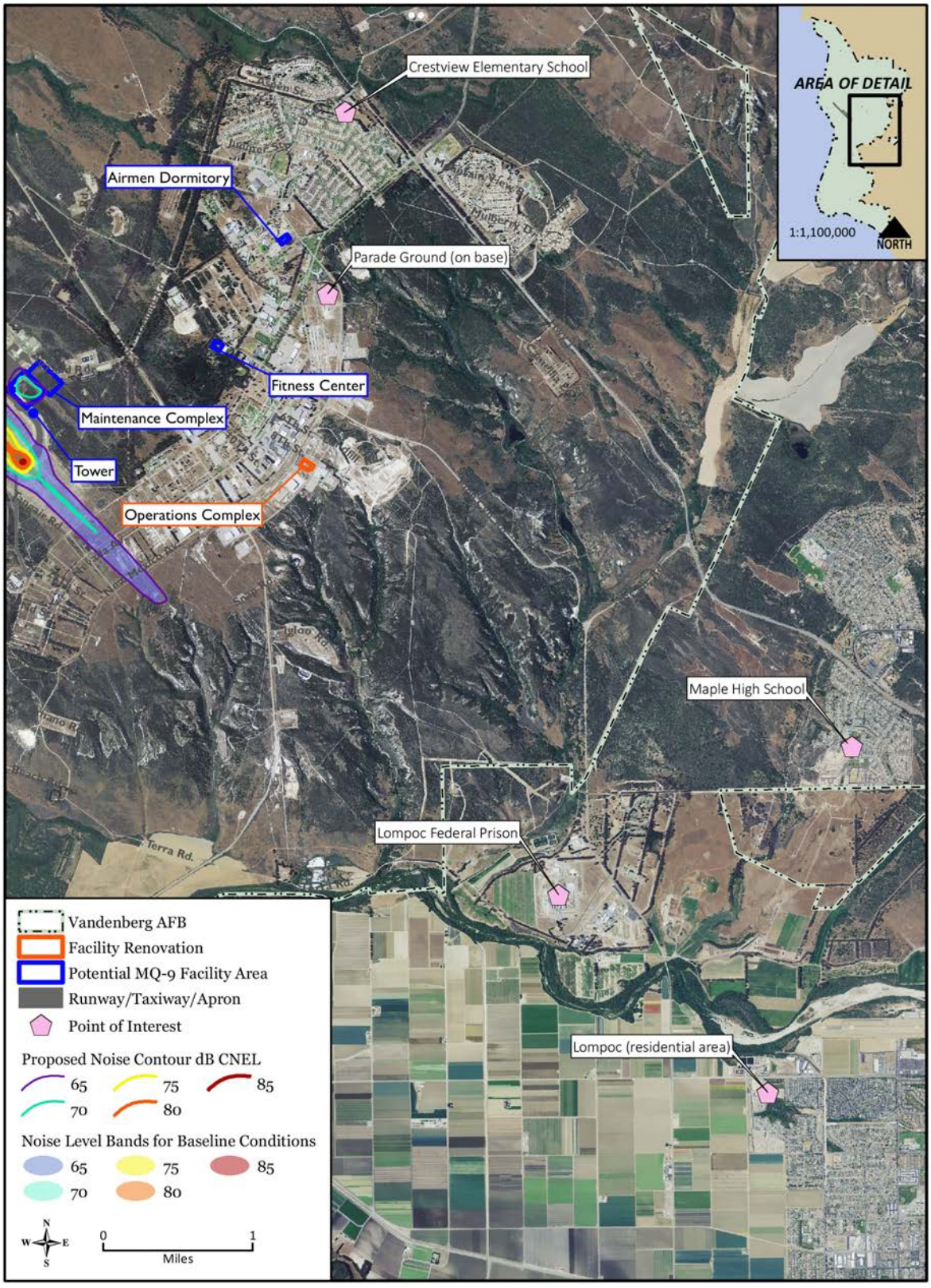

Figure 3.2-2. Representative Noise-Sensitive Locations Near Vandenberg AFB

Overflight events that exceed 50 dB, even momentarily, have some potential to interfere with speech. The number of outdoor potential speech-interference events due to aircraft noise rounds to zero at all locations except the on-base Parade Ground (Table 3.2-3).

Average noise levels during the school day (L_{eq-8hr}) at Crestview Elementary School and Maple High School are below 60 dB. In accordance with DoD Noise Working Group guidance, classroom interference is minimal at these noise levels.

Aircraft operations at Vandenberg AFB occur almost exclusively during "acoustic day" (i.e., 7:00 a.m. to 7:00 p.m.), but flight operations during "acoustic evening" (7:00 p.m. to 10:00 p.m.) and "acoustic night" (10:00 p.m. to 7:00 a.m.) are sometimes required to support launch missions, cargo-transport timelines, or contingency operations (e.g., firefighting). Operations during evening and night each make up approximately 1 percent of total flying operations. The probability of being awakened at least once per night rounds to zero at the representative locations studied.

3.2.2.2 Other Base Acoustics (Construction and Facility Operations)

Vandenberg AFB is an active military installation, and the acoustic environment includes the sounds of installed equipment (e.g., heating ventilation and air conditioning), vehicle traffic, and construction activities (e.g., construction vehicles and equipment). Noise generated by day-to-day ground activities is localized to the area immediately surrounding the activity. Construction noise is temporary, lasting only for the duration of the construction project.

3.2.3 Health and Safety, Vandenberg AFB

The 30th Space Wing Safety Office (30 SW/SE) is responsible for the installation safety program. Vandenberg AFB's Safety Office's mission is to implement proactive mishap prevention programs to protect personnel, equipment, and combat capability.

3.2.3.1 Base Facilities Construction

As with Tyndall AFB, day-to-day operations at Vandenberg AFB are conducted in accordance with applicable USAF safety regulations, published USAF Technical Orders, and standards prescribed by AFOSH requirements. Contractors working on the installation must prepare appropriate job site safety plans explaining how job safety will occur throughout the life of the project. Contractors must also follow applicable OSHA requirements.

3.2.3.2 Airspace and Range Training Operations

The affected environment for Airspace and Range Training Operations at Vandenberg AFB includes flight safety, mishap prevention, and BASH.

3.2.3.2.1 Flight Safety and Mishap Prevention

As discussed previously, flight safety is based on the physical risks associated with aircraft flight. Flight safety is affected by means of numerous rules and regulations that dictate operations near other aircraft, aircraft speeds, and minimum safe altitudes.

The primary safety concern regarding military aircraft training operations is the potential for aircraft mishaps to occur, with Class A mishaps classified as the most severe type. There is one active runway at Vandenberg AFB, and no large fixed-wing air operations are assigned. Approximately 15 to 20 aircraft use the runway each month at the installation. Much of this airfield traffic is transient and includes distinguished visitor traffic, C-130 traffic from a nearby National Guard unit, FAA aircraft, National Aeronautics and Space Administration aircraft, etc. (USAF, 2019h). No Class A mishaps have been recorded at Vandenberg AFB in well over 10 years.

As discussed in Section 3.1.3.1, there are well-established procedures for responding to aircraft mishaps on USAF and public property (see Section 3.1.3 and Appendix B, Section B.3). These include maintaining response teams and mutual aid agreements with local fire departments. Additionally, numerous procedures are implemented at Vandenberg AFB, such as maintaining emergency and mishap response plans, to minimize the potential for impacts related to an aircraft mishap.

All flight operations at Vandenberg AFB would occur over land. There are unimproved areas around Vandenberg AFB that are susceptible to wildland fire resulting from a potential MQ-9 mishap. Like Tyndall AFB, Vandenberg AFB has implemented a Wildland Fire Management Plan (Vandenberg AFB, 2011a) that provides a framework for the management of wildland fire. Vandenberg AFB uses controlled burns as a land management tool to reduce available fuel and fire hazard (Vandenberg AFB, 2011a). If a wildland fire does occur, Vandenberg AFB would respond, either on its own, or with assistance of local fire departments.

3.2.3.2.2 Bird/Animal Aircraft Strike Hazard

The airfield at Vandenberg AFB is one of the least used runways in the USAF; consequently, BASH incidents are uncommon. There were three strikes in 2019, with the last one occurring in October 2019. Previously, there were four strikes in 2012, with one resulting in a bird being sucked into an aircraft engine. While the repair cost associated with these strikes is not known, none resulted in a Class A mishap (Evans, 2018).

Although, the frequency of strikes is very low, a BASH threat exists in the Vandenberg AFB vicinity due to resident and migratory bird species and large deer population; consequently, the installation has developed a BASH Plan (USAF, 2014c). In addition to general procedures identified in Appendix B, Section B.3, the Vandenberg AFB BASH Plan includes installation-specific measures to detect and reduce the threat of wildlife. These include the use of vehicles for both monitoring bird and wildlife activity, denying airfield access, and removal of wildlife threats. Other measures used include bioacoustics (i.e., use of species-specific alarms or distress calls broadcast and propane cannons), airfield video surveillance cameras, and night vision devices (USAF, 2014c).

In addition to bird hazards, deer also pose a strike hazard at Vandenberg AFB as the airfield is surrounded by a significant amount of deer habitat. Deer incursions occur on the airfield despite an electrobraid deer fence surrounding its perimeter. Deer typically congregate in the area of the intersection of North Alpha taxiway and the runway, especially from 1 hour prior to sunset to 1 hour after sunrise. Aircrews must use caution during hours of darkness (USAF, 2014c).

Additionally, Vandenberg AFB and transient pilots have access to the Avian Hazard Advisory System and Bird Avoidance Model to help aviators assess the BASH risk for specific locations. Vandenberg AFB also uses bird condition terminology, as described in Appendix B, Section B.3, to disseminate bird activity information and implement unit operational procedures.

3.2.4 Air Quality, Vandenberg AFB

The following section describes the air quality affected environment within the Vandenberg AFB region and associated airspaces.

3.2.4.1 Base

The California Air Resource Board relies on the NAAQS for purposes of regulating air quality and they have established the California Ambient Air Quality Standards (CAAQS) for this purpose. The CAAQS are at least as restrictive as the NAAQS and include pollutants that do not have national standards. The CAAQS only would apply to proposed stationary sources of emissions. Table B.4-1 of Appendix B of this EIS presents the NAAQS and CAAQS.

3.2.4.1.1 Region of Influence and Existing Air Quality

The ROI for air emissions resulting from implementation of the proposed MQ-9 Wing beddown and mission at Vandenberg AFB would primarily affect air quality in western Santa Barbara County and the adjoining offshore waters, where proposed aircraft operations would occur below 3,000 feet AGL. Operational emissions in airspaces over western Santa Barbara County, the offshore waters of Southern California, and areas in Central California are not included because they are projected to occur above 3,000 feet AGL. Analysis of proposed aircraft operations is limited to operations that would occur within the lowest 3,000 feet of the atmosphere, as this is the typical depth of the atmospheric mixing layer where the release of aircraft emissions would affect ground-level pollutant concentrations.

Presently, Santa Barbara County and the adjoining offshore waters are in unclassified/attainment of all NAAQS for all pollutants (USEPA, 2019a). Additionally, Santa Barbara County and the adjoining offshore waters are in attainment of all CAAQS except for O_3, $PM_{2.5}$, and PM_{10} (Santa Barbara County Air Pollution Control District, 2019).

Table 3.2-4 summarizes estimates of annual emissions generated by activities within Santa Barbara County for calendar year 2017. These data were obtained from the USEPA National Emissions Inventory and reflect the most recent annual emissions data available for the County (USEPA, 2020). Stationary sources are point sources identifiable by name and location. Area sources are point sources of emissions too small to track individually, such as individual homes, small office

buildings, or diffuse stationary sources (e.g., wildfires or agricultural tilling equipment). Mobile sources are vehicles or equipment with gasoline or diesel engines (e.g., an airplane or a ship). Two types of mobile sources are considered: on-road and nonroad. On-road mobile sources are vehicles such as cars, light trucks, heavy trucks, buses, engines, and motorcycles. Nonroad sources are aircraft, locomotives, diesel and gasoline boats and ships, personal watercraft, lawn and garden equipment, agricultural and construction equipment, and recreational vehicles.

Table 3.2-4. Annual Emissions for Santa Barbara County, California, 2017

Source Type	Air Pollutant Emissions (tons per year)							
	VOCs	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	CO_2e (mt)	HAPs
Stationary Sources	1,035	1,759	828	77	128	75	192,678	187
Area Sources	5,636	2,862	1,196	106	4,206	902		445
On-Road Sources	1,284	9,354	2,408	17	258	124	1,837,357	349
Nonroad Sources	665	6,271	855	0	64	55	200,739	227
Total Emissions[1]	**8,619**	**20,245**	**5,287**	**200**	**4,656**	**1,155**	**2,230,774**	**1,208**

Source: (USEPA, 2020)

Key: CO = carbon monoxide; CO_2e (mt) = carbon dioxide equivalent in metric tons; HAPs = hazardous air pollutants; 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; SOx = sulfur oxides; VOCs = volatile organic compounds

Note:

[1] Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.

Existing sources of emissions at Vandenberg AFB include (1) aircraft and space launch operations and maintenance activities, (2) onsite private- and government-owned vehicles, (3) AGE, (4) nonroad equipment, and (5) stationary sources, such as fuel storage tanks; external combustion equipment (boilers and paint booth heaters); and internal combustion engines (diesel generators) (Vandenberg AFB, 2018). Table 3.2-5 summarizes the annual emissions that occurred from stationary and mobile sources at Vandenberg AFB during calendar year 2017 (the most recent year of data).

Table 3.2-5. Annual Emissions for Operations at Vandenberg AFB – Year 2017

Activity Type	Air Pollutant Emissions (tons per year)						
	VOCs	CO	NO_x	SO_x	PM_{10}	CO_2e (mt)	HAPs
Stationary and Mobile Sources	39.90	212.73	82.74	3.51	6.86	21,148	1.49
Total Emissions	**39.90**	**212.73**	**82.74**	**3.51**	**6.86**	**21,148**	**1.49**
Santa Barbara County 2017 Emissions	**8,619**	**20,245**	**5,287**	**200**	**4,656**	**2,230,774**	**1,208**
Vandenberg AFB 2017 Emissions % of County 2017 Emissions	**0.5%**	**1.1%**	**1.6%**	**1.8%**	**0.2%**	**1.0%**	**0.1%**

Source: (Vandenberg AFB, 2018)

Key: CO = carbon monoxide; CO_2e (mt) = carbon dioxide equivalent in metric tons; HAPs = hazardous air pollutants; NO_x = nitrogen oxides; PM_{10} = particulate matter less than or equal to 10 microns in diameter; SO_x = sulfur oxides; VOCs = volatile organic compounds

3.2.4.1.2 Regional Climate

The climate of the project area is Mediterranean, characterized by warm, dry summers and mild, relatively damp winters. The major influence of the regional climate is the Pacific Ocean and the Eastern Pacific High, a strong persistent atmospheric high-pressure system. Meteorological data collected at Lompoc, about 3 miles southeast of Vandenberg AFB, are used to describe the climate of the Vandenberg AFB project region (Western Region Climate Center, 2016).

Temperature. Due to the proximity of the project site to the coastline, marine air from the Pacific Ocean has a strong moderating effect on air temperatures at Vandenberg AFB. The high and low temperatures during the summer months average in the mid-70s (°F) and low 50s, respectively. The high and low temperatures during the winter months average in the mid-60s and low 40s.

Precipitation. The average annual precipitation for Vandenberg AFB is about 15 inches. Over 90 percent of the total annual precipitation in the project area occurs from polar storm systems that frequent the area during the months of November through April. The peak monthly average rainfall of 3.1 inches occurs in February. Summer is the driest season, when an average of 0.10 inches occurs from June through August. Snowfalls in the region are extremely rare and average less than 1.0 inch per year.

Prevailing Winds. Winds prevail from the northwest direction at Vandenberg AFB for every month of the year. Variations to this wind flow occur during the late evening and early morning hours due to easterly winds that flow down the Santa Ynez River valley, in addition to southeast winds that occur ahead of polar storm systems during the colder months of the year.

3.2.4.1.3 Greenhouse Gases

GHGs are gases that trap heat in the atmosphere. GHG emissions are generated by both natural processes and human activities. The accumulation of GHGs in the atmosphere regulates the earth's temperature. Human activities are contributing to climate change, primarily by releasing GHGs into the atmosphere. Climate change refers to any significant change in the measures of climate lasting for an extended period of time (USEPA, 2016).

The most recent assessment of climate change impacts conducted by the State of California (California's Fourth Climate Change Assessment or Fourth Assessment) predicts that temperatures in California will increase by 5.6°F or 8.8°F by 2100, based on scenarios of moderate GHG emission reductions from current levels or a continuation of current GHG emission levels (business as usual) (Representative Concentration Pathways 4.5 and 8.5 scenarios, respectively, as developed in the Intergovernmental Panel on Climate Change Fifth Assessment Report) (Bedsworth et al., 2018). In California, global warming effects are predicted to include exacerbation of air quality problems, a reduction in municipal water supply from the Sierra snowpack, a rise in sea level that would displace coastal development, damage to marine and terrestrial ecosystems, and an increase in the incidence of infectious diseases, asthma, and other human health problems (Bedsworth et al., 2018).

The potential effects of GHG emissions generated by the project alternatives are by nature global. Given the global nature of climate change and the current state of the science, it is not useful at this time to attempt to link the emissions quantified for local actions to any specific climatological change or resulting environmental impact. Therefore, the quantitative analysis of CO_2e emissions

in this EIS is for disclosing the local net effects (increase or decrease) of the Proposed Action and alternatives and for its potential usefulness in making reasoned choices among alternatives.

3.2.4.1.4 Applicable Regulations and Standards

Vandenberg AFB is located within Santa Barbara County, which is within the South Central Coast Air Basin. The South Central Coast Air Basin is composed of the counties of San Luis Obispo, Santa Barbara, and Ventura. The Santa Barbara County Air Pollution Control District is responsible for regulating stationary sources of air emissions in Santa Barbara County. Appendix B.4 of this EIS presents additional information on the regulatory setting of the Vandenberg AFB project region.

3.2.4.2 Airspace and Ranges

Airspaces projected for use by proposed MQ-9 aircraft operations and flight routes between these locations and Vandenberg AFB would occur within western Santa Barbara County, the offshore waters of Southern California, and areas in Central California. However, these MQ-9 aircraft operations would not appreciably affect ground-level air quality, as they would occur well above 3,000 feet AGL.

3.2.5 Hazardous Materials and Waste, Vandenberg AFB

Vandenberg AFB has the facilities and established procedures and protocols for the use, handling, and management of hazardous materials and waste.

3.2.5.1 Hazardous Materials Management

A variety of products containing hazardous materials is used by the installation as part of day-to-day operations. To administer these materials, Vandenberg AFB has implemented a comprehensive hazardous materials management process, including the use of an HTA, in Building 5500. The HTA encompasses a storage facility and an established set of procedures designed to control the acquisition, storage, issue, and disposition of serviceable hazardous materials. (Vandenberg AFB, 2015a).

Aircraft flight operations and maintenance and installation maintenance require storage and use of hazardous materials such as flammable and combustible liquids. These materials include acids, corrosives, caustics, glycols, compressed gases, aerosols, batteries, hydraulic fluids, solvents, paints, pesticides, herbicides, lubricants, fire retardants, photographic chemicals, alcohols, and sealants. The existing storage tanks for JP-8 are operated under an SPCCP.

3.2.5.2 Hazardous Waste Management

Vandenberg AFB is a Large Quantity Generator of hazardous waste per USEPA regulations and maintains a USEPA Identification Number, 100000064431. Vandenberg AFB manages its hazardous waste in accordance with its HWMP and in compliance with the State of California

regulations and USEPA's regulations as contained in CFR, Title 40, Parts 261 through 280 (Vandenberg AFB, 2015a).

Hazardous waste is generated by aircraft, vehicle, and aviation support equipment maintenance activities and from POL management and distribution. Types of hazardous and petroleum (non-hazardous) waste generated include used oil and filters, used antifreeze, used solvent, used sealants, reclaimed fuel, waste diesel and motor gasoline, waste fuel and fuel filters, paint waste, spent hydraulic fluid, waste corrosives, and fluorescent lamps and batteries (managed as universal waste).

Disposal of hazardous waste generated on Vandenberg AFB is the responsibility of the Defense DLA-DS. Specifically, the DLA and its local Contracting Officer Representative (COR) are responsible for overseeing Vandenberg AFB hazardous waste disposal activities. The DLA contracts out hazardous waste management services to a commercial firm that serves as the agent for receiving and storing specified hazardous waste; arranging for the shipment of the hazardous waste to permitted off-base TSDFs; and managing and operating the CCAP (Vandenberg AFB, 2015b).

Vandenberg AFB has implemented policies and procedures that identify hazardous waste generation areas and address the proper labeling, storage, and handling of these wastes, as well as record keeping, spill contingency and response requirements, and education and training of appropriate personnel. All policies and procedures associated with the management of hazardous waste are outlined in the HWMP (Vandenberg AFB, 2015b).

3.2.5.3 Environmental Restoration Program

The ERP program in general is described in Section 3.1.5.3. The ERP at Vandenberg AFB began in the early 1980s with a basewide record search that identified 44 ERP sites for further investigation. Supplemental site assessments and investigation have increased the total number of ERP sites requiring further evaluation to 146. Regulatory requirements for further investigation of Areas of Interest (AOIs) have identified 152 areas of concern (AOCs) requiring further evaluation (Vandenberg AFB, 2011b).

3.2.5.4 Contamination Sites

There are five former and one active ERP/contamination sites identified at Vandenberg AFB associated with historical operations (Figure 3.2-3) near construction projects for the proposed MQ-9 Beddown (Vandenberg AFB, 2019a).

The active ERP site is Site AOI-147 (also known as CG 147). This site footprint is under building 8401, which is proposed for internal renovations for use as the MQ-9 Operations Complex. This site is an active site undergoing treatment for solvent contamination in soil, shallow soil gas, and perched groundwater. The active treatment is planned to continue until 2024. However, this treatment would not preclude repurposing and occupying this building for industrial use.

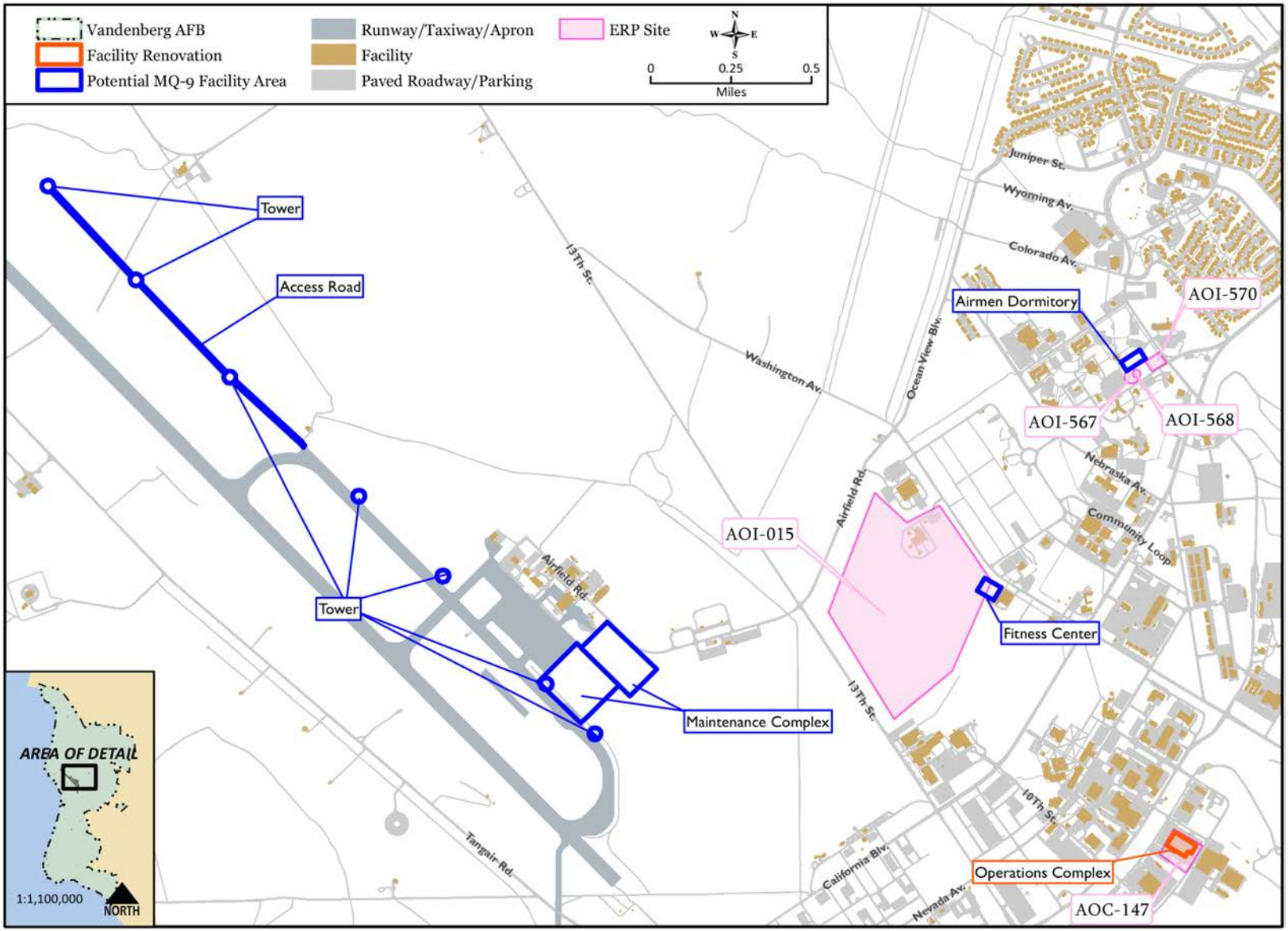

Figure 3.2-3. Vandenberg AFB MQ-9 Beddown ERP Sites

The five closed ERP/contamination sites at Tyndall AFB include the following:

- ERP Site AOI-570. This site is a former UST investigation associated with the former Building 13028. The UST was removed in 1986 and the site was closed by the State of California in 1993. This site footprint is near the proposed MQ-9 dormitory location.
- ERP Site AOI-569. This site was a former UST investigation associated with the former Building 13027. The UST was removed in 1986 and the site was closed by the State of California in 1993. This site footprint is near the proposed MQ-9 dormitory location.
- ERP Site AOI-568. This site was a former UST investigation associated with the former Building 13026. The UST was removed in 1994 and the site was closed by the State of California in 1999. This site footprint is near the proposed MQ-9 dormitory location.
- ERP Site AOI-567. This site was a former UST investigation associated with the former Building 13026. The UST was removed in 1993 and the site was closed by the State of California in 1994. This site footprint is near the proposed MQ-9 dormitory location.
- ERP Site AOI-15. This site was an area of reported concrete and asphalt disposal. This site was closed by the State of California in 2001 and is near the proposed MQ-9 fitness center location.

3.2.6 Soils and Geologic Resources, Vandenberg AFB

The ROI for soils and geologic resources would be any area where ground-disturbing activities associated with the Proposed Action would occur. For Vandenberg AFB this would be areas of construction and renovation indicated in Figure 2.3-4. Local and regional resource conditions are described for context, where applicable.

3.2.6.1 Geology

Vandenberg AFB is a geologically complex area that includes the transition zone between the Southern Coast Range and Western Transverse Range Geomorphic Provinces of California. Major geomorphic features of Vandenberg AFB include the Casmalia Hills, San Antonio Terrace, Barka Slough, Purisima Hills, Burton Mesa, Lompoc Valley, Lompoc Terrace, Santa Ynez Mountains, and Sudden Flats. Generally, northwest-trending ridges and valleys characterize topography at Vandenberg AFB (Vandenberg AFB, 2011a).

Underlying Vandenberg AFB are marine sedimentary rocks of Late Mesozoic age (140 to 70 million years before the present) and Cenozoic age (70 million years to the present). Extensive folding and faulting throughout the region has created four structural regions: the Santa Ynez Range, the Lompoc lowland, the Los Alamos syncline, and the San Rafael Mountain uplift (USAF, 2019i). Much of the runway and developed areas of Vandenberg AFB are located within the Lompoc and Surf quadrangles. Surficial geology in these areas is largely mapped as older Quaternary alluvium, a late Pleistocene, poorly consolidated deposit of sand and pebble gravel (USGS, 1988). Bedrock in the area of the Proposed Action consists of the Monterey Formation, a late-Miocene thinly bedded, siliceous shale with thin limestone strata (USGS, 1988). Near-surface geology includes the Orcutt formation (ranging from less than 1 foot to 150 feet in thickness), a middle- to upper-Pleistocene eolian non-marine sand and gravel underlain by the

Paso Robles and the Monterey formations. The lower portion of the Orcutt formation consists of well-rounded pebbles of quartzite, igneous rocks, and Monterey chert and shale.

3.2.6.2 Seismicity

The California Geological Survey classifies faults as either active or potentially active, according to the Alquist-Priolo Special Studies Zone Act of 1972. Alquist-Priolo Special Study Zones around faults are designated by the California Geological Survey in areas identified by the California State Geologist as being active. The Alquist-Priolo Special Studies Zone Act limits development along the surface trace of active faults in order to reduce the potential for structural damage and/or injury due to fault rupture. The California Geological Survey also suggests that active faults located within a 60-mile radius of a project site be evaluated with respect to regional seismicity.

Santa Barbara County is located in a zone of high seismic activity in the Transverse Range geologic province. Although most seismic activity in California occurs along the San Andreas Fault system (7 miles northeast of Santa Barbara County), most historic seismic events in the Santa Barbara region have originated offshore on an east-west trending fault between Santa Barbara and the Channel Islands. Active faults in the San Andreas Fault system that fall within Santa Barbara County include the Nacimiento, Ozena, Suey, and Little Pine faults (USGS, 2020b). Numerous onshore and offshore faults have been mapped near Vandenberg AFB; however, most are inactive and incapable of surface fault rupture or are unlikely to generate earthquakes.

Four major faults are present on Vandenberg AFB: the Lion's Head fault on north Vandenberg AFB and the Hosgri (largely offshore), Santa Ynez River, and Honda Faults on south Vandenberg AFB (SBCOEM, 2017).

During an earthquake, soils in lowland areas with high water capacity or proximity to the underlying water table are susceptible to liquefaction. On level ground, liquefaction results in water rising to the ground surface. On sloping ground, liquefaction will usually result in slope failure, possibly resulting in landslides. Areas in low coastal plan and valley bottoms are underlain by alluvium and given a moderate rating with respect to liquefaction potential. The areas most prone to liquefaction on Vandenberg AFB are near San Antonio Creek and the Santa Ynez River, which are categorized as having moderate to high potential for liquefaction (SBCOEM, 2017). The potential for liquefaction on Vandenberg AFB, despite these areas, is considered low. Additionally, there are no known areas within the project area where liquefaction has occurred.

3.2.6.3 Oil and Gas Leases

In December 2019, the Bureau of Land Management released a ROD for a Final Supplemental EIS that explores multiple alternatives for allowing drilling and hydraulic fracturing (fracking) on public lands across eight counties in California's Central Valley and Central Coast, including 122,000 acres in Santa Barbara County. The Supplemental EIS identifies much of the lands comprising Vandenberg AFB as an area open for oil and gas leasing.

Two oil field well boundaries of the Central Coastal District of California either cross into or are contained within Vandenberg AFB. The Jesus Maria field is located to the north of the former Marshallia Golf Course. None of the eight wells located in this field are currently active; five are

classified as idle and have not actively produced since the 1980s and the remaining three are plugged. In the Lompoc field, there are five wells classified as active within the boundary of Vandenberg AFB (CADOC, 2019). In a December 2019 letter, the California Department of Conservation indicated that there were no known oil wells located near the proposed facility locations (CADOC, 2020).

3.2.6.4 Soils

A soil-mapping unit represents an area characterized by one major kind of soil, or an area characterized by several kinds of soils (often referred to as a series). Many of the soil map units described in this section contain minor soils that are encompassed within the map unit. This section presents properties of the soil type that comprise the majority of each soil map unit to provide an indication of the conditions and limitations of soils found in the project area. Minor soils contained within dominant soil types in any given area can have different properties and limitations that can only be determined by onsite examination.

Seven dominant soil types have been identified on Vandenberg AFB (Vandenberg AFB, 2011a). These include:

- The Tangair-Narlon association of poorly drained and moderately well drained sands and loamy sands, located primarily on terraces.
- The Marina-Oceano association of drained sands found on mesas and dunes.
- The Chamise-Arnold-Crow Hill association of well-drained and somewhat excessively drained sand to clay loams on high terraces and uplands.
- The Concepcion-Botella association of well-drained loamy sands, fine sandy loams, and silty clay loams found on terraces and in small valleys.
- The Sorrento-Mocho Camarillo association of well-drained to somewhat poorly drained sandy loams to silty clay loams on floodplains and alluvial fans.
- The Shedd-Santa Lucia-Diablo association of well-drained, shaly clay loam found on strongly sloping to very steeply sloping topography.
- The Los Osos-San Andreas-Tierra association of well-drained to moderately well-drained soils of fine sandy loams to sand found in strongly sloping to very steep terrain.

Soils near the areas of the proposed MQ-9 Wing beddown at Vandenberg AFB are predominately sandy or loamy, slightly acidic to neutral, well drained, and, in general, far removed from the underlying water table. Characteristics of the predominant soil series in areas that could be affected by ground activities of the proposed MQ-9 Wing beddown are depicted in Figure 3.2-4. Soil series descriptions can be found on the Official Series Descriptions of the NRCS (NRCS, 2020c) and the NRCS Web Soil Survey online data resource (NRCS, 2020d).

3.2.6.5 Prime Farmland

Some soils near the Proposed Action location have prime farmland designation: Elder shaley loam is categorized as prime farmland soil and Marina sands are categorized as a farmland of statewide importance (NRCS, 2020c). These soils are depicted in Figure 3.2-4.

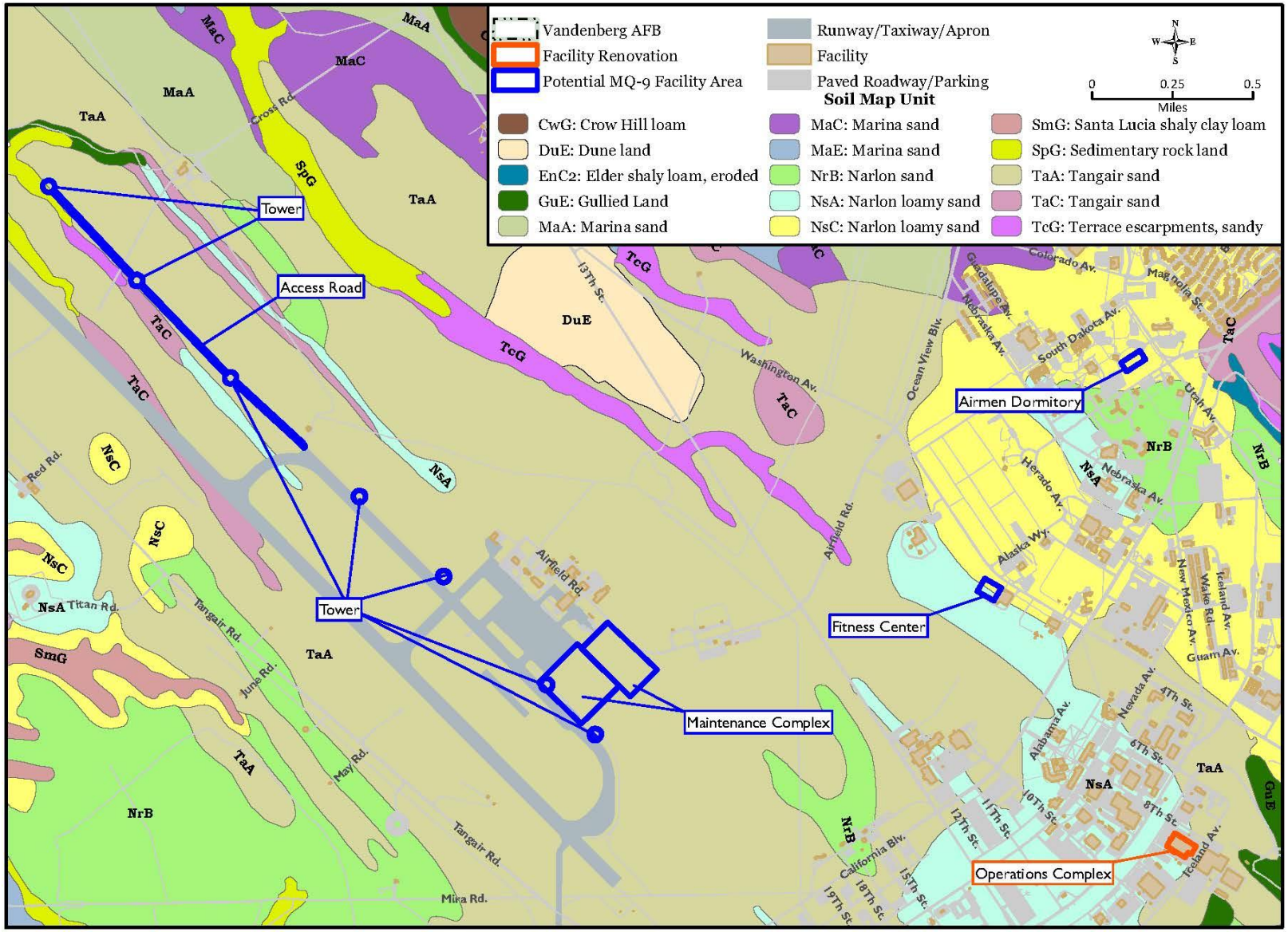

Figure 3.2-4. Soil Types in Areas of Disturbance for Facilities Associated With MQ-9 Wing Beddown at Vandenberg AFB

3.2.7 Water Resources, Vandenberg AFB

3.2.7.1 Surface Water

The major freshwater resources of the Vandenberg AFB region include six streams that comprise two major and four minor drainages. The major drainages are San Antonio Creek and the Santa Ynez River, and the minor drainages include Jalama Creek, Shuman Creek, Bear Creek, and Cañada Honda Creek (Vandenberg AFB, 2011a). The drainages on Vandenberg AFB are subject to runoff from on-base construction and agriculture. San Antonio Creek, the Santa Ynez River, and Shuman Creek also receive off-base agricultural runoff, which results in elevated dissolved solids, phosphates, and nitrates in those streams. Figure 3.2-5 depicts these and other waters.

Table 3.2-6 details the CWA Section 303(d) impaired water that could receive runoff due to the proposed MQ-9 Wing beddown at Vandenberg AFB. Total maximum daily loads for this waterbody are expected to be established in 2021.

Table 3.2-6. Vandenberg AFB CWA 303(d) Waters

Waterbody ID	Water Segment Name	Impairment(s)
CAR314100402005081612563 1	Santa Ynez River (below city of Lompoc to ocean)	Sedimentation/siltation (sediment) Nitrates (nutrients) pH (miscellaneous) Sodium (salinity) Fecal coliform (fecal indicator bacteria) *Escherichia coli* (fecal indicator bacteria) Low dissolved oxygen (nutrients) Total dissolved solids (salinity) Water temperature Chloride (salinity) Toxicity (toxicity)

Source: (California Envionmental Protection Agency, 2017)

Vandenberg AFB operates under a Small MS4 General Permit CAS000004. The Small MS4 General Permit applies to discharges from urbanized areas at Vandenberg AFB, and it requires that Vandenberg AFB regulate stormwater runoff from new development and redevelopment projects. This is accomplished by following the Vandenberg AFB Post-Construction Storm Water Standards, which describe Low Impact Development (LID) and Storm Water Control Plan requirements.

Vandenberg AFB operates under a General Permit for Storm Water Discharges Associated with Industrial Activities (General Permit) Order No. 2014-0057-DWQ (NPDES No. CAS000001) issued by the State Water Resources Control Board. Five distinct industrial facilities managed by the USAF and located at Vandenberg AFB are subject to the requirements of the General Permit, including a landfill, recycling center, vehicle maintenance area, and airfield. To satisfy the requirements of the NPDES permit, the USAF has prepared and implemented an SWPPP (Vandenberg AFB, 2016).

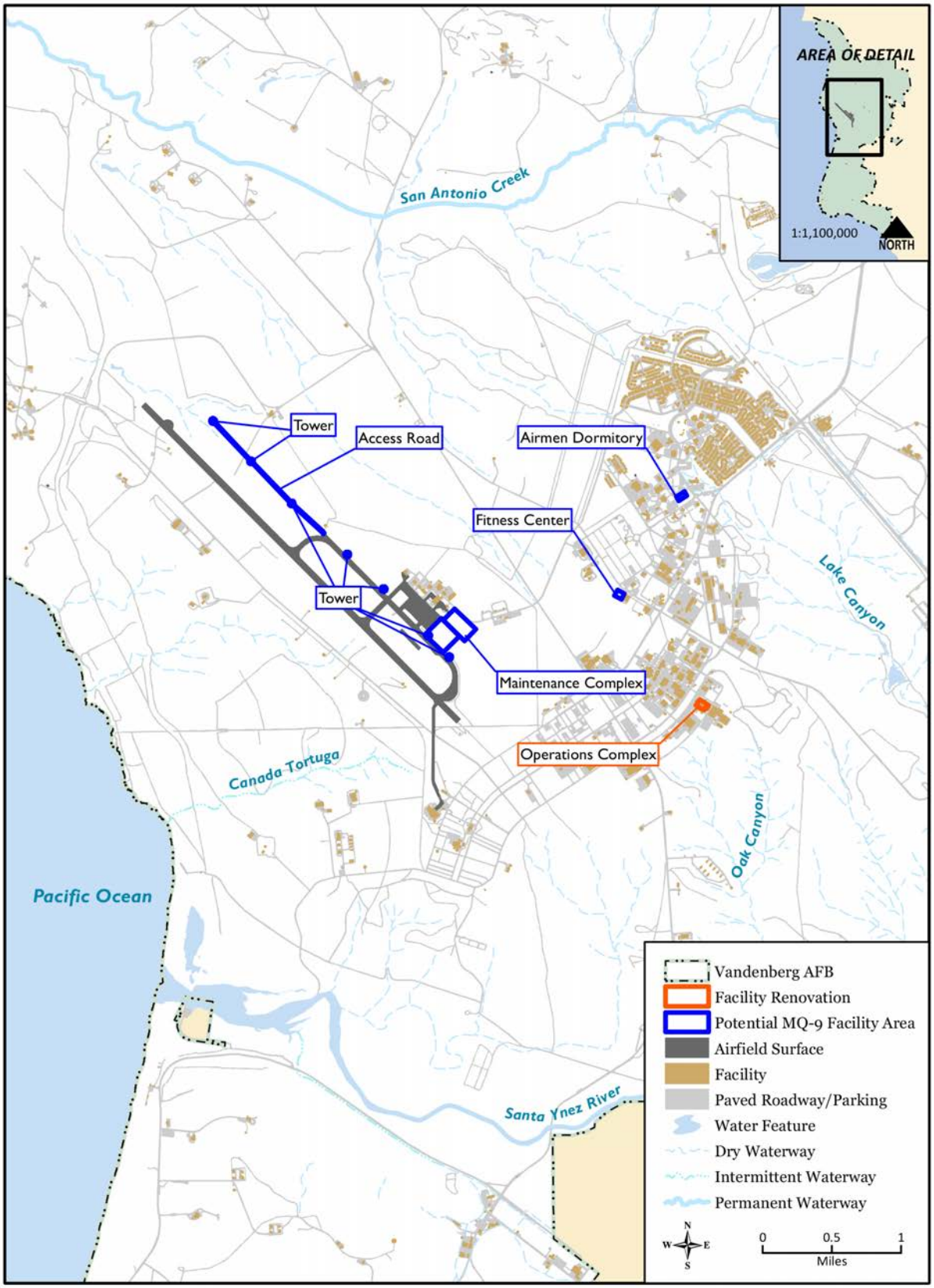

Figure 3.2-5. Water Resources at Vandenberg AFB

3.2.7.2 Groundwater

Vandenberg AFB includes parts of two major groundwater basins and at least two subbasins. Most of the northern third of the base is within the San Antonio Creek Basin, while most of the southern two-thirds of the base are within the Santa Ynez River Basin and associated Lompoc Terrace and Cañada Honda Subbasins (USAF, 2013b). Construction areas for the proposed MQ-9 Wing beddown are not located within the San Antonio Creek Basin or Santa Ynez River Basin.

Groundwater in the subsurface of the cantonment area occurs within a variety of the unconsolidated sediments. However, occurrence is not consistent, either vertically or horizontally, throughout the cantonment area. This apparent inconsistency or discontinuity of groundwater is sometimes the case within a single area, although at some areas it is more consistent and predictable (Arcadis, 2019).

While most of the potable water at Vandenberg AFB is supplied by the Central Coast Water Authority via the Coastal Branch of the California Aqueduct, four wells located in the San Antonio Creek-Barka Slough area are used to supplement Vandenberg AFB during annual maintenance periods. Treated groundwater is used about 1 to 3 weeks per year, while maintenance is being performed on the main water line.

3.2.7.3 Floodplains

Floodplains (100 year) have been delineated for San Antonio Creek and the Santa Ynez River, and compliance with EO 11988, Floodplain Management, is required. There are no floodplains present at any construction areas for the proposed MQ-9 Wing beddown.

3.2.7.4 Coastal Zone Management

California has a federally approved Coastal Zone Management Program. The California Coastal Commission is the lead agency for coastal management and is responsible for enforcing the state's federally approved coastal management plan. California's Coastal Management Program was established in 1978 to protect and manage California's coastal zone and the resources that lie within.

California's coastal zone is defined as the land and water area of the state extending seaward to the state's outer limit of jurisdiction, including all offshore islands and extending inland generally 3,000 feet from the mean high tide line, but excludes all federal facilities including Vandenberg AFB. Federal actions undertaken at Vandenberg AFB that have reasonably foreseeable effects on California's coastal zone must be consistent with California's six enforceable policies, which are included in Chapter 3 of the California Coastal Act. The enforceable policies relevant to the proposed MQ-9 Wing beddown are Article 2, Public Access; Article 3, Recreation; Article 4, Marine Environment; Article 5, Land Resources; and Article 6, Development.

3.2.8 Biological Resources, Vandenberg AFB

3.2.8.1 Flora

Vandenberg AFB is located in the Central and Southern California Coast Sections of the California Coastal Chaparral Forest and Shrub Province (McNab, 1996). Vegetation in this region historically consisted of chaparral, mixed hardwood forest, coastal prairie-scrub, coastal sagebrush, valley oak savanna, and southern oak forest communities. Grazing, agriculture, forestry, and urbanization have changed the historical vegetation communities in the region.

The majority of Vandenberg AFB consists of forested/scrub and chaparral habitats (Table 3.2-7). Developed lands include the urbanized area of Vandenberg AFB and consist primarily of turf grass and landscaped areas. Detailed information on these community types is contained in the INRMP (Vandenberg AFB, 2011a).

Table 3.2-7. General Vandenberg AFB Habitat Types

Habitat	Acreage
Grasses, Forbs, and Herbs	19,324
Sage Scrub (Coastal and Purple)	28,300–35,900
Coastal Strand, Dune Scrub, Bluff Scrub	10,012
Chaparral	13,061
Oak woodland	4,354
Riparian Woodland	2,200–3,940
Permanent Ponds	Not recorded
Freshwater Marsh/Vernal Pool	350
Bishop Pine Forest	454
Coastal Salt Marsh	172
Rocky Headlands/Coastal Bluffs	Not recorded
Tanbark Oak Forest	64
Freshwater Lakes	32
Freshwater Streams	27 miles
Saltwater Areas	60
Developed and other	11,856

Source: (Vandenberg AFB, 2011a)

3.2.8.2 Fauna

Common wildlife documented on the base includes a wide variety of birds, mammals, reptiles, and invertebrate species adapted to the various vegetative communities on the installation. Common game species include California mule deer (*Odocoileus hemionus californicus*), feral pig (*Sus scrofa*), mourning dove (*Zenaida macroura*) and various rabbit and waterfowl species (Vandenberg AFB, 2019b; Vandenberg AFB, 2011a). Representative bird species include belted kingfisher, red-winged blackbird, wrentit (*Chamaea fasciata*), spotted towhee (*Pipilo maculatus*), Bewick's wren (*Thryomanes bewickii*), California quail (*Callipepla californica*), western meadowlark (*Sturnella neglecta*), horned lark (*Eremophila alpestris*), Cassin's kingbird (*Tyrannus vociferans*), western bluebird (*Sialia mexicana*) and red-shouldered hawk (*Buteo lineatus*). Representative mammals include mule deer, coyote (*Canis latrans*), and mountain lion (*Puma*

concolor). Reptiles recorded at the installation include western rattlesnake (*Crotalus oreganus*) and gopher snake (*Pituophis catenifer annectens*), among others.

3.2.8.3 Wetlands

According to the INRMP, wetlands comprise approximately 5 percent of Vandenberg AFB (Vandenberg AFB, 2011a) and consist of a range of wetland types, including both freshwater (palustrine) and marine (estuarine) systems. Major wetland resources are associated with Barka Slough, San Antonio Creek, the Santa Ynez River, and the Santa Ynez River estuary. Vandenberg AFB also supports isolated depressional wetlands and vernal pool wetlands, which are distributed throughout the installation but limited overall as a habitat type.

3.2.8.4 Sensitive Species

Twenty (20) federally listed species have been observed at Vandenberg AFB (Table 3.2-8), and another three federally listed species have the potential to occur on the installation. In addition to federally listed species, a number of state listed species and species protected under the BGEPA and the MMPA are known to occur on the installation (Table 3.2-8). Formal Section 7 consultation has been initiated with the USFWS and a Biological Assessment has been prepared for federally listed species at Vandenberg AFB (Vandenberg AFB, 2020a). Not all species were carried forward for detailed evaluation in the Biological Assessment due to a lack of suitable habitat, lack of known occurrences, and/or information demonstrating a species is only known from other areas of Vandenberg AFB and would be unaffected by proposed activities (Table 3.2-8) (Vandenberg AFB, 2020a). Migratory birds at Vandenberg AFB are federally protected under the Migratory Bird Treaty Act.

Table 3.2-8. Federally and State Listed Species with Potential to Occur at Vandenberg AFB, California

Common Name	Scientific Name	Status[1]	Habitat	Potential Occurrence on Vandenberg AFB
Mammals				
Southern sea otter	*Enhydra lutris nereis*	FT	Nearshore waters, off rocky coastline kelp beds	O
Pacific harbor seal	*Phoca vitulina richardii*	MMPA	Coastal waters and rocky shorelines	O
Northern elephant seal	*Mirounga angustirostris*	MMPA	Coastal waters, sandy beaches, rocky shorelines	O
California sea lion	*Zalophus californianus*	MMPA	Coastal waters, sandy beaches, rocky shorelines	O
Northern fur seal	*Callorhinus ursinus*	MMPA	Coastal waters, sandy beaches, rocky shorelines	O
Townsend's big-eared bat	*Corynorhinus townsendii*	CSC	Rocky outcrops, man-made structures	O
Pallid bat	*Antrozous pallidus*	CSC	Rocky outcrops, arid caves, manmade structures	O
Western mastiff bat	*Eumops perotis californicus*	CSC	Caves, abandoned structures, attics, trees	P

Table 3.2-8. Federally and State Listed Species with Potential to Occur at Vandenberg AFB, California

Common Name	Scientific Name	Status[1]	Habitat	Potential Occurrence on Vandenberg AFB
San Diego desert woodrat	*Neotoma lepida intermedia*	CSC	Coastal sage scrub, prickly pear cactus	O
American badger	*Taxidea taxus*	CSC	Open grasslands	O
Birds				
Allen's hummingbird	*Selasphorus sasin*	CSC	Open or partly wooded areas	O
Ashy storm-petral	*Oceanodroma homochroa*	CSC	Rock outcrops, coastal bluffs	O
Bald eagle	*Haliaeetus leucocephalus*	BGEPA/SE	Large lakes and wetlands	O
Bank swallow	*Riparia*	ST	Coastal bluffs	Undetermined
Belding savannah sparrow	*Passerculus sandwichensis beldingi*	SE	Saltmarsh vegetation and coastal grassland	P
Black skimmer	*Runchops niger*	CSC	Nearshore waters	O
California least tern	*Sternula antillarum browni*	FE	Sand dunes near water	O
California condor[2]	*Gymnogyps californianus*	FE	Scrubby chaparral to forested mountain regions	O
Common loon	*Gavia immer*	CSC	Nearshore waters, estuary, artificial ponds	O
Costa's hummingbird	*Calypte costae*	CSC	Riparian woodland	O
Golden eagle	*Aquila chrysaetos*	BGEPA/CSC	Cliffs, large trees in open areas	O
Grasshopper sparrow	*Ammodramus savannarum*	CSC	Grassland, open scrub	O
Least bittern	*Ixobrychus exilis*	CSC	Freshwater marsh, ponds, lakes with emergent vegetation	O
Least Bell's vireo	*Vireo bellii pusillus*	FE	Riparian corridor	P
Little willow flycatcher	*Empidonax trailii brewsteri*	SE	Willow thickets and brushy swamps	P
Loggerhead shrike	*Lanius ludovicianus*	CSC	Semi-open country with posts, wire, trees, scrub	O
Long-eared owl	*Asio otus*	CSC	Riparian woodland	O
Marbled murrelet	*Brachyramphus marmoratus*	FT	Nearshore waters	O
Mountain plover	*Charadrius montanus*	CSC	Semi-arid plains, grassland, plateaus	O
Northern harrier	*Circus cyaneus*	CSC	Open grassland, coastal sage scrub, marshes, agricultural areas	O
Olive-sided flycatcher	*Contopus cooperi*	CSC	Oak and riparian woodland	O
Purple martin	*Progne subis*	CSC	Nests in crevices in trees and rocks in woodland habitats	Undetermined
Short-eared owl	*Asio flammeus*	CSC	Coastal grassland and marshland	O
Southwestern willow flycatcher	*Empidonax traillii extimus*	FE	Undisturbed willow riparian	O

Table 3.2-8. Federally and State Listed Species with Potential to Occur at Vandenberg AFB, California

Common Name	Scientific Name	Status[1]	Habitat	Potential Occurrence on Vandenberg AFB
Tricolored blackbird	*Agelaius tricolor*	CSC	Dense tule stands, fields, and pastures	O
Vaux's swift	*Chaetura vauxi*	CSC	Nests in large hollow trees	O
Western burrowing owl	*Athene cunicularia hypugea*	CSC	Open, dry grassland	O
Western snowy plover	*Charadrius nivosus*	FT	Coastal sandy beaches, dunes	O
White-tailed kite	*Elanus leucurus*	CP	Open grassland, sparse woodlands, coastal scrub	O
Yellow breasted chat	*Icteria virens*	CSC	Dense willow riparian thicket woodland	O
Yellow warbler	*Dendroica petechial brewsteri*	CSC	Willow riparian woodland	O
Reptiles				
California horned lizard	*Phrynosoma blainvillii*	CSC	Scrub, chaparral, and grassland with open shrub canopy and loose sandy or loamy soils	O
Silvery legless lizard	*Anniella pulchra*	CSC	Sparsely vegetated coastal scrub and chaparral with loose sandy or loamy soils	O
Two-striped garter snake	*Thamnophis hammondii*	CSC	Permanent and intermittent rivers and creeks in a variety of habitats	O
Western pond turtle	*Emys marmorata*	CSC	Perennial lakes, ponds, streams; eggs laid in upland areas 16–400 meters from water	O
Amphibians				
California red-legged frog[3]	*Rana draytonii*	FT	Perennial ponds and streams	O
California tiger salamander[4]	*Ambystoma californiense*	FE/FT	Utilizes a variety of burrows in grassland, oak woodland, and coastal scrub. Requires long lasting vernal pools for breeding.	P
Western spadefoot	*Scaphiopus hammondii*	CSC	Grassland, vernal pools in or near loose sandy or loamy soils	O
Fish				
Arryo chub	*Gila orcutti*	CSC	Streams and lakes	O
Southern steelhead	*Oncorhynchus mykiss irideus*	FE	Perennial streams with connection to ocean	O
Tidewater goby	*Eucyclogobius newberryi*	FE	Perennial streams, primarily coastal	O
Unarmored threespine stickleback	*Gasterosteus aculeatus williamsoni*	FE	Perennial streams	O
Gastropods				
Black abalone	*Haliotus cracherodii*	FE	Coastal waters and rocky shorelines	O

Table 3.2-8. Federally and State Listed Species with Potential to Occur at Vandenberg AFB, California

Common Name	Scientific Name	Status[1]	Habitat	Potential Occurrence on Vandenberg AFB
Crustaceans				
Vernal pool fairy shrimp	*Branchinecta lynchi*	FE	Vernal ponds	O
Flowering Plants				
Beach layia	*Layia carnosa*	FE	Coastal dunes	O
Beach spectaclepod	*Dithyrea maritima*	ST	Coastal dunes	O
Gambel's watercress	*Nasturtium gambelii*	FE	Freshwater marsh	O
Gaviota tarplant[3]	*Deinandra increscens* ssp. *villosa*	FE	Coastal bluffs, coastal scrub	O[6]
La Graciosa thistle[3]	*Cirsium loncholepis*	FE	Coastal dune swale wetlands, coastal salt marsh. No present locations on Vandenberg AFB.[5]	O[6]
Lompoc yerba santa	*Eriodictyon capitatum*	FE	Chaparral	O
Marsh sandwort	*Arenaria paludicola*	FE	Freshwater marsh[5]	P
Salt marsh bird's beak	*Cordylanthus maritimus* ssp. *maritimus*	FE	Salt marsh[7]	U
Seaside bird's beak	*Cordylanthus rigidus* ssp. *littoralis*	SE	Coastal dunes, chaparral. Primarily found in chaparral on Vandenberg AFB.	O
Surf thistle	*Cirsium rhothophilum*	ST	Coastal dunes	O
Vandenberg monkeyflower[3]	*Diplacus vandenbergensis*	FE	Burton Mesa chaparral	O
Insects				
El Segundo blue butterfly	*Euphilotes battoides allyni*	FE	Scrub habitat with seacliff buckwheat (*Eriogonum parvifolium*)	O

Sources: (Vandenberg AFB, 2011a; USFWS, 2020c; Vandenberg AFB, 2020a)
Key: AFB = Air Force Base; BGEPA = Bald and Golden Eagle Protection Act; FE = Federally Endangered; FT = Federally Threatened; FC = Federal Candidate; PT = Proposed Threatened; SSC = Species of Special Concern; O = Observed; P = Potential; U = Unlikely; SE=State Endangered (California); ST = State Threatened (California); CSC = California Species of Concern; CP = California Fully Protected; USFWS = U.S. Fish and Wildlife Service
Notes:
[1] Federally listed species are also protected under state designations.
[2] One California condor was observed at Vandenberg AFB in 2017. Additional consultation with the USFWS would be required should the California condor return to the installation.
[3] Critical habitat within the ROI.
[4] The Santa Barbara County population is considered FE and the Central California Distinct Population Segment is FT.
[5] Not yet documented at Vandenberg AFB, but surveys continue.
[6] La Graciosa thistle and Gaviota tarplant were last observed and documented in 1958 (30 CES, 2020).
[7] Historically occurred in Santa Ynez River salt marsh, but has not been found recently or documented at Vandenberg AFB.

3.2.9 Cultural Resources, Vandenberg AFB

The APE for cultural resources is based on the type of potential impacts that might occur within the area. The APE for direct impacts is the area directly affected by construction activities that could physically alter, damage, or destroy all or part of a cultural resource. For the MQ-9 Wing beddown, this includes the areas of proposed disturbance shown on Figure 2.3-4 to account for the proposed Operations Complex, the Maintenance Complex, the GDT Foundations and Towers, the Fitness Center, the Airmen Dormitory, and the Infrastructure and Communication Conduit Extension. The APE for indirect visual effects is the same APE for direct impacts, plus the addition of a 0.5-mile buffer to account for the potential introduction of a visual or atmospheric element that could alter the setting of an NRHP-listed or -eligible architectural resource by introducing a visual component that is out of character for the period the resource represents. Finally, the APE for indirect noise effects consists of the 65 dB CNEL noise contour for proposed airfield operations, as shown on Figure 3.2-6, to account for potential noise and/or vibration issues that could affect the setting or otherwise damage an NRHP-listed or -eligible architectural resource.

3.2.9.1 Archaeological Resources

There are approximately 1,600 archaeological sites on Vandenberg AFB (Applied EarthWorks, 2019). Of these 1,600 sites, 2 have been nominated to the NRHP, 111 have been evaluated as NRHP-eligible, and 456 have been recommended as potentially eligible (Vandenberg AFB, 2005). Site types range from prehistoric artifact scatters, rock art sites, middens, campsites, and shell middens to historic-period artifact scatters, camps, and building remains. All areas of the APE for direct impacts for the proposed MQ-9 facilities have been surveyed for archaeological resources, either previously to acceptable standards or specifically for this project; no archaeological sites were identified (USAF, 2020d).

3.2.9.2 Architectural Resources

As of 2005, over 100 historic buildings, structures, and other historical resources have been inventoried on Vandenberg AFB (Vandenberg AFB, 2005). Of this total, 1 building has been determined to be NRHP-eligible and nine properties (including one historic district with 18 buildings) have been recommended as NRHP-eligible (Vandenberg AFB, 2005). The number of resources on the inventory will undoubtedly increase as additional buildings reach the 50-year threshold and other unknown or previously unconsidered properties are documented (Vandenberg AFB, 2005). For the purposes of analysis, unevaluated properties are treated as though they are eligible for listing on the NRHP.

A thorough inventory of Cold War-era buildings and structures on Vandenberg AFB was conducted by the U.S. Army Construction Engineering Research Laboratories (CERL) in 1999 and 2000 (Vandenberg AFB, 2005). The CERL study excluded base exchanges, general administrative buildings, family housing, maintenance shops, sewage treatment plants, and similar facilities from the evaluation because they played secondary functions, but did not support operational missions directly (CERL, 1998). The CERL study resulted in identification of 62 NRHP-eligible Cold War-era properties at Vandenberg AFB. The 62 NRHP-eligible Cold War-era properties (Vandenberg AFB, 2005) on Vandenberg AFB are managed under a programmatic agreement with the California Office of Historic Preservation (Vandenberg AFB, 2005).

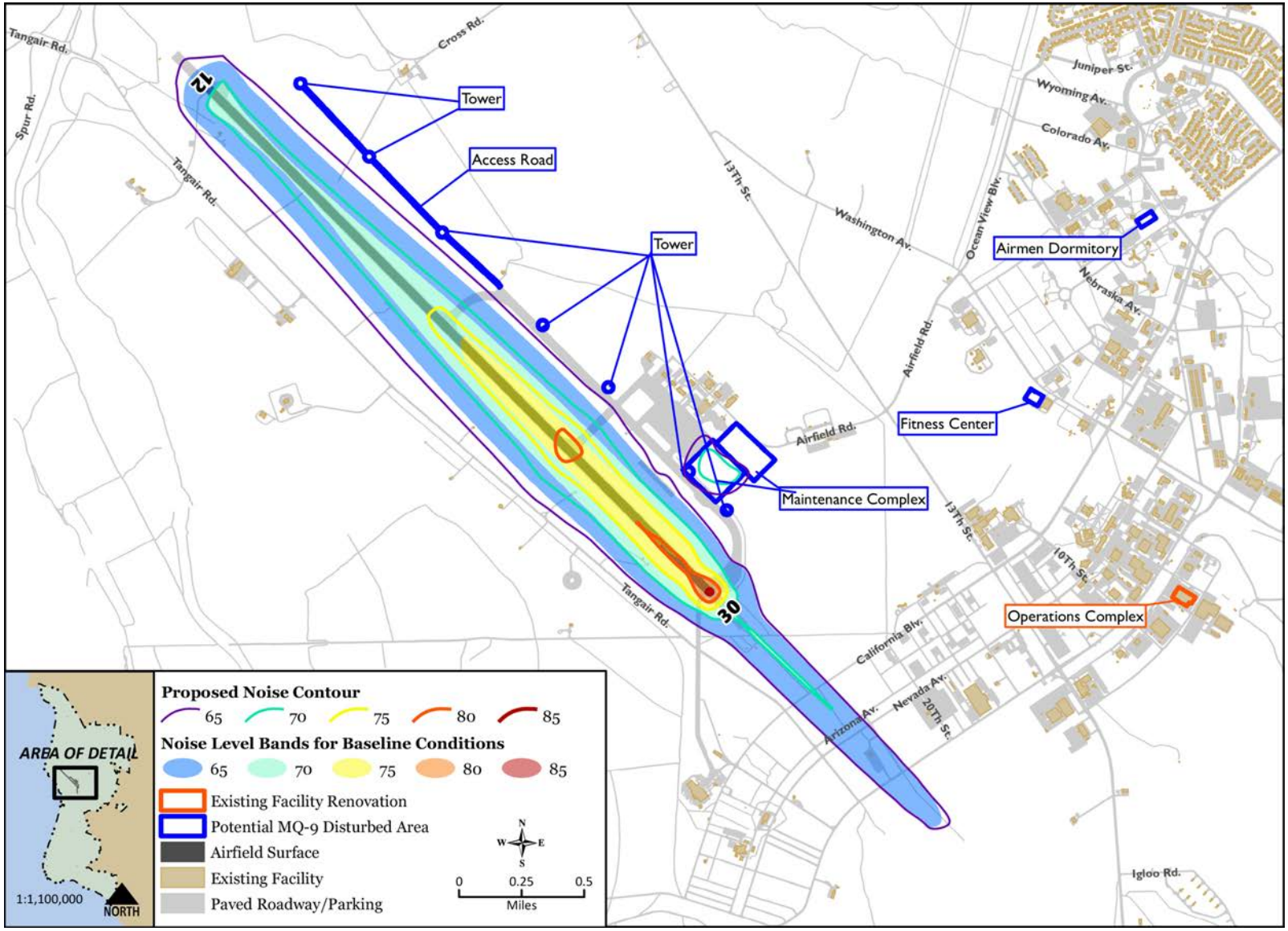

Figure 3.2-6. Area of Potential Effects for Indirect Noise Effects for Vandenberg AFB (65 dB CNEL Noise Contours for Proposed Operations)

APE for Direct Impacts. None of the NRHP-eligible buildings is within the APE for direct impacts for the MQ-9 Wing beddown at Vandenberg AFB. A single previously unevaluated Cold War-era building (building 8401) within the APE for direct impacts was evaluated in 2019 for NRHP eligibility and found to be ineligible both individually and as part of a historic district (AFCEC, 2019b).

APE for Indirect Visual Impacts. There are 26 unevaluated buildings within the APE for indirect impacts (within 1/2 mile of the direct APE) for the construction associated with the MQ-9 Wing beddown at Vandenberg AFB. Many of these buildings are from the Cold War era and were evaluated and excluded by the CERL study (CERL, 1998); however, the study was performed in 1998 and some of these buildings are now 50 years of age or older. The buildings are a mix of dormitories, officers' quarters, a chapel, post office, and a gymnasium.

APE for Indirect Noise/Vibration Impacts. There are five pre-1990 structures within the APE for indirect noise/vibration impacts associated with airfield operations. These structures, constructed between 1959 and 1983, are all related to runway instrumentation, and were evaluated and excluded by the CERL Cold War-era study (CERL, 1998).

3.2.9.3 Traditional Cultural Properties

Vandenberg AFB consults with federally recognized Indian tribes on actions with the potential to affect protected tribal resources, tribal treaty rights, or Indian lands significantly. Consultation letters have been sent to the Santa Ynez Band of Chumash Indians. There are perhaps as many as 1,000 sites, on or near Vandenberg AFB, of ideological importance to federally recognized Chumash tribal members, as well as non–federally recognized persons and groups claiming Chumash cultural affiliation. These sites range from places with cosmological meaning and ritual activity, such as Humqaq (Point Conception), Tranquillon Peak, and Swordfish Cave, to small resource-gathering or processing locales that mark where people ancestral to the Chumash lived (Vandenberg AFB, 2005). The CRM program at Vandenberg AFB recognizes that in the event such traditional cultural properties or sacred sites are identified during the consultation process, the CRM program would collaborate with the tribe in the management and protection of such sites.

3.2.10 Land Use, Vandenberg AFB

3.2.10.1 Land Use on Vandenberg AFB

Vandenberg AFB is located along the Pacific coast in the west part of Santa Barbara County, California. Regionally, the base is roughly halfway between San Francisco and San Diego. The City of Lompoc is located immediately east of the base, 10 miles from the main gate, and the City of Santa Maria is located to the northeast, 20 miles to the main gate.

Vandenberg AFB covers about 99,100 acres. Highway 246 runs through the installation, dividing it into North Vandenberg AFB and South Vandenberg AFB. State Highway 1 passes to the east of the base. The Union Pacific Railroad passes through Vandenberg AFB along the coast.

Vandenberg AFB's primary missions are to launch, place, and track satellites; to test and evaluate intercontinental ballistic missiles (ICBM); and to support aircraft operations in the western range over to Hawaii and the western Pacific Ocean. The Vandenberg AFB INRMP categorizes the land broadly as unimproved (about 33,200 acres that is natural, open-space land), semi-improved (about 21,200 acres with scattered mission facilities and infrastructure), and improved (about 44,700 acres with man-made infrastructure) (Vandenberg AFB, 2011a).

The Base Installation Development Plan (USAF, 2019h) divides Vandenberg AFB into 11 planning districts and applies a set of functional land uses within each district. Three districts (Community, Town Center, and Mission District) account for most of the improved land and support administrative, training, industrial, commercial, and residential land uses. The base has housing for 999 housing units and 440 single-person dorm spaces. To the west of the main cantonment is the airfield with a runway, taxiways, aprons, hangars and flightline support facilities. Missile launch complexes are located in North Vandenberg AFB, while space launch complexes, telemetry, and tracking facilities are scattered throughout both North and South Vandenberg AFB. Between these more improved areas and the coastal beaches, the land is mostly open and natural, providing an important buffer for the safety and security of the mission.

Existing noise levels on Vandenberg AFB are generally low due to the large areas of undeveloped landscape and sparse noise sources. Wind and surf are the primary source of background noise. Louder noise levels originate from industrial facilities and transportation routes. Rocket launches and aircraft overflights generate louder intermittent noise levels. General ambient hourly noise-measurements range from around 35 to 60 dB (Tetra Tech, Inc., 2011). Noise-sensitive land uses on and near Vandenberg AFB include residential areas, hospitals, schools, and libraries.

Vandenberg AFB prepared an AICUZ Study in 2006 (USAF, 2006) and an addendum in 2009 (USAF, 2009). These noise contours provide the surrounding communities and Santa Barbara County with Vandenberg AFB's noise footprint to use in their planning process and documents. Figure 3.2-7 shows the extent of the AICUZ compatibility footprint and the APZs on the base. No areas off base are affected by noise levels of 65 dB CNEL or higher. The safety zones are entirely within the base. Vandenberg AFB has worked with Santa Barbara County and the City of Lompoc to protect land west of the City of Lompoc through agricultural leases and other conservation activities in order to mitigate the threat of encroachment due to projected population growth in the Lompoc Valley area (USAF, 2019h).

About 23,500 acres of rangeland on Vandenberg AFB supports cattle grazing and about 1,100 acres support dryland farming. The U.S. Department of Justice Federal Bureau of Prisons leases Vandenberg AFB land for the U.S. Penitentiary (30th Space Wing, 2016). These penal facilities, including the Federal Correctional Institution, Lompoc, are located between the cantonment and developed areas of the City of Lompoc. The land leased to the U.S. Penitentiary for agricultural uses creates a buffer between Vandenberg AFB and the City of Lompoc residential areas.

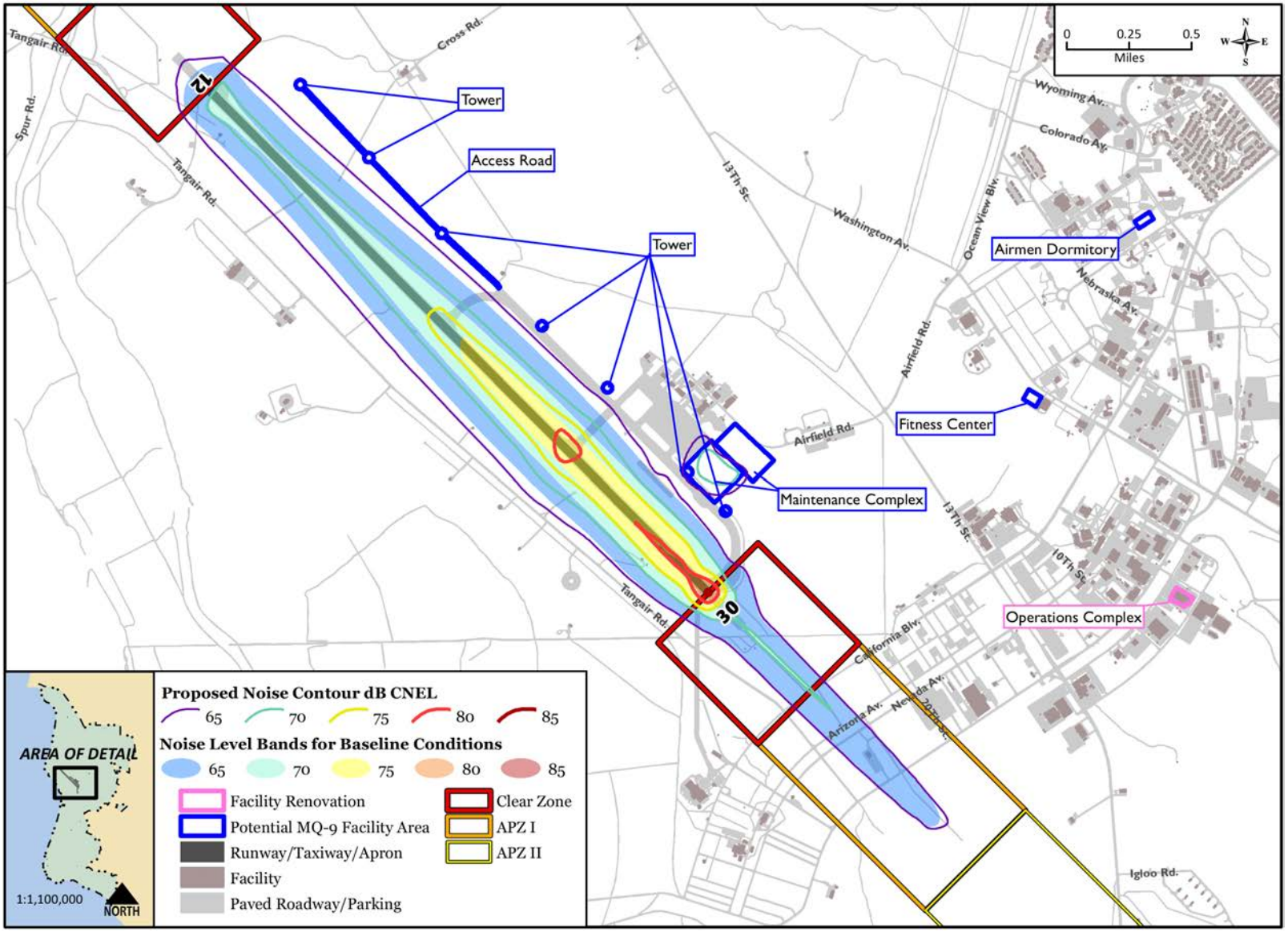

Figure 3.2-7. MQ-9 Mission at Vandenberg AFB Noise Exposure and Clear Zones and Accident Potential Zones

Vandenberg AFB has 42 miles of coastline within the Coastal Zone Management zone. Activities and development in this zone must adhere to the policies of the Coastal Zone Management Act (CZMA), and federal actions affecting this zone must complete a Coastal Consistency Determination (Tetra Tech, Inc., 2011). Vandenberg AFB actively manages coastal areas to preserve the ecology and to comply with CMZA and special management area restrictions.

The City of Lompoc and surrounding communities of Mesa Oaks, Mission Hills, and Vandenberg Village are several miles east of the cantonment areas on Vandenberg AFB. Together, these communities have about 45,000 residents. Historically, about 56 percent of off-base personnel live in Lompoc, and about 43 percent live in Santa Maria/Orcutt (SAIC, 2006). Recent trends in land development suggest that more residents are choosing the Santa Maria/Orcutt and the smaller communities over the City of Lompoc. The remaining 1 percent live mostly in Guadalupe and Buellton in Santa Barbara County. Table 3.2-3 shows that ambient and daytime average noise levels at selected surrounding locations are low, and well below threshold compatibility levels for all AICUZ land use categories.

3.2.10.2 Recreation on Vandenberg AFB

Vandenberg AFB allows recreational activities to the maximum extent possible that is compatible with the mission and safety priorities and environmental considerations. About 15,000 active duty, retirees, dependents of personnel, and over 4,500 civilians have recreational access on Vandenberg AFB. Developed facilities include a campground, picnic areas, shooting range, archery and paintball ranges, saddle club, football fields, tennis courts, running tracks, beach sports, bicycle paths, and off-road vehicle use areas. Permitted employees and family members, retirees, and civilian employees have access to about 4.8 miles of beach along the Vandenberg AFB coastline (Vandenberg AFB, 2011a). The Vandenberg AFB Outdoor Recreation Management Plan describes the recreational facilities and activities and access requirements at Vandenberg AFB (USAF, 2010).

Two dispersed recreation activities on Vandenberg AFB are hunting and fishing. The base regulates these activities under a Fish and Wildlife Cooperative Agreement, in coordination with the California Department of Fish and Wildlife. California Fish and Game Commission sets season and bag limits, and the base is responsible for enforcement (Tetra Tech, Inc., 2011). There are seasonal restrictions on recreational access during certain nesting and breeding times.

Vandenberg AFB provides fishing opportunities (excluding the public) along the Pacific coast with limitations in designated marine preserves. On South Vandenberg AFB, access to the coastline is very restricted due to security, safety, and sensitive wildlife resources. Only selected beach areas are available for fishing and water activities due to safety hazards associated with the powerful undertow and riptides along the coastline. Scuba activity is restricted to members of the Vandenberg AFB dive club, and surfing is limited to members of the Vandenberg AFB surfing club (Tetra Tech, Inc., 2011).

3.2.11 Infrastructure, Vandenberg AFB

3.2.11.1 Potable Water System

The Coastal Branch of the Central Coast Water Authority supplies treated water to Vandenberg AFB, Santa Barbara County, and customers in San Luis Obispo County as part of the California State Water Project. Water allotment is based on a percentage of statewide precipitation for the previous year. On average, Vandenberg AFB is allocated 5,500 acre-feet (4,910,084 gallons per day [gpd]). The minimum requirement for the base is about 2,200 acre-feet (1,964,033 gpd), but several years ago the base was only supplied 800 acre-feet (714,194 gpd). When the allotment is below the requirement or when the supply system requires maintenance, the base has the ability to supply its own water from groundwater wells. With an estimated service population of 14,970, recent average daily use has equaled 1,600,000 gpd with peak use reaching 2,200,000 gpd (USAF, 2015).

Vandenberg AFB's drinking water system was privatized in June 2016 and American Water now owns, operates, and maintains the drinking water infrastructure and has regulatory responsibility for the entire system (Vandenberg AFB, 2018). There are six locations on the Base where water is treated (at the San Antonio plant, four booster plants, and one mobile emergency plant). There is a total combined storage capacity of 15 million gallons of storage capacity on base. There are four active groundwater production wells and two 4-million-gallon water storage tanks that serve as a backup water supply for the North Base when Central Coast Water Authority supply is shut down. There are four water storage tanks on South Base with a capacity of at least 750,000 gallons. There are over 300 miles of water distribution lines (230 miles of active lines and 73 miles of abandoned lines) (USAF, 2015).

3.2.11.2 Sanitary Sewer System

Wastewater generated within the main cantonment area on Vandenberg AFB is directed through a system of collection pipes and lift stations to the City of Lompoc Regional Wastewater Reclamation Plant located on Central Avenue. The plant processes an average of 3.2 MGD of wastewater from the city and Vandenberg Village and the base. The plant receives, on average, 0.80 MGD from the base. Other wastewater generated at the base is treated either at package plants or by septic systems. There are two package plants: one in the south cantonment area and one at the Vandenberg Tracking Station. In addition, there are 115 septic and leach field systems at remote locations on North Base and South Base.

Privatization of the sanitary sewer system occurred in 2016; American Water now is responsible for operation and maintenance of the sanitary sewer system that conveys base domestic wastewater to the city of Lompoc. The city of Santa Maria also has a 13.5-MGD wastewater treatment plant that receives 6.8 MGD.

3.2.11.3 Storm Drainage System

Stormwater collected in the north cantonment and residential areas at Vandenberg AFB is conveyed via surface flow, open drainage swales, or underground structures. There is no basewide stormwater collection system. Stormwater generally flows toward the Pacific Ocean, Pine Lake Canyon, San Antonio Creek, Santa Ynez River, and other miscellaneous canyons.

The Vandenberg AFB cantonment areas are covered under the MS4 General Permit. Under this permit, Vandenberg AFB must reduce the discharge of pollutants to Waters of the United States to the maximum extent practicable and complete implementation tasks. These tasks are described in the permit and in the installation's Municipal Storm Water Guidance Document (formerly Storm Water Management Plan).

Stormwater discharges associated with industrial activities are regulated under the California General Permit for Storm Water Discharges Associated with Industrial Activities (Water Quality Order No. 2014-0057-DWQ/NPDES General Permit No. CAS000001). The following five industrial areas are covered under this permit: landfill, Defense Logistics Agency Disposition Services, Vandenberg Recycling Center, 30 Logistics Readiness Squadron Vehicle Maintenance, and airfield. The SWPPP provides BMPs to be employed at each industrial site as well as stormwater monitoring and sampling requirements (Vandenberg AFB, 2016). Construction activities or ground disturbance of 1 acre or more require permitting under the California General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Water Quality Order No. 2009-0009-DWG/NPDES General Permit No. CAS000002).

3.2.11.4 Solid Waste Management

Solid wastes generated from the Vandenberg AFB residential housing, on-base commercial activities, the Federal Correction Institute, and United States Penitentiary are disposed of in the base landfill. The base landfill is a 217-acre unlined Class III waste management facility. A commercial contractor collects refuse and recyclables generated on base and operates the base landfill. The base operates the landfill pursuant to Solid Waste Facility Permit #42-AA-0012, issued on June 10, 2000, by the California Integrated Waste Management Board and Waste Discharge Requirement (WDR) Order No. R3-2004-0151, issued by the Central Coast Regional Water Quality Control Board on November 19, 2004 (USAF, 2013b).

The landfill can accept 374 tons per day of nonhazardous general municipal solid waste, 18 tons per day of nonhazardous separated or commingled recyclables, and 8 tons per day of the nonhazardous wastes allowed in Section 14 of the permit. Section 14 items include nonfriable asbestos, small animal carcasses, separated construction and demolition debris, wood or green wastes to be chipped for recycling or alternate daily cover, waste tires to be hauled offsite for recycling or incineration, and properly treated medical waste as defined in the California Health and Safety Code, Chapter 8, Section 117600, et seq. (Untreated medical wastes are not accepted and are managed under separate contract.)

3.2.11.5 Electrical System

Vandenberg AFB and cities in the surrounding region receive power from Pacific Gas & Electric (PG&E). Electrical power is supplied through two 69-kV power lines that terminate at the Vandenberg AFB switching station. From the switching station, the north loop and south loop distribution lines feed nine substations located on North Base and South Base and step down the voltage to 12.47 kV. There are 1,200 miles of above-ground distribution cables. This system has a capacity of 100 megawatts (MW) with a peak load of 25 MW. Electricity is purchased from PG&E and is primarily generated using natural gas fuel, supplemented by renewable sources of hydro-turbines and solar arrays. The new solar farm will provide approximately 35 percent of the total daytime load. There is also a 15-MW natural gas power plant located on South Base near SLC-6, originally built to support the Space Shuttle program.

3.2.11.6 Natural Gas System

Vandenberg AFB and cities in the surrounding region receive natural gas from Southern California Gas Company. The company is able to provide the base with 632 million cubic feet (MCF) per year. With the recent removal of many World War II-era wood-framed buildings, the base's yearly consumption has dropped to 265 MCF, and adequate capacity is available to meet new demands.

3.2.12 Transportation, Vandenberg AFB

3.2.12.1 Roadway Network

This section describes the transportation system and conditions for highways and intersections around Vandenberg AFB. The analysis quantitatively evaluates the network of surrounding roadways, with qualitative evaluation of the on-base network. A 2013 ECF study (SDDC, TEA, 2013) included collection of traffic data at several key intersections around and on the base. The study also evaluated the processing times for traffic entering each of the gates. This EIS focuses on the following intersections:

- Cabrillo Highway (CA-1) and Lompoc Casmalia Road
- Utah Street and West Lompoc Casmalia Road
- Santa Lucia Canyon Road and Pine Canyon Road
- Arguello Boulevard and Ocean Avenue

The EIS also focuses on the following road segments and gates serving Vandenberg AFB:

- CA-1 east of the Santa Maria Gate (runs east/west)
- CA-1 south of the Santa Maria Gate (runs north/south)
- Lompoc Casmalia Road north and south of Utah Street
- Santa Lucia Canyon Road north and south of Pine Canyon Road
- Ocean Avenue East east and west of the Solvang Gate (Arguello Boulevard)

Figure 3.2-8 outlines the primary locations studied as part of this EIS.

CA-1 is the primary highway into and out of the Santa Maria Gate, which is the main gate for the base. This location also includes the visitor center for the base. No truck traffic is allowed at the Santa Maria Gate. CA-1 is a four-lane, divided highway with a posted speed limit of 65 mph. Only local traffic is allowed north of the Santa Maria Gate to the Utah Gate.

Traffic accesses the Utah Gate north of the Santa Maria Gate and via the intersection of Utah Street and Lompoc Casmalia Road. These roadways are two-lane highways with relatively light traffic, and Lompoc Casmalia Road has a posted speed limited of 50 mph. The Utah Gate is a secondary entrance and primarily serves residential areas as well as an elementary school. Lompoc Gate is a secondary entrance to Vandenberg AFB, with traffic entering and existing via the intersection of Santa Lucia Canyon Road and Pine Canyon Road. Santa Lucia Canyon Road is a two-lane highway with a posted speed limit of 45 mph. This T-intersection channelizes right turns away from the intersection, creating less impact for right turns to and from Pine Canyon Road toward and away from the Lompoc Gate. Lompoc Gate serves truck traffic entering Vandenberg AFB and includes an inspection area.

Solvang Gate is a secondary entrance to Vandenberg AFB, with traffic access from the intersection of Ocean Avenue and Arguello Boulevard. Across Ocean Avenue is the South Gate, and traffic may use both gates to cross between the south and north areas of Vandenberg AFB. Ocean Avenue is a four-lane highway at this location; however, it becomes a two-lane highway north and south of the intersection. This EIS evaluates the capacity of the two-lane highway sections, given that the four-lane segment is short in length and designed to improve the operation of the intersection at this location.

Other infrastructure includes network roads surrounding Titan Gate and Coast Gate, but use of these gates is limited to special events; therefore, these gates and the network roads surrounding them are not included in the EIS analysis.

Most roadways in the area that serve Vandenberg AFB are high-speed roadways (i.e., speed limits of 45 mph or greater), making traffic safety a key consideration. CA-1 has a posted speed limit of 65 mph, and any queues that back up into intersections or onto local highways could cause safety performance issues. Traffic queues at intersections and at gates have the potential to increase rear-end crash risk, and high-speed facilities could experience higher risk of injury and fatal crashes. This EIS focuses on operational impacts to the affected environment, while additional safety analysis through crash data evaluation could also provide insights into proper treatments and support future design of facilities.

Stakeholders for the roadway network in this area include the USAF, the California Department of Transportation (Caltrans), the FHWA, and local agencies. Caltrans published guidelines for traffic impact analysis (Caltrans, 2002) and strives to maintain LOS C for state highways. The Caltrans cutoff for acceptable LOS is between LOS C and LOS D. The Caltrans guidelines also specify the total number of trips created by a proposed action that warrants the development of a traffic impact study. This EIS evaluates roadways where the action would generate greater than 100 trips, meeting the guideline specifications for a traffic impact study.

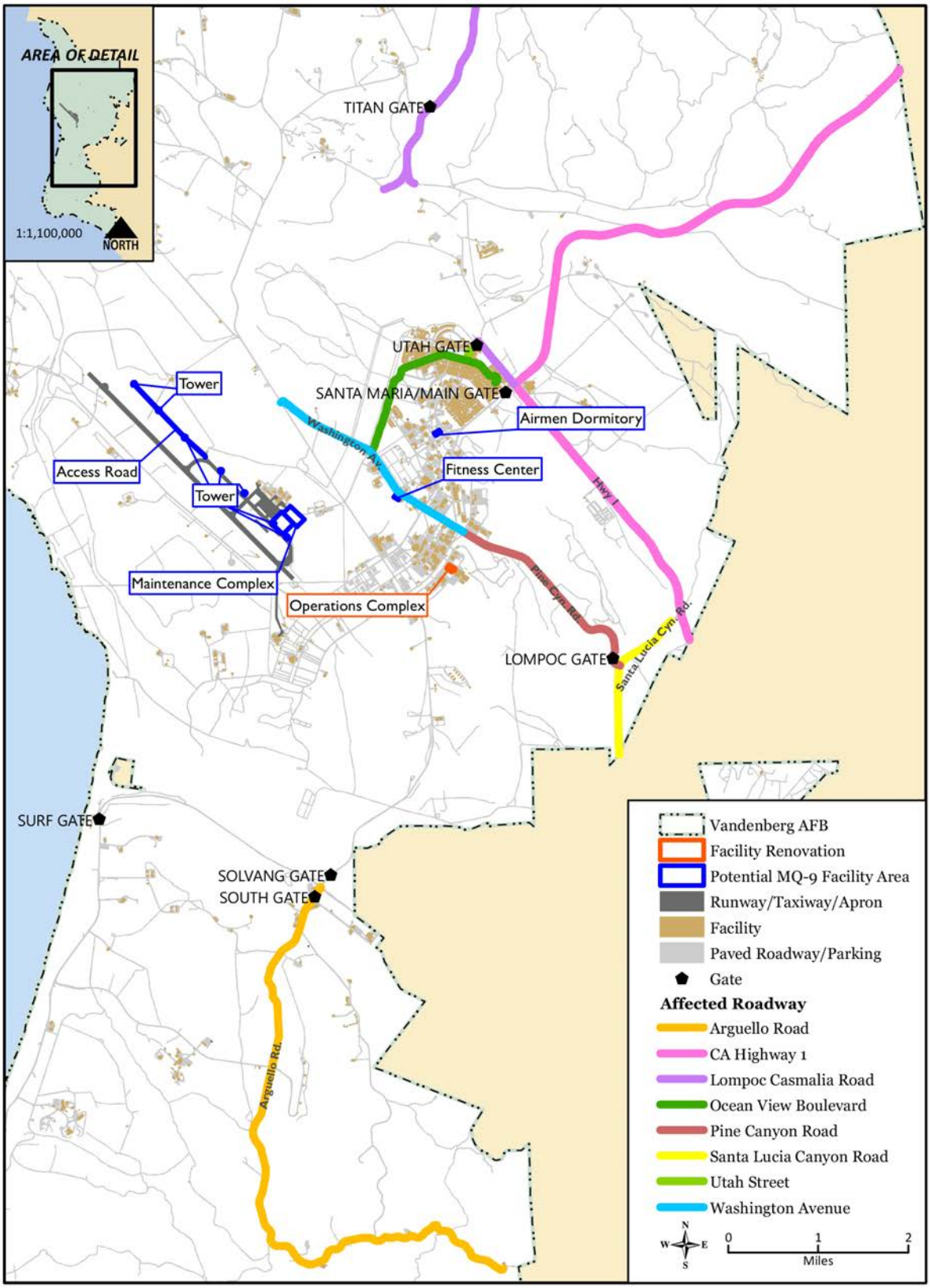

Figure 3.2-8. Vandenberg AFB Roadway Network Study Area

3.2.12.2 Existing Operational Conditions

This EIS uses the 2012 traffic data collected at each intersection and assumes a conservative 1 percent ambient growth rate in traffic per year to estimate 2019 traffic volumes (SDDC, TEA, 2013). The analysis shows acceptable conditions based on the estimated 2019 traffic volumes near Vandenberg AFB. The ECF study (SDDC, TEA, 2013) evaluated several roadways on base, including the Juniper Street and Montana Street intersections with California Boulevard. Both of these intersections are one-way, stop-controlled intersections that experienced LOS ranges from LOS B to LOS C, primarily during the 2012 analysis year. The controlling criteria for LOS for unsignalized intersections is the control delay experienced on the minor street approach, and these values range from 17 to 34 seconds per vehicle as a result of the ECF study.

For the intersections and roadway segments near Vandenberg AFB, the analysis includes the same metrics outlined for Tyndall AFB in Section 3.1.12. Table 3.2-9 summarizes the existing operational conditions for the local network surrounding the base.

Table 3.2-9. Intersection and Road Segment LOS and Performance Metrics (Vandenberg AFB)

Intersection or Road Segment	Time Period	2019			
		LOS	V/C Ratio	Control Delay (sec./vehicle)	Highest Contributing Lane Group
CA-1 and Lompoc Casmalia Road	a.m. p.m.	B C	0.77 0.90	19.0 32.0	CA-1 left turns westbound Through trips leaving Vandenberg AFB
Santa Lucia Canyon Road and Pine Canyon Road	a.m. p.m.	B C	0.08 0.42	12.0 13.5	Left turns from Pine Canyon Road Right turns from Pine Canyon Road
Arguello Boulevard and Ocean Avenue	a.m. p.m.	B A	0.13 0.18	12.0 9.3	Left turns from Solvang Gate Right turns from Solvang Gate
CA-1 east of Santa Maria Gate	a.m. p.m.	A B	0.24 0.33	NA	NA
CA-1 south of Santa Maria Gate	a.m. p.m.	A A	0.22 0.16	NA	NA
Lompoc Casmalia Road north of Utah Street	a.m. p.m.	B A	0.09 0.03	NA	NA
Lompoc Casmalia Road south of Utah Street	a.m. p.m.	B A	0.07 0.06	NA	NA
Santa Lucia Canyon Road north of Lompoc Gate	a.m. p.m.	C C	0.28 0.23	NA	NA
Santa Lucia Canyon Road south of Lompoc Gate	a.m. p.m.	C C	0.21 0.23	NA	NA
Ocean Avenue east of Solvang Gate	a.m. p.m.	C A	0.33 0.01	NA	NA
Ocean Avenue west of Solvang Gate	a.m. p.m.	A C	0.01 0.21	NA	NA

Key: LOS = Level of Service; NA = not applicable; sec/veh = seconds per vehicle; US-98 = U.S. Highway 98; V/C = volume-to-capacity

Notes:

[1] For signalized intersections, one lane group may cause a significant impact to the overall LOS for the intersection. The table shows this lane group for each analysis period. The V/C ratio is for the highest lane group (worst case).

[2] The analysis for a future year yields acceptable operating conditions and no impacts to the intersection of Utah Street and West Lompoc Casmalia Road. Therefore, the analysis excludes this intersection, including the Proposed Action (no trips expected to Utah Gate).

All intersections and road segments meet the Caltrans LOS threshold for acceptable operational conditions during 2019.

3.2.13 Socioeconomics, Vandenberg AFB

Economy, Employment, and Income

Vandenberg AFB employment of USAF personnel, DoD civilians, and contractors totaled 6,857 in January 2019. The base has a major influence on the local and regional economy with a total economic impact of $1.75 billion to the local area (MyBaseGuide, 2020). In 2018, there were 281,958 jobs in Santa Barbara County with approximately 52 percent, or 147,000, of those jobs in the Northern Santa Barbara County ROI (see Table 3.2-10). Table 3.2-11 compares several economic characteristics in Santa Barbara County with the State of California and the nation.

Table 3.2-10. Estimated Full-Time and Part-Time Employment by Industry in Santa Barbara County

Industry	Number of Jobs in 2018	Percent of Total Employment
Total Employment	281,958	100.0%
Farm Employment	13,007	4.6%
Forestry, Fishing, and related activities	10,636	3.8%
Mining, quarrying, and oil and gas extraction	1,769	0.6%
Utilities	362	0.1%
Construction	13,003	4.6%
Manufacturing	14,688	5.2%
Wholesale Trade	6,240	2.2%
Retail Trade	23,001	8.2%
Transportation and Warehousing	6,821	2.4%
Information	5,111	1.8%
Finance and Insurance	8,327	3.0%
Real Estate and rental and leasing	14,782	5.2%
Professional, scientific, and technical services	21,775	7.7%
Management of companies and enterprises	3,097	1.1%
Administrative and support and waste management and remediation services	15,098	5.4%
Educational services	5,611	2.0%
Health care and social assistance	28,469	10.1%
Arts, entertainment, and recreation	7,859	2.8%
Accommodation and food services	26,736	9.5%
Other services	16,461	5.8%
Government and government enterprises	39,105	13.9%

Source: (BEA, 2019)

Table 3.2-11. 2018 Selected Economic Characteristics, Santa Barbara County, California, and United States

Geographic Area	Average Annual Unemployment Rate	Per Capita Income	Median Household Income
Santa Barbara County	6.1%	$34,229	$71,657
State of California	6.7%	$35,021	$71,228
United States	5.9%	$32,621	$60,293

Source: (USCB, 2018b)

Population

Northern Santa Barbara County is the ROI for analysis of Vandenberg AFB environmental effects. Table 3.2-12 displays the population projections for northern Santa Barbara County as reported by the California Department of Finance.

Table 3.2-12. Population Projections for Northern Santa Barbara County[1]

Region	Year							
	2019	2020	2021	2022	2023	2024	2025	2026
Northern Santa Barbara County	257,644	260,025	262,427	264,852	267,299	269,769	272,262	274,777

[1] (California Department of Finance, 2020) Adjusted for North County.

Table 3.2-13 provides a summary of the population supported by Vandenberg AFB. Nearly all of the population supported by Vandenberg AFB are in Northern Santa Barbara County, with some retirees in southern San Luis Obispo County.

Table 3.2-13. Population Directly Supported by Vandenberg AFB

Personnel Type	Number
Military Personnel	2,892
Military Dependents	3,785
Department of Defense Civilians	1,143
Non-Appropriated Fund/Contractors/Private Business	2,822
Retirees (Santa Barbara and San Luis Obispo Counties from all service branches)	8,000
Total	**18,642**

Source: (Vandenberg AFB, 2020b)
Note: A non-appropriated fund position is a government position funded through sources other than DoD appropriations budget.

Approximately 63.4 percent of military personnel live off-base while the remaining 36.6 percent live on-base. In 2003, the communities that supported the off-base personnel include Lompoc (approximately 55.5 percent) and Santa Maria-Orcutt area (approximately 42.6 percent) with fewer personnel residing in Guadalupe, Nipomo and Buellton (Vandenberg AFB, 2006). Based on construction activity since 2003, the distribution of off-base personnel in the communities in 2019 is estimated to be in Lompoc, 47 percent; Santa Maria-Orcutt area, 46 percent; Guadalupe and Nipomo, 4 percent; and Buellton, 3 percent.

Housing

As of 2018, there were 999 total housing units on base, of which 927 (92.8 percent) were occupied. There was an estimated total of 1,063 active-duty military personnel living on base (see Table 3.2-14).

Table 3.2-15 provides selected housing characteristics for Santa Barbara County, the City of Santa Maria and the City of Lompoc. Increasing home prices has caused concern for housing affordability in the region. An estimated 56.48 percent of renter households in the county paid more than 30 percent of their income on rent (Santa Barbara County Public Health Department,

2016). Occupants that spend more than 30 percent of their income on housing are considered cost burdened.

Table 3.2-14. Total Military Housing at Vandenberg AFB

Housing Type	2018		
	Number of Units	Air Force Persons per Unit	Total Persons
Privatized Housing	709 (637)	1.09	695
Barracks/Dorms/UPH	290	1	290
Total On Base or Federal Land	**999**		**985**

Source: (California Department of Finance, 2018)
Key: AFB = Air Force Base; UPH = Unaccompanied Personnel Housing
Note: Based on an occupancy rate of 92.8%

Table 3.2-15. Selected Housing Characteristics for Santa Barbara County

Housing Type	Number of Units	Air Force Persons per Unit	Total Persons
Housing on Base or Federal Land	999	1.09	1,089
Barracks/Dorms/UPH	300	1	300
Total On Base or Federal Land	1,299		1,389

Source: Vandenberg AFB 4/4/2020
Key: AFB = Air Force Base; UPH = Unaccompanied Personnel Housing
Note: Based on an occupancy rate of 92.8%

The median rent as of September 2019 for different cities in Santa Barbara County are shown in Table 3.2-16.

Table 3.2-16. Housing Market Summary in Santa Barbara County and Representative Cities in ROI, September 2019

Geographic Region	Current Median Home Value	Year-Over-Year Change	Current Median Rent
Santa Barbara County	$601,000	1.2%	$2,836
California	$550,800	1.0%	$2,633
United States	$231,000	4.8%	-
Lompoc	$350,200	1.2%	$1,957
Santa Maria	$394,700	3.7%	$2,093
Buellton	$560,800	1.9%	$2,542

Source: (University of California, 2019)

Education

There are 20 school districts that provide educational services to the county. During the 2018–2019 school year there were 69,379 students enrolled throughout the multiple school districts (CADOE, 2019). The northern Santa Barbara County ROI schools enrolled 44,984 students (see Table 3.2-17).

Students residing on Vandenberg AFB attend the Lompoc Unified School District. There is one elementary school, Crestview Elementary, located on Vandenberg AFB that serves students in kindergarten through sixth grade. Crestview is part of the Lompoc Unified School District. (VandenbergHousing.Com, 2020). Enrollment at Crestview is approximately 500 students after merging with Los Padres (Crestview Elementary, 2020).

Table 3.2-17. Student Enrollment in Northern Santa Barbara County ROI

District	School Year				
	2014–2015	2015–2016	2016–2017	2017–2018	2018–2019
Ballard Elementary	132	124	129	131	132
Blochman Union Elementary	1,063	1,242	1,277	1,313	1,283
Buellton Union Elementary	626	612	614	564	612
College Elementary	408	408	393	396	362
Cuyama Joint Unified	233	234	245	761	786
Guadalupe Union Elementary	1,282	1,269	1,280	1,298	1,283
Lompoc Unified	10,076	10,215	10,139	10,142	10,045
Los Olivos Elementary	471	172	146	139	153
Orcutt Union Elementary	5,269	5,266	5,274	5,202	5,181
Santa Maria Joint Union High	7,782	7,900	7,858	7,949	8,166
Santa Maria-Bonita	16,026	16,584	16,868	17,122	16,940
Santa Ynez Valley Union High	1,025	997	956	944	926
SBE-Olive Grove Charter	-	75	180	312	369
Solvang Elementary	591	570	591	600	605
Total Northern Santa Barbara County ROI	**44,984**	**45,668**	**45,950**	**46,873**	**46,843**

Source: (CADOE, 2019)
Key: ROI = region of influence

Public Services

Public services include police, fire, medical, and emergency services. The Santa Barbara County Sheriff Department has approximately 600 employees, 150 volunteers, 260 law enforcement deputies, and 200 custody deputies (Santa Barbara County, 2020). Incorporated municipalities with their own municipal police departments include Santa Maria, Lompoc, and Santa Barbara City. The U.S. average full-time sworn officers per 1,000 people ranges between 2.19 and 2.39 (U.S. Department of Justice, 2016).

The Santa Barbara County Fire Department has approximately 245 full-time employees in the department (Santa Barbara County Fire Department, 2020). Santa Maria Fire has 60 employees, Lompoc Fire has 30 employees and Guadalupe has 17 employees. The U.S. average is in the range of 1.54 to 1.78 firefighters per 1,000 people protected (National Fire Protection Association, 2019).

There are multiple health clinics, hospitals, and medical professionals throughout Santa Barbara County serving the numerous communities. On base, the 30 Force Support Service (FSS) at Vandenberg AFB offers a variety of services for military personnel, their families, and eligible personnel. The 30th Medical Group at Vandenberg AFB provides health care services, while the Vandenberg AFB fire department provides 24-hour fire and emergency services.

3.2.14 Environmental Justice, Vandenberg AFB

Environmental justice, based on EO 12898, applies to minority and low-income populations. EO 13045 directs federal agencies to identify and assess environmental health and safety risks that may affect children 17 years of age and under, and the USAF identifies populations over 65 years of age to assess environmental health and safety risks to elderly populations.

Table 3.2-18 identifies the total population in the county as well as the total minority and low-income populations in the county. Table 3.2-19 identifies the number and percent of the total county population that is under 18 or 65 years of age and older. In the 2010 census, the Northern Santa Barbara County ROI had 57 percent of the population and approximately 60 percent of the ROI individuals who identified themselves as minority (USCB, 2010a).

Table 3.2-18. Environmental Justice Populations in Santa Barbara County

Geographic Region	Total Population	Minority		Population for Whom Poverty Status is Determined[1]	Low-Income	
		Number	Percent		Number	Percent
Santa Barbara County	443,738	244,382	55.1%	424,510	63,010	14.8%
California	39,148,760	24,452,924	62.5%	38,407,403	5,487,141	14.3%
United States	322,903,030	125,721,853	38.9%	314,943,184	44,257,979	14.1%

Sources: (USCB, 2018c; USCB, 2018d)
Note:
[1] Does not include people in institutional group quarters, college dormitories, military barracks, living situations without conventional housing (excluding those in shelters), and unrelated individuals under age 15 (such as foster children) and is therefore different from "Total Population."

Table 3.2-19. Children and Elderly in Santa Barbara County

Geographic Region	Total Population	Children (under 18 years)		Elderly (65 years or older)	
		Number	Percent	Number	Percent
Santa Barbara County	443,738	99,117	22.3%	64,775	14.6%
California	39,148,760	9,073,655	23.2%	5,315,457	13.6%
United States	322,903,030	73,553,240	22.8%	49,238,581	15.2%

Source: (USCB, 2018d)

In the affected environment, aircraft noise levels at Vandenberg AFB do not extend beyond the installation boundary and no off-base populations are exposed to noise levels of 65 dB CNEL or greater. No off-base populations are within the APZs. Off-base populations experience infrequent noise and ground vibration from missile launches, but this does not result in any impact to environmental justice or any other sensitive populations.

4. ENVIRONMENTAL CONSEQUENCES

4.0 INTRODUCTION TO ENVIRONMENTAL CONSEQUENCES

Chapter 4, environmental consequences, has been prepared to provide the public, agencies, and the USAF decision maker with an understanding of the environmental consequences resulting from decisions to beddown a three-squadron F-35A Wing or a four-squadron F-35A Wing at Tyndall AFB and an MQ-9 Wing at either Tyndall AFB or Vandenberg AFB. The MQ-9 Wing could be located at Tyndall AFB with or without either F-35A Wing beddown alternative, and No Action includes not having a F-35 A Wing beddown at Tyndall AFB and/or not having an MQ-9 beddown at either of Tyndall AFB or Vandenberg AFB. Table 4.0-1 presents the potential aircraft actions addressed in this EIS which are associated with the different alternatives and bases.

Table 4.0-1. Alternative Aircraft Actions Addressed in this EIS

Potential Tyndall AFB Decisions		Potential Vandenberg AFB Decisions	
Aircraft Action	**EIS Section where Evaluated**	**Aircraft Action**	**EIS Section where Evaluated**
Three-Squadron F-35A Wing beddown	Section 4.1	MQ-9 Wing beddown or No Action	Section 4.2.2
Four-Squadron F-35A Wing beddown	Section 4.1	MQ-9 Wing beddown or No Action	Section 4.2.2
MQ-9 Wing beddown	Section 4.2.1	No aircraft beddown	Section 4.2.2
Three-Squadron F-35A Wing plus MQ-9 Wing beddown	Section 4.3	No aircraft beddown	Section 4.2.2
Four-Squadron F-35A Wing plus MQ-9 Wing beddown	Section 4.3	No aircraft beddown	Section 4.2.2
No Action at Tyndall AFB	Section 4.1, Section 4.2.1	MQ-9 Wing beddown or No Action	Section 4.2.2

Chapter 4, Environmental Consequences, focuses on the resource areas that could be affected by implementation of the F-35A (Tyndall AFB) and MQ-9 (Tyndall AFB or Vandenberg AFB) missions and excludes discussion of resource areas not affected, as discussed in Section 2.5.1. Table 4.0-2 presents the environmental resources analyzed in this EIS.

Table 4.0-2. Environmental Resource Areas Analyzed in this EIS

Resource Area	Analysis of Affected Environment and Environmental Consequences			
	F-35A		MQ-9	
	Base	Airspace Proposed for Use	Base	Airspace Proposed for Use
Airspace Management and Air Traffic Control	Yes	Yes	Yes	Yes
Noise	Yes	Yes	Yes	No change to noise conditions
Health and Safety	Yes	Yes	Yes	Yes

Table 4.0-2. Environmental Resource Areas Analyzed in this EIS

Resource Area	Analysis of Affected Environment and Environmental Consequences			
	F-35A		MQ-9	
	Base	Airspace Proposed for Use	Base	Airspace Proposed for Use
Air Quality	Yes	Yes	Yes	No; all flight operations above mixing level
Hazardous Materials and Waste	Yes	No construction or new materials introduced	Yes	No construction or new materials introduced
Soil and Geologic Resources	Yes	No construction or new materials introduced	Yes	No construction or new materials introduced
Water Resources	Yes	No construction or new materials introduced	Yes	No construction or new materials introduced
Biological Resources	Yes	Yes	Yes	No construction or new materials introduced
Cultural Resources	Yes	Yes	Yes	No change to noise conditions and no construction or new materials introduced
Land Use and Recreation	Yes	Yes	Yes	No; land uses on ranges compatible with missions
Infrastructure	Yes	No construction or new materials introduced	Yes	No construction or new materials introduced
Transportation	Yes	No traffic affected under airspace	Yes	No traffic affected under airspace
Socioeconomics	Yes	No economic effects anticipated under airspace affected	Yes	No economic effects anticipated under airspace affected
Environmental Justice / Protection of Children	Yes	No populations anticipated to be affected under airspace	Yes	No populations anticipated to be affected under airspace

As described in Chapter 2, Section 2.2.5.3, this EIS evaluates three different scenarios for F-35A afterburner use: afterburner use on 5 percent of takeoffs, on 50 percent of takeoffs, and on 95 percent of takeoffs. The different afterburner take-off levels would have the potential to affect the following environmental resources: acoustic environment, air quality, land use and recreation, socioeconomics, and environmental justice. The different afterburner takeoffs would not affect the following environmental resources: airspace management and air traffic control, health and safety, hazardous materials and waste, geologic resources, water resources, biological resources, cultural resources, infrastructure, and transportation. The different afterburner scenarios are not evaluated for these resource areas.

The following sections of Chapter 4 present the environmental consequences for each environmental resource that result from overlaying the proposed actions and alternatives from Chapter 2 on the affected environment described in Chapter 3.

4.1 PROPOSAL TO BEDDOWN AN F-35A OPERATIONAL WING AT TYNDALL AFB

4.1.1 Airspace Management and Air Traffic Control, F-35A at Tyndall

4.1.1.1 Airspace Management and Air Traffic Control, Three-Squadron F-35A Alternative

4.1.1.1.1 Base Airfield Operations

The proposed beddown of three F-35A squadrons would generate approximately 33,440 annual airfield operations (as shown in Table 2.2-3). As noted previously, annual airfield operations at Tyndall AFB have varied over the years as the based and transient aircraft have changed, including the recent effects post-hurricane conditions have had on this airfield's use. The projected F-35A airfield operations combined with the nearly 17,000 operations currently conducted by based and transient aircraft would total about 50,000 annual operations. This would be within the levels previously conducted at Tyndall AFB, as shown in Table 3.1-1. Likewise, the existing SUA has been used by F-35A and other fifth-generation fighter aircraft. The F-35A Wing proposed for Tyndall AFB would be another fifth-generation fighter in the airspace. Therefore, these operations could be managed and controlled by the Tyndall AFB control tower and RAPCON within their respective Class D and surrounding terminal airspace area without requiring any changes to airspace structure or local governing procedures to the airspace environment. Any future changes that may be needed to meet F-35A or other aircraft mission requirements would be coordinated with ATC and other responsible interests, as appropriate. Therefore, this alternative would not have any negative impacts on Tyndall AFB airfield operations and its associated airspace uses.

4.1.1.1.2 Airspace and Ranges

The three F-35A squadrons would generate the sorties and annual hours of use shown in Table 2.2-5, Table 2.2-6, and Table 3.1-3 for the different training airspace and ranges areas. Seventy-five percent of the F-35A annual flight hours and sortie operations would be in the offshore Warning Area W-147 and W-470. The remaining sortie operations would be in the Compass Lake and Carabelle training areas and W-151. Most training activities would be conducted between FL180 and FL300. There would be little use of the three range areas, as described in Section 2.2.4.4. Table 3.1-3 demonstrates that the number of F-35A flight operations at the airfield and in the airspace would be within what has been the recent use of the airspace and ranges. Airspace management has demonstrated full capability to manage the airspace and range for the number of operations.

Local operating procedures governing airfield and SUA operations and the RAPCON's positive control of flights between the airfield and the different assigned SUA training areas ensure all

military IFR flights are separated from other airport and enroute IFR aircraft operating in this region. The scheduled use of these SUA areas also manages the extent of mission activities conducted within these areas during the active periods. The existing SUA has been used by F-35A and other fifth-generation fighter aircraft. The F-35A Wing proposed for Tyndall AFB would be another fifth-generation fighter in the airspace. The projected F-35A operations would not require any changes to the existing SUA structure and the manner in which these areas are managed to accommodate all military training requirements. Therefore, this alternative would not have any negative impacts on the overall use and management of the Tyndall AFB training area and range airspace and other military and civilian air traffic in this region.

4.1.1.2 Airspace Management and Air Traffic Control, Four-Squadron F-35A Alternative

4.1.1.2.1 Base Airfield Operations

The Four-Squadron F-35A Wing Alternative would generate approximately 44,3600 airfield operations annually. This would be about a 33 percent increase over the three F-35A squadron alternative (Table 2.2-8). Again, considering the operational levels this airfield airspace environment has experienced over the years that have included F-35A aircraft and ATC positive control of these operations within the Class D and terminal airspace areas, the additional operations would have no negative impact on airfield and airspace uses.

4.1.1.2.2 Airspace and Ranges

The added F-35A squadron would generate a proportional increase in the daily sorties and SUA annual hours of use shown in Table 2.2-9, Table 2.2-10, and Table 3.1-3. The majority of the additional sorties would be conducted within those areas noted for the three-squadron alternative. Those operations would also have a minimal effect on the SUA and range uses given the manner in which these sortie missions would be managed by the scheduling/coordinating agencies and their flight operations controlled by ATC during those missions. Therefore, this alternative would also not require any changes to the existing airfield and training airspace areas nor would its added use of these areas have any adverse impacts on the overall military and civilian airspace uses in this region.

4.1.1.3 Airspace Management and Air Traffic Control, No Action Alternative

The No Action Alternative would not result in increased uses of the Tyndall AFB airfield and SUA/range airspace areas beyond the approximately 17,000 airfield operations currently conducted by based and transient aircraft. The USAF would continue to use and manage airspace as it is today, though as discussed previously, the use levels can vary with the different based and transient aircraft that operate at Tyndall AFB throughout the year to fulfill mission requirements within the local training airspace.

4.1.2 Noise, F-35A at Tyndall

This section will quantitatively compare noise levels under action alternatives to noise levels under No Action Alternative conditions to assess impacts. No Action Alternative conditions, which

reflect the cessation of based F-22 and T-38 operations at Tyndall AFB following Hurricane Michael, represent current and future operations with no additional mission beddowns.

This section will also restate noise levels, which had been present prior to the hurricane, as a point of reference. As described in Section 3.2.1, pre-hurricane noise levels were substantially higher than No Action Alternative operations noise levels. People that had lived near Tyndall AFB prior to the storm and that have experienced the pre-hurricane noise levels may have a different perception of noise levels as would occur under proposed beddown scenarios. Because current residents include both people that had been present prior to the storm and people that have come to the area since the storm, both the No Action Alternative and pre-hurricane conditions are potentially relevant to people's perceptions of and reactions to the noise.

4.1.2.1 Noise, Three-Squadron F-35A Alternative

4.1.2.1.1 Base Airfield Operations

F-35A aircraft based at nearby Eglin AFB have conducted practice approach operations at Tyndall AFB on a regular basis for several years, and people living near Tyndall AFB have probably experienced F-35A overflight noise. Maximum noise levels (L_{max}) generated by individual overflights of F-35A aircraft at specified altitude and aircraft configurations are listed in Table 3.1-4.

The noise level of an overflight depends not only on the aircraft type but also on how the aircraft is flown. For example, F-35A aircraft departures that make use of the afterburner generate a different noise signature than F-35A departures that do not use the afterburner. As shown on Figure 2.2-2, use of the afterburner allows the aircraft to accelerate faster and reach take-off airspeeds earlier than standard military power departures. During afterburner takeoffs, the aircraft typically leaves the ground sooner and is at slightly higher altitudes throughout the climbout compared to standard military power takeoffs.

During afterburner takeoffs, F-35A pilots typically turn the afterburner off at approximately 8,000 feet from brake release to conserve fuel and avoid accelerating beyond airspeeds allowable near an installation. After turning the afterburner off, the aircraft continues its climb at standard military power (i.e., the same power setting used by pilots conducting standard military power takeoffs). At locations perpendicular to the runway, the increased noise generated by the afterburner results in L_{max} being slightly louder, as measured in A-weighted sound levels, than standard military power takeoffs. However, locations further down the aircraft flight path are overflown at slightly higher altitudes and at the same engine power setting during afterburner takeoffs than during standard military power takeoffs. As a result, afterburner take-off overflight noise levels are often slightly less loud than standard military power take-off noise levels at locations beyond the end of the runway, due to the difference in the distance between the aircraft and the noise-sensitive location.

For this EIS, the USAF evaluated three different scenarios for afterburner use: (1) Scenario A is afterburner use on 5 percent of total takeoffs, (2) Scenario B is afterburner use on 50 percent of total takeoffs, and (3) Scenario C is afterburner use on 95 percent of total takeoffs.

Annoyance and Land Use Compatibility

Calculated DNL under the three-squadron F-35A Wing beddown alternative with afterburner Scenario A (5 percent afterburner use) is shown in Figure 4.1-1. Figure 4.1-2 illustrates the calculated 65 dB DNL for each of the afterburner scenarios under the three-squadron F-35A Wing beddown alternative. Under all three afterburner scenarios, off-base land areas affected at greater than 65 dB DNL are limited to portions of the City of Parker and Saint Andrews State Park (Shell Island). A person's reaction to noise is dependent on several non-acoustic factors, including the person's perception of the importance of the activity generating the noise and the activity the person is involved in at the time the noise occurs. Several social surveys have found that people are consistently more likely to become annoyed by aircraft noise at higher DNL and are less likely to become annoyed at lower DNL (Schultz, 1978; Finegold, Harris, & Von Gierke, 1994; Miedema & Vos, 1998). Noise levels greater than 65 dB DNL are considered incompatible with noise-sensitive land uses, such as residential, in accordance with DoD guidelines.

Under the three-squadron F-35A Wing beddown alternative, the number of acres of off-base land at greater than 65 dB DNL would increase to 68, 64, and 61 acres, for afterburner Scenarios A, B, and C, respectively (Table 4.1-1). The acreage affected is substantially larger than the 2 acres affected under No Action Alternative operations, but is smaller than the 217 acres affected under pre-hurricane conditions (described as a point of reference).

Table 4.1-1. Off-Base Acres of Land at 65 dB DNL or Greater Under Three-Squadron F-35A Wing Alternative

DNL (dB)	Pre-Hurricane	No Action	Three-Squadron F-35A Wing Beddown					
			Afterburner Scenario A (5%)		Afterburner Scenario B (50%)		Afterburner Scenario C (95%)	
	Acres	Acres	Acres	Change[1]	Acres	Change[1]	Acres	Change[1]
65–69	199	2	61	59	58	56	58	56
70–74	15	0	7	7	6	6	3	3
75–79	3	0	0	0	0	0	0	0
80–84	0	0	0	0	0	0	0	0
≥85	0	0	0	0	0	0	0	0
Total	**217**	**2**	**68**	**66**	**64**	**62**	**61**	**59**

Key: ≥ = greater than or equal to; dB = decibel; DNL = day-night average sound level
Note:
[1] Change is relative to No Action.

The estimated number of people affected by noise levels greater than 65 dB DNL under the 5, 50, and 95 percent afterburner scenarios would be 80, 71, and 66, respectively (Table 4.1-2). It is important to note that affected population estimates were made using 2017 U.S. Census data (i.e., pre-hurricane). The number of people living in areas near Tyndall AFB is currently in a state of flux. The 2017 census data (USCB, 2018d) is the best population data available and may approximate population after rebuilding of the community is complete. The estimated number of residents affected by noise levels greater than 65 dB DNL is substantially higher than the 0 people affected under the No Action Alternative conditions, but is much smaller than the estimated 190 people affected under pre-hurricane conditions (included as a point of reference).

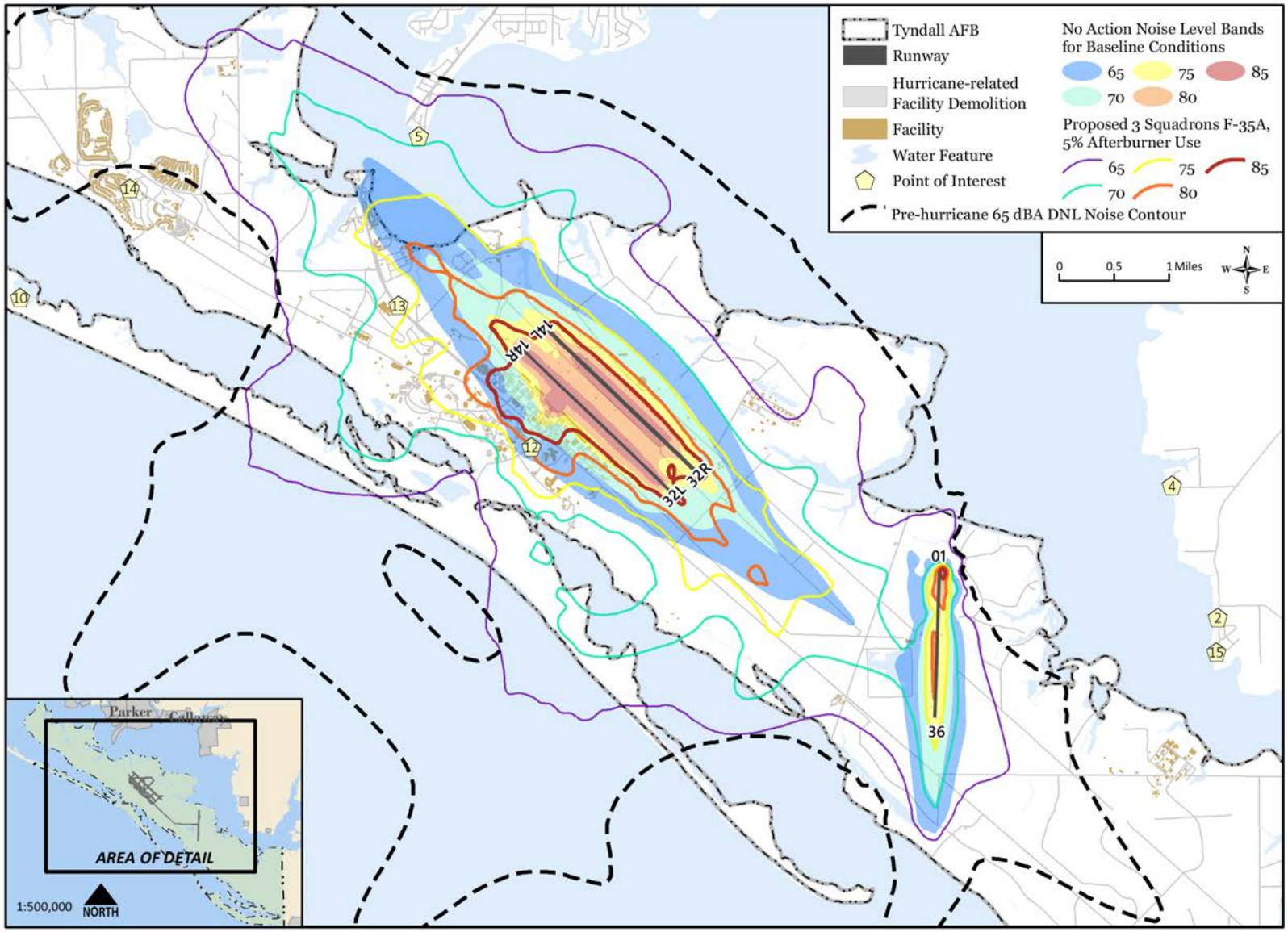

Figure 4.1-1. Noise Contours Under Three-Squadron F-35A Wing Beddown, Five-Percent Afterburner Use

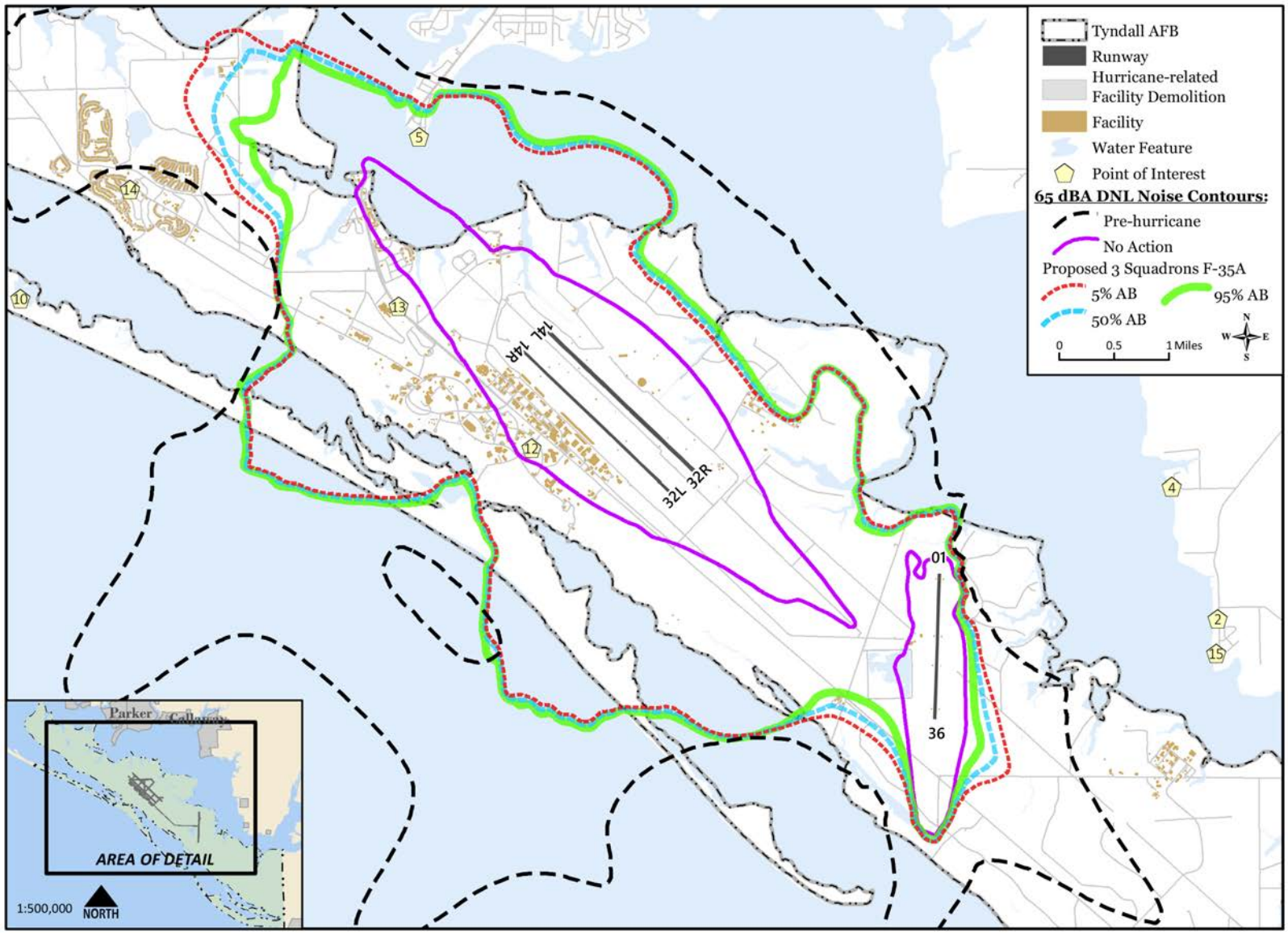

Figure 4.1-2. 65 dB DNL Noise Contours Under Three-Squadron F-35A Wing Beddown, All Afterburner Scenarios

Table 4.1-2. Estimated Number of People Exposed to Noise Levels Greater Than 65 dB DNL Under the Three-Squadron F-35A Wing Alternative

DNL (dB)	Pre-Hurricane	No Action	Three-Squadron F-35A Wing Beddown					
			5% Afterburner		50% Afterburner		95% Afterburner	
	Residents	Residents	Residents	Change[1]	Residents	Change[1]	Residents	Change[1]
65–69	184	0	80	80	71	71	66	66
70–74	6	0	0	0	0	0	0	0
75–79	0	0	0	0	0	0	0	0
80–84	0	0	0	0	0	0	0	0
≥85	0	0	0	0	0	0	0	0
Total	**190**	**0**	**80**	**80**	**71**	**71**	**66**	**66**

Key: ≥ = greater than or equal to; dB = decibel; DNL = day-night average sound level
Note:
[1] Change is relative to No Action.

Additional noise calculations were run at several representative noise-sensitive locations, which are depicted in Figure 3.1-1. Noise levels would exceed 65 dB DNL at Long Point Condominiums, would exceed 70 dB DNL at Tyndall Elementary School, and would exceed 80 dB DNL at the Tyndall AFB Dormitories (Table 4.1-3). These noise levels are considered incompatible with residential and educational land uses. Noise levels would increase by as much as 14 dB DNL relative to No Action Alternative operations, but would be lower than the pre-hurricane noise levels at all locations except the Tyndall AFB Dormitories, where they would increase by 5 dB relative to pre-hurricane conditions (included as a point of reference).

Table 4.1-3. Day-Night Average Sound Level at Representative Noise-Sensitive Locations Under Three-Squadron F-35A Wing Alternative

Location Description	Pre-Hurricane	No Action	Three-Squadron F-35A Wing Beddown					
			5% Afterburner		50% Afterburner		95% Afterburner	
	DNL	DNL	DNL	Change[1]	DNL	Change[1]	DNL	Change[1]
First Baptist Church of Parker	58.6	44.8	54.1	9.3	54	9.2	53.9	9.1
Allenton (town)	59.2	46.5	52.4	5.9	52.6	6.1	52.8	6.3
Saint Andrews State Park, Campground	45.4	33.6	38.8	5.2	38.6	5	38.5	4.9
Bayou Point (residences)	58.3	47	51.6	4.6	52	5	52.4	5.4
Long Point Condominiums	70.5	58.7	69	10.3	68.7	10	68.5	9.8
Mexico Beach (community)	58.1	44.9	46.2	1.3	46.1	1.2	46	1.1
Panama City (community)	65.5	50.7	56.3	5.6	56.6	5.9	56.9	6.2
Parker Elementary School	55.1	41.3	50.2	8.9	50.2	8.9	50.2	8.9
Piney Point (residences)	47.1	35.9	41.4	5.5	41.5	5.6	41.7	5.8
Saint Andrews State Park, Shell Island	64	42.1	56	13.9	56.2	14.1	56.3	14.2
Saint Andrews (community)	50.8	46.5	49.5	3	49.3	2.8	49.2	2.7
Tyndall AFB Dormitories	75.5	67.6	80.7	13.1	80.9	13.3	81	13.4
Tyndall Elementary School	75.2	61	73	12	72.8	11.8	72.6	11.6
Tyndall AFB on-base housing	63.6	48	58.4	10.4	57.8	9.8	57	9
Water's Edge (residences)	58.9	47.1	52.9	5.8	53	5.9	53.2	6.1

Key: AFB = Air Force Base; DNL = day-night average sound level
Note:
[1] Change is relative to No Action.

Speech Interference

Overflight events that exceed 50 dB, even momentarily, have some potential to interfere with speech. The number of potential outdoor speech-interference events per average daytime hour would increase by as much as five to seven events under the three afterburner-use sub-alternatives (Table 4.1-4). Speech-interference events are brief, lasting only for the duration of the overflight. Speech-interference event-counts assume that the people involved in conversation do not raise their voices to talk over the aircraft noise. The number of events per hour would increase substantially relative to No Action Alternative operations, but would decrease or remain the same relative to pre-hurricane conditions (included as a point of reference).

Table 4.1-4. Number of Outdoor Speech-Interference Events per Average Daytime Hour Under Three-Squadron F-35A Wing Alternative

Location Description	Pre-Hurricane	No Action	Three-Squadron F-35A Wing Beddown					
			5% Afterburner		50% Afterburner		95% Afterburner	
	Events	Events	Events	Change[1]	Events	Change[1]	Events	Change[1]
First Baptist Church of Parker	7	1	6	5	6	5	6	5
Allenton (town)	8	2	6	5	6	4	6	4
Saint Andrews State Park, Campground	5	1	4	3	4	3	4	3
Bayou Point (residences)	7	1	6	5	6	5	6	5
Long Point Condominiums	8	2	7	5	7	5	7	5
Mexico Beach (community)	4	1	3	2	3	2	3	2
Panama City (community)	8	2	7	5	7	5	7	5
Parker Elementary School	7	1	6	5	6	5	6	5
Piney Point (residences)	5	1	5	4	5	4	5	4
Saint Andrews State Park, Shell Island	7	1	6	5	6	5	6	5
Saint Andrews (community)	6	1	5	4	5	4	5	4
Tyndall AFB Dormitories	9	2	7	5	7	5	7	5
Tyndall Elementary School	8	2	7	5	7	5	7	5
Tyndall AFB on-base housing	7	1	6	5	6	5	6	5
Water's Edge (residences)	8	2	6	4	6	4	6	4

Key: AFB = Air Force Base
Note:
[1] Change is relative to No Action.

Classroom Noise

Noise interference with learning in schools is of particular concern because noise can interrupt communication or interfere with concentration. The DoD Noise Working Group guidelines recommend that exterior noise levels during the school day not exceed 60 dB L_{eq-8hr}, as that would indicate that interior classroom noise levels likely exceed a recommended 40 dB maximum background noise level (DoD Noise Working Group, 2009). Exterior school-day noise levels would be below the 60 dB L_{eq-8hr} criteria level at Parker Elementary School, but would exceed 60 dB L_{eq-8hr} at Tyndall Elementary School (Table 4.1-5) under all three-squadron F-35A Wing afterburner-use scenarios. The number of indoor noise events with potential to interfere with speech (above 50 dB L_{max}) per average daytime hour at Tyndall Elementary School would be as high as six events with windows open or five events with windows closed. The number of events at Parker Elementary School would be as high as three events with windows open, but would round to zero events under all afterburner-use sub-alternatives with windows closed.

Table 4.1-5. Indicators of Classroom Interference Under Three-Squadron F-35A Wing Alternative

Location Description	Pre-Hurricane	No Action	Three-Squadron F-35A Wing Beddown					
			5% Afterburner		50% Afterburner		95% Afterburner	
	L_{eq-8hr}	L_{eq-8hr}	L_{eq-8hr}	Change[1]	L_{eq-8hr}	Change[1]	L_{eq-8hr}	Change[1]
Parker Elementary School	56.9	<45	52.0	7.0	52.0	7.0	52.0	7.0
Tyndall Elementary School	77.0	62.9	74.9	12.0	74.7	11.8	74.5	11.6
	Events (Windows Open)	**Events (Windows Open)**	**Events (Windows Open)**	**Change[1]**	**Events (Windows Open)**	**Change[1]**	**Events (Windows Open)**	**Change[1]**
Parker Elementary School	4	1	2	1	3	2	3	2
Tyndall Elementary School	6	1	5	4	6	5	5	4
	Events (Windows Closed)	**Events (Windows Closed)**	**Events (Windows Closed)**	**Change[1]**	**Events (Windows Closed)**	**Change[1]**	**Events (Windows Closed)**	**Change[1]**
Parker Elementary School	1	0	0	0	0	0	0	0
Tyndall Elementary School	5	1	5	4	5	4	5	4

Key: < = less than; L_{eq-8hr} = 8-hour equivalent noise level
Note:
[1] Change is relative to No Action.

Sleep Disturbance

Nighttime flying, which is required as training for certain missions, has an increased likelihood of causing sleep disturbance. The lack of quality sleep has the potential to affect health and concentration. The probability of being awakened at least once per night was calculated using a method described by the American National Standards Institute (American National Standards Institute, 2008). The method first predicts the probability of awakening associated with each type of

flying event (higher SELs yield higher probability of awakening) and then sums the probabilities associated with all event types. The overall probability of awakening at least once per night reflects all flying events that occur between 10:00 p.m. and 7:00 a.m., when most people sleep. The analysis also accounts for standard building attenuation of 15 dB and 25 dB with windows open and closed, respectively. Sleep disturbance probabilities listed for parks and schools are not intended to imply that people regularly sleep in parks or schools, but instead are indicative of impacts in nearby residential areas. Less than 1 percent of F-35A Wing operations would be expected to occur between 10:00 p.m. and 7:00 a.m., when most people are trying to sleep. An estimated 2 percent or less of people would be awakened at least once per night by aircraft noise at the locations studied under any of the afterburner scenarios (Table 4.1-6).

Table 4.1-6. Percent of People Awakened by Aircraft Noise at Least Once per Night at Representative Locations Under the Three-Squadron F-35A Wing Alternative

Location Description	Pre-Hurricane	No Action	Three-Squadron F-35A Wing Beddown					
			5% Afterburner		50% Afterburner		95% Afterburner	
	% Awakened	% Awakened	% Awakened	Change[1]	% Awakened	Change[1]	% Awakened	Change[1]
First Baptist Church of Parker	1	0	1	1	1	1	1	1
Allenton (town)	1	0	1	1	1	1	1	1
Saint Andrews State Park, Campground	0	0	0	0	0	0	0	0
Bayou Point (residences)	1	0	1	1	1	1	1	1
Long Point Condominiums	2	0	1	1	1	1	1	1
Mexico Beach (community)	1	0	0	0	0	0	0	0
Panama City (community)	1	0	1	1	1	1	1	1
Parker Elementary School	1	0	1	1	1	1	1	1
Piney Point (residences)	0	0	0	0	0	0	0	0
Saint Andrews State Park, Shell Island	1	0	1	1	1	1	1	1
Saint Andrews (community)	1	0	0	0	0	0	0	0
Tyndall AFB Dormitories	2	0	1	1	2	2	2	2
Tyndall Elementary School	2	0	1	1	1	1	1	1
Tyndall AFB on-base housing	1	0	1	1	1	1	1	1
Water's Edge (residences)	1	0	1	1	1	1	1	1

Key: AFB = Air Force Base
Note:
[1] Change is relative to No Action.

Potential Hearing Loss

Under the three-squadron F-35A Wing beddown alternative, noise levels exceeding 80 dB DNL would not extend to off-base land areas. Therefore, in accordance with DoD policy, the risk of potential hearing loss in off-base areas is minimal (DoD Noise Working Group, 2013).

The Tyndall AFB Dormitory is the only existing on-base residential facility that would be exposed to noise levels greater than 80 dB DNL under the three-squadron F-35A Wing beddown alternative. The noise level at this facility would increase to as high as 81 dB DNL under three-squadron F-35A Wing beddown alternative afterburner scenarios (see Table 4.1-3). Siting and design of a proposed new Airmen Dormitory following standard USAF planning processes and in compliance with USAF noise criteria contained in DODI 4165.57 would ensure that potential hearing loss risk would be minimal for residents of the new facility. Other existing facilities that would be affected by noise levels greater than 80 dB DNL include several industrial, administrative, and community support facilities.

Noise levels are taken into account as part of the USAF installation planning and facility design processes.

Workplace Noise

Workplace noise would continue to be managed in accordance with applicable regulations to minimize hearing-loss risk for people working on Tyndall AFB. The USAF Hearing Conservation Program is designed to protect workers from the harmful effects of hazardous noise by identifying all areas where workers are exposed to hazardous noise and requiring hearing protection and monitoring as necessary.

Nonauditory Health

Nonauditory health effects of long-term noise exposure (e.g., cardiovascular health risks) have not been documented at levels below those at which noise-induced hearing loss is a substantial risk.

4.1.2.1.2 Airspace and Range Training Operations

Eglin AFB-based F-35A aircraft currently uses airspace proposed for use by the Tyndall AFB-based F-35A Wing, and individual F-35A overflight noise levels would remain the same as are listed in Table 3.1-10.

The number of F-35A operations flown would increase as described in Table 3.1-3, resulting in changes in time-averaged noise levels beneath the airspace (Table 4.1-7). Under the three-squadron F-35A Wing beddown operational scenario, the FTU, which is currently operating F-22 and T-38 aircraft from Eglin AFB, is assumed to depart the region and would not be conducting training sorties in regional airspace (see Section 3.1.1). Noise level increases associated with proposed F-35A training operations are offset, partially or completely, by decreases in F-22- and T-38-operations noise. The L_{dnmr} would increase by up to 2.5 dB under the three-squadron F-35A Wing beddown alternative relative to No Action Alternative operations, but would remain similar to ambient, and well below 65 dB.

Table 4.1-7. Noise Levels Beneath Training Airspace Under Three-Squadron F-35A Wing Alternative

Airspace Area	Pre-Hurricane	No Action Alternative Operations	Three-Squadron F-35A Wing Beddown	
	L_{dnmr} (dBA)[1]	L_{dnmr} (dBA)[1]	L_{dnmr} (dBA)[1]	Change (dBA)[2]
Compass Lake Work Area (underlying Tyndall B MOA)	<45	<45	47.5	2.5
Compass Lake Work Area (underlying Tyndall C MOA)	51.1	48.5	48.4	-0.1
Carabelle Work Area	<45	<45	47	2

Key: < = less than; dBA = A-weighted decibel; L_{dnmr} = onset rate-adjusted monthly day-night average sound level; MOA = Military Operations Area
Notes:
[1] L_{dnmr} was not calculated for overwater training areas, W-151 and W-470.
[2] Change in noise levels is calculated relative to No Action Alternative.

F-35A aircraft would conduct supersonic flights in offshore Warning Areas W-151 and W-470. Several aircraft types, including F-22 aircraft, currently conduct supersonic training in the same area. F-22 aircraft have the ability to maintain supersonic airspeeds without the use of afterburners, and create more sonic booms per sortie than other aircraft types. Because the F-22 aircraft currently based at Eglin AFB will depart the region, the sonic booms generated by the unit would cease to occur. The net result of the departure of the F-22 unit and the beddown of the F-35A Wing would be a slight reduction in CDNL and booms per day in the warning areas (Table 4.1-8). Sonic booms reaching the shoreline would continue to be relatively infrequent, and would become slightly more infrequent under the three-squadron F-35A Wing beddown alternative.

Table 4.1-8. Offshore Sonic Boom Noise Levels Under Three-Squadron F-35A Wing Alternative

Airspace Area	Pre-Hurricane	No Action	Three-Squadron F-35A Wing	Change[1]
	CDNL (dB)	CDNL (dB)	CDNL (dB)	CDNL (dB)
W-151	61.8	57.4	50.6	-6.8
W-470	64.5	62.6	58.7	-3.9
	booms/day	booms/day	booms/day	booms/day
W-151	12.5	5.3	1.1	-4.2
W-470	26.9	17.6	7.0	-10.6

Key: dB = decibel; CDNL = C-weighted day-night average sound level
Note:
[1] Change is relative to No Action.

4.1.2.2 Noise, Four-Squadron F-35A Alternative

4.1.2.2.1 Base Airfield Operations

Noise levels generated by individual F-35A overflights would be identical to those described in Sections 3.1.2 and 4.1.2.

Noise contours (DNL) under the four-squadron F-35A Wing beddown alternative with afterburner Scenario A (5 percent afterburner use) is shown in Figure 4.1-3. Figure 4.1-4 illustrates the calculated 65 dB DNL for each of the afterburner scenarios under the four-squadron F-35A Wing beddown alternative.

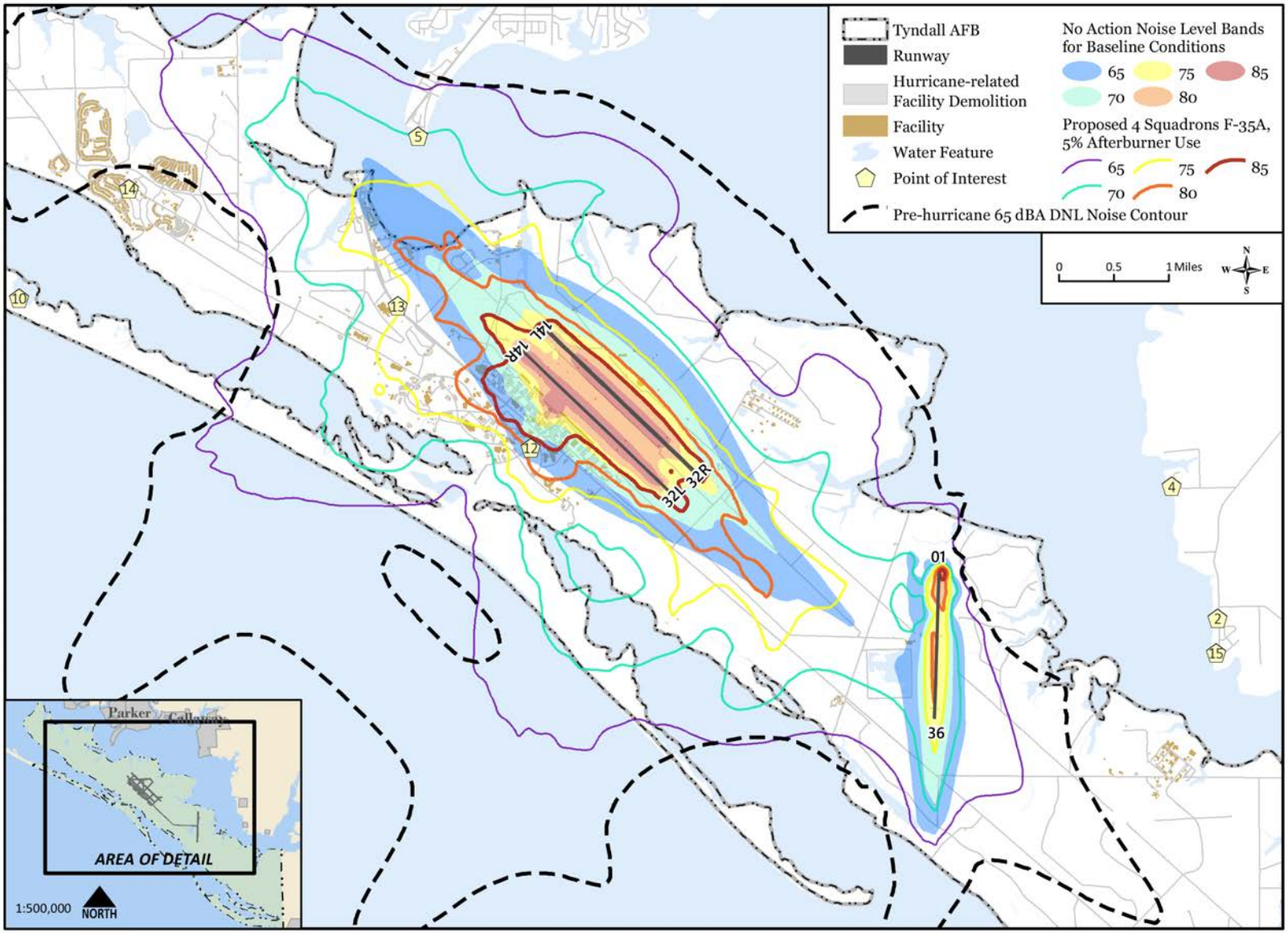

Figure 4.1-3. Noise Contours Under Four-Squadron F-35A Beddown 5% Afterburner Use

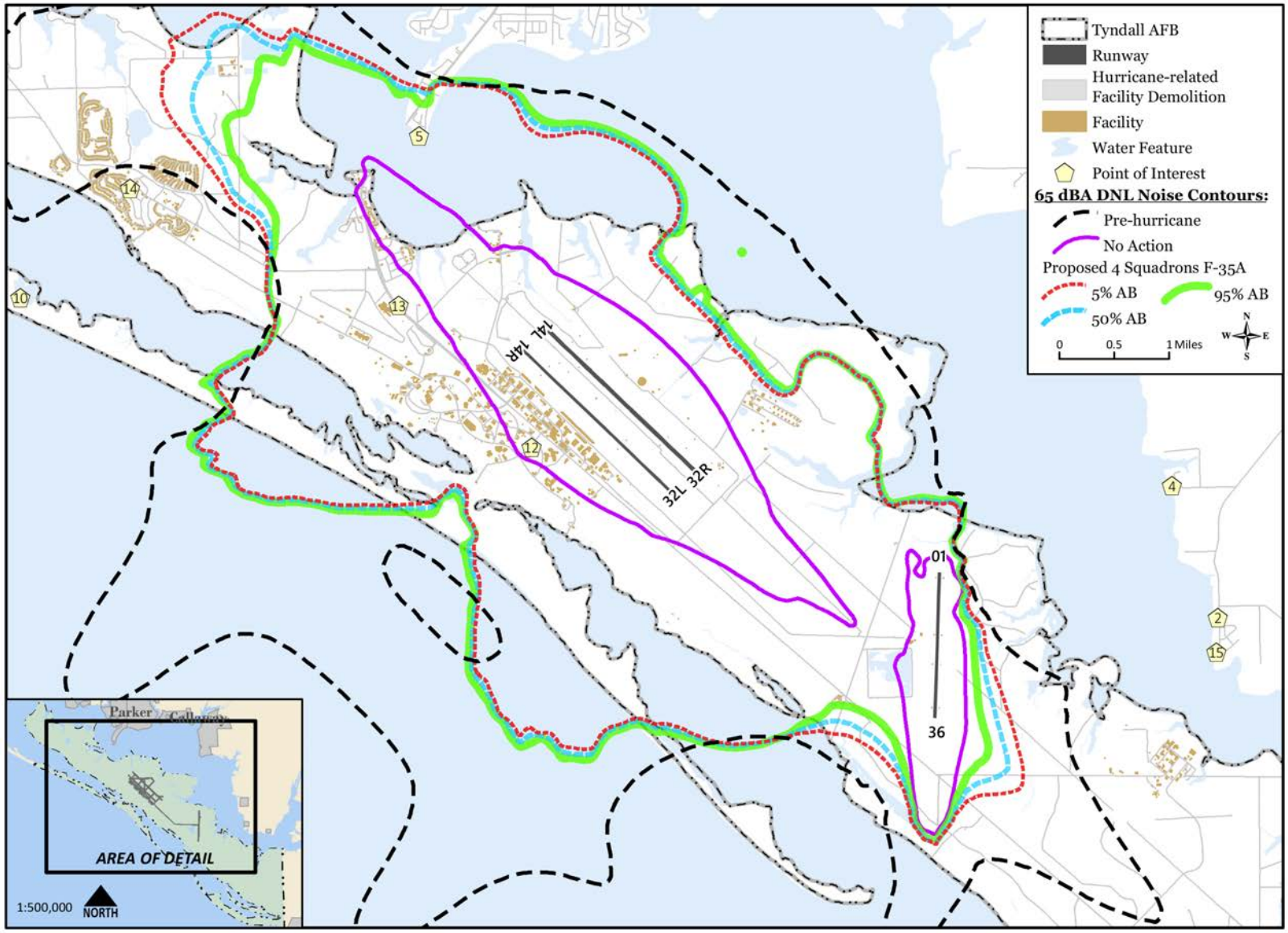

Figure 4.1-4. 65 dB DNL Noise Contours Under Four-Squadron F-35A Wing Beddown, All Afterburner Scenarios

Off-base land areas affected at greater than 65 dB DNL are limited to portions of the City of Parker and Saint Andrews State Park (Shell Island) under all three afterburner scenarios. As described in Section 4.1.2.1, a person's reaction to noise is dependent on several non-acoustic factors. Noise levels greater than 65 dB DNL are considered incompatible with noise-sensitive land uses, such as residential, in accordance with DoD guidelines.

The number of acres of off-base land at greater than 65 dB DNL would increase to 93, 93, and 84 acres, respectively (Table 4.1-9), under the 5, 50, and 95 percent afterburner sub-alternatives. The acreage affected is substantially larger than the 2 acres affected under No Action Alternative operations, but is substantially smaller than the 217 acres affected under pre-hurricane conditions (included as a point of reference).

Table 4.1-9. Off-Base Acres of Land at 65 dB DNL or Greater Under Four-Squadron F-35A Wing Alternative

DNL (dB)	Pre-Hurricane	No Action	Four-Squadron F-35A Beddown					
			5% Afterburner		50% Afterburner		95% Afterburner	
	Acres	Acres	Acres	Change[1]	Acres	Change[1]	Acres	Change[1]
65–69	199	2	79	77	81	79	74	72
70–74	15	0	14	14	12	12	10	10
75–79	3	0	0	0	0	0	0	0
80–84	0	0	0	0	0	0	0	0
≥85	0	0	0	0	0	0	0	0
Total	**217**	**2**	**93**	**91**	**93**	**91**	**84**	**82**

Key: ≥ = greater than or equal to; dB = decibel; DNL = day-night average sound level
Note:
[1] Change is relative to No Action.

The estimated number of people affected by noise levels greater than 65 dB DNL under the 5, 50, and 95 percent afterburner scenarios would be 135, 131, and 135, respectively (Table 4.1-10). It is important to note that affected population estimates were made using 2017 U.S. Census data (i.e., pre-hurricane). The number of people living in areas near Tyndall AFB is currently in a state of flux. The 2017 census data (USCB, 2018d) is the best population data available, and may approximate population after rebuilding of the community is complete. The estimated number of residents affected by noise levels greater than 65 dB DNL is substantially higher than the 0 people affected under No Action Alternative conditions, but much smaller than the estimated 190 people affected under the pre-hurricane conditions (included as a point of reference).

Table 4.1-10. Estimated Number of People Exposed to Noise Levels Greater Than 65 dB DNL Under the Four-Squadron F-35A Wing Alternative

DNL (dB)	Pre-Hurricane	No Action	Four-Squadron F-35A Beddown					
			5% Afterburner		50% Afterburner		95% Afterburner	
	Residents	Residents	Residents	Change[1]	Residents	Change[1]	Residents	Change[1]
65–69	184	0	129	129	131	131	135	135
70–74	6	0	6	6	0	0	0	0
75–79	0	0	0	0	0	0	0	0
80–84	0	0	0	0	0	0	0	0
≥85	0	0	0	0	0	0	0	0
Total	**190**	**0**	**135**	**135**	**131**	**131**	**135**	**135**

Key: ≥ = greater than or equal to; dB = decibel; DNL = day-night average sound level
Note:
[1] Change is relative to No Action.

Additional noise calculations were run at several representative noise-sensitive locations, which are depicted in Figure 3.1-1. The noise level at Long Point Condominiums would be between 65 and 70 dB DNL under the 50 and 95 percent sub-alternatives, and would be between 70 and 75 dB DNL under the 5 percent afterburner sub-alternative. Noise levels would be between 70 and 75 dB DNL at Tyndall Elementary School, and would be between 80 and 85 dB DNL at the Tyndall AFB Dormitories (Table 4.1-11). These noise levels are considered incompatible with residential and educational land uses. Noise levels would increase by as much as 15 dB DNL relative to No Action Alternative operations, but would be lower than the pre-hurricane levels at all locations except the Tyndall AFB Dormitories, where they would increase by 7 dB relative to pre-hurricane conditions (included as a point of reference).

Table 4.1-11. Day-Night Average Sound Level at Representative Noise-Sensitive Locations Under Four-Squadron F-35A Wing Alternative

Location Description	Pre-Hurricane	No Action	Four-Squadron F-35A Beddown					
			5% Afterburner		50% Afterburner		95% Afterburner	
	DNL	DNL	DNL	Change[1]	DNL	Change[1]	DNL	Change[1]
First Baptist Church of Parker	58.6	<45	55.3	10.3	55.1	10.3	55	10.2
Allenton (town)	59.2	46.5	53.3	6.8	53.6	7.1	53.8	7.3
Saint Andrews State Park, Campground	45.4	<45	<45	0	39.5	0	<45	0
Bayou Point (residences)	58.3	47	52.4	5.4	52.9	5.9	53.3	6.3
Long Point Condominiums	70.5	58.7	70.1	11.4	69.9	11.2	69.6	10.9
Mexico Beach (community)	58.1	<45	46.6	1.6	46.5	1.6	46.3	1.4
Panama City (community)	65.5	50.7	57.2	6.5	57.6	6.9	57.9	7.2
Parker Elementary School	55.1	<45	51.3	6.3	51.3	10	51.3	10
Piney Point (residences)	47.1	<45	<45	6.4	42.5	6.6	<45	0
Saint Andrews State Park, Shell Island	64	<45	57.3	12.3	57.4	15.3	57.5	15.4
Saint Andrews (community)	50.8	46.5	50.2	3.7	50	3.5	49.8	3.3
Tyndall AFB Dormitories	75.5	67.6	81.9	14.3	82.1	14.5	82.2	14.6
Tyndall Elementary School	75.2	61	74.2	13.2	74	13	73.8	12.8
Tyndall AFB on-base housing	63.6	48	59.6	11.6	58.9	10.9	58.1	10.1
Water's Edge (residences)	58.9	47.1	53.8	6.7	54	6.9	54.1	7

Key: < = less than; AFB = Air Force Base; DNL = day-night average sound level
Note:
[1] Change is relative to No Action.

Speech Interference

Speech interference is possible when noise levels exceed 50 dB. For the purposes of this analysis, any change to normal speech patterns is counted as an interference event. Table 4.1-12 lists the number of events exceeding L_{max} of 50 dB outdoors. Flight paths are variable and speech-interference events sometimes occur far from standard Tyndall AFB flight patterns. Speech-interference events are stated for people conversing outdoors, because the local weather supports people spending a large fraction of their day outdoors. The number of speech-interference events would increase by as many as 7 to 9 events per average hour under any of the sub-alternatives' afterburner scenarios relative to No Action Alternative operations. The number would decrease or remain the same relative to pre-hurricane conditions, except at First Baptist Church of Parker, Bayou Point, Long Point Condominiums, Panama City, Piney Point, Saint Andrews State Park (Shell Island), and Tyndall on-base housing, where the number would increase by as many as 2 events per hour (included as a point of reference).

Table 4.1-12. Number of Speech-Interference Events per Average Daytime Hour Under Four-Squadron F-35A Wing Alternative

Location Description	Pre-Hurricane	No Action	Four-Squadron F-35A Beddown					
			5% Afterburner		50% Afterburner		95% Afterburner	
	Events	Events	Events	Change[1]	Events	Change[1]	Events	Change[1]
First Baptist Church of Parker	7	1	8	7	8	7	8	7
Allenton (town)	8	2	8	6	8	6	8	6
Saint Andrews State Park, Campground	5	1	5	4	5	4	5	4
Bayou Point (residences)	7	1	8	7	8	7	8	7
Long Point Condominiums	8	2	9	7	9	7	9	7
Mexico Beach (community)	4	1	3	2	3	2	4	3
Panama City (community)	8	2	9	7	9	7	9	7
Parker Elementary School	7	1	7	6	7	6	7	6
Piney Point (residences)	5	1	7	6	7	6	7	6
Saint Andrews State Park, Shell Island	7	1	8	7	8	7	8	7
Saint Andrews (community)	6	1	6	5	6	5	6	5
Tyndall AFB Dormitories	9	2	9	7	9	7	9	7
Tyndall Elementary School	8	2	8	6	8	6	8	6
Tyndall AFB on-base housing	7	1	8	7	8	7	8	7
Water's Edge (residences)	8	2	8	6	8	6	8	6

Key: AFB = Air Force Base
Note:
[1] Change is relative to No Action.

Classroom Noise

Noise interference with learning in schools is of particular concern because noise can interrupt communication or interfere with concentration. The DoD Noise Working Group guidelines recommend that exterior noise levels during the school day not exceed 60 dB L_{eq-8hr}, as that would indicate that interior-classroom noise levels likely exceed a recommended 40 dB maximum background noise level (DoD Noise Working Group, 2009). Exterior school-day noise levels would be below the 60 dB L_{eq-8hr} criteria level at Parker Elementary School, but would exceed 60 dB L_{eq-8hr} at Tyndall Elementary School under all F-35A Wing afterburner-use sub-alternatives (Table 4.1-13). The number of indoor noise events with potential to interfere with speech (above 50 dB L_{max}) per average daytime hour at Tyndall Elementary School would be as high as six events with windows open or closed. The number of events at Parker Elementary School would be three events with windows open, but would be one event under all afterburner-use sub-alternatives with windows closed.

Table 4.1-13. Indicators of Classroom Interference Under Four-Squadron F-35A Wing Alternative

Location Description	Pre-Hurricane	No Action	Four-Squadron F-35A Beddown Alternative					
			5% Afterburner		50% Afterburner		95% Afterburner	
	L_{eq-8hr}	L_{eq-8hr}	L_{eq-8hr}	Change[1]	L_{eq-8hr}	Change[1]	L_{eq-8hr}	Change[1]
Parker Elementary School	56.9	<45	53.1	8.1	53.1	8.1	53.1	8.1
Tyndall Elementary School	77.0	62.9	76.1	13.2	75.9	13.0	75.7	12.8
	Events (Windows Open)	**Events (Windows Open)**	**Events (Windows Open)**	**Change[1]**	**Events (Windows Open)**	**Change[1]**	**Events (Windows Open)**	**Change[1]**
Parker Elementary School	4	1	3	2	3	2	3	2
Tyndall Elementary School	6	1	6	5	6	5	6	5
	Events (Windows Closed)	**Events (Windows Closed)**	**Events (Windows Closed)**	**Change[1]**	**Events (Windows Closed)**	**Change[1]**	**Events (Windows Closed)**	**Change[1]**
Parker Elementary School	1	0	1	1	1	1	1	1
Tyndall Elementary School	5	1	6	5	6	5	6	5

Key: < = less than; L_{eq-8hr} = 8-hour equivalent noise level
Note:
[1] Change is relative to No Action.

Sleep Disturbance

As described in Section 4.1.2.1, nighttime flying, which is required as training for certain missions, has an increased likelihood of causing sleep disturbance. Less than 1 percent of based F-35A Wing operations would be expected to occur between 10:00 p.m. and 7:00 a.m., when most people are

trying to sleep. An estimated 2 percent or less of people would be awakened at least once per night by aircraft noise at the locations studied under any of the sub-alternatives (Table 4.1-14).

Table 4.1-14. Percent of People Awakened by Aircraft Noise at Least Once per Night at Representative Locations Under the Four-Squadron F-35A Wing Alternative

Location Description	Pre-Hurricane	No Action	Four-Squadron F-35A Beddown					
			5% Afterburner		50% Afterburner		95% Afterburner	
	% Awakened	% Awakened	% Awakened	Change[1]	% Awakened	Change[1]	% Awakened	Change[1]
First Baptist Church of Parker	1	0	1	1	1	1	1	1
Allenton (town)	1	0	1	1	1	1	1	1
Saint Andrews State Park, Campground	0	0	0	0	0	0	0	0
Bayou Point (residences)	1	0	1	1	1	1	1	1
Long Point Condominiums	2	0	2	2	2	2	2	2
Mexico Beach (community)	1	0	0	0	0	0	0	0
Panama City (community)	1	0	1	1	1	1	1	1
Parker Elementary School	1	0	1	1	1	1	1	1
Piney Point (residences)	0	0	0	0	0	0	0	0
Saint Andrews State Park, Shell Island	1	0	1	1	1	1	1	1
Saint Andrews (community)	1	0	0	0	0	0	0	0
Tyndall AFB Dormitories	2	0	2	2	2	2	2	2
Tyndall Elementary School	2	0	2	2	2	2	2	2
Tyndall AFB on-base housing	1	0	1	1	1	1	1	1
Water's Edge (residences)	1	0	1	1	1	1	1	1

Key: AFB = Air Force Base
Note:
[1] Change is relative to No Action.

Potential Hearing Loss

Under the four-squadron F-35A Wing beddown alternative, noise levels exceeding 80 dB DNL would not extend to off-base land areas. Therefore, in accordance with DoD policy, the risk of potential hearing loss is minimal (DoD Noise Working Group, 2013).

Workplace Noise

Workplace noise would continue to be managed in accordance with applicable regulations to minimize hearing-loss risk for people working on Tyndall AFB.

Nonauditory Health

Nonauditory health effects of long-term noise exposure (e.g., cardiovascular health risks) have not been documented at levels below those at which noise-induced hearing loss is a substantial risk.

4.1.2.2.2 Airspace and Range Training Operations

Individual F-35A overflight noise levels in training airspace would remain the same as are listed in Table 3.1-10.

The number of F-35A operations flown would increase as described in Table 3.1-3, resulting in changes in time-averaged noise levels beneath the airspace (Table 4.1-15). Under the four-squadron F-35A Wing beddown alternative, the FTU, which is currently operating F-22 and T-38 aircraft from Eglin AFB, is assumed to depart the region and would not be conducting training sorties in regional airspace (see Section 3.1.1). Noise-level increases associated with F-35A training operations are partially offset by decreases in F-22 and T-38 operations noise. The L_{dnmr} would increase by up to 3.8 dB under the four-squadron F-35A Wing beddown alternative relative to No Action Alternative operations, but would remain similar to ambient noise levels and well below 65 dB.

Table 4.1-15. Noise Levels Beneath Training Airspace Under Four-Squadron F-35A Wing Alternative

Airspace Area	Pre-Hurricane Operations	No Action Alternative Operations	Four-Squadron F-35A Beddown	
	L_{dnmr} (dBA)[1]	L_{dnmr} (dBA)[1]	L_{dnmr} (dBA)[1]	Change (dBA)[2]
Compass Lake Work Area (underlying Tyndall B MOA)	<45	<45	48.8	3.8
Compass Lake Work Area (underlying Tyndall C MOA)	51.1	48.5	49.4	0.9
Carabelle Work Area	<45	<45	48.3	3.3

Key: < = less than; dBA = A-weighted decibel; L_{dnmr} = onset rate-adjusted monthly day-night average sound level; MOA = Military Operations Area

Notes:

[1] L_{dnmr} was not calculated for overwater training areas, W-151 and W-470.

[2] Change in noise levels is calculated relative to No Action Alternative.

F-35A aircraft would conduct supersonic flights in offshore Warning Areas W-151 and W-470. Several aircraft types, including F-22 aircraft, currently conduct supersonic training in the same area. F-22 aircraft have the ability to maintain supersonic airspeeds without the use of afterburners, and create more sonic booms per sortie than other aircraft types. Because the F-22 aircraft currently based at Eglin AFB would depart the region, the sonic booms generated by the unit would cease to occur. The net result of the departure of the F-22 unit and the beddown of the four-squadron F-35A Wing would be a reduction in CDNL and booms per day in the warning areas (Table 4.1-16). Sonic booms reaching the shoreline would continue to be relatively infrequent, and would become less frequent under the four-squadron F-35A Wing beddown alternative.

Table 4.1-16. Offshore Sonic-Boom Noise Levels Under Four-Squadron F-35A Wing Alternative

Airspace Area	Pre-Hurricane	No Action	Four-Squadron F-35A	Change[1]
	CDNL (dB)	CDNL (dB)	CDNL (dB)	CDNL (dB)
W-151	61.8	57.4	50.9	-6.5
W-470	64.5	62.6	59	-3.6
	booms/day	booms/day	booms/day	booms/day
W-151	12.5	5.3	1.2	-4.1
W-470	26.9	17.6	7.7	-9.9

Key: dB = decibel; CDNL = C-weighted day-night average sound level
Note:
[1] Change is relative to No Action.

4.1.2.3 Noise, No Action Alternative

Under the No Action Alternative, aircraft operations and noise levels would not increase due to an F-35A Wing beddown. There would be no additional noise impacts to the affected environment from the No Action Alternative.

4.1.3 Health and Safety, F-35A at Tyndall

4.1.3.1 Health and Safety, Three-Squadron F-35A Alternative

4.1.3.1.1 Base Facilities Construction

Ground operations and maintenance activities on Tyndall AFB would continue to be conducted using the same processes and procedures as under current operations. All actions would be accomplished by technically qualified personnel and would be conducted in accordance with applicable USAF safety requirements, approved technical data, and AFOSH standards.

To support this alternative, new facilities would be constructed, while other facilities would be altered or have additional space developed. No unique construction practices or materials are required to construct these facilities. During construction, standard industrial safety standards and BMPs would be followed. These would include: implementing procedures to ensure that guards, housekeeping, and personal protective equipment are in place; establishing programs and procedures for lockout, right-to-know, confined space, hearing conservation, forklift operations, and so on; conducting employee safety orientations and performing regular safety inspections; and developing a plan of action for the correction of any identified hazards. No unusual ground safety risks are expected from these activities.

4.1.3.1.2 Airspace and Range Training Operations

Flight Safety and Mishap Prevention

Under this alternative, flying operations would continue to be conducted in the existing airspace environment using safety procedures currently in effect. The primary impact related to this alternative is the potential for aircraft mishaps due to a proposed increase in operations.

The USAF calculates Class A mishap rates for each type of aircraft in the inventory. Mishaps rates are computed based on the number of mishaps per 100,000 flying hours. (NOTE: Combat

losses due to enemy action are excluded from mishap statistics.) Through 2019, the F-35 had logged a total of approximately 96,000 flying hours (it began flying operations in 2012), with three recorded Class A mishaps. This equates to a lifetime mishap rate of 3.11 or approximately one mishap every 31,000 flying hours (USAF, 2019j). Under this alternative, the F-35A would fly an estimated 18,447 hours per year in the training airspace. From Table 2.2-6, there are 13,802 hours of training overwater and 4,645 hours of training over land. Based on the projected Class A mishap rate, the three-squadron Wing would have an estimated annual average of 0.43 Class A mishaps training over water and 0.14 Class A mishaps training over land. The USAF has established procedures for dealing with mishaps, as described below.

This analysis makes only a statistical prediction regarding the frequency of mishaps and may not represent real-world conditions. Current aircraft flight safety policies and procedures at Tyndall AFB (as described in Section 3.1.3 and Appendix B, Section B.3) are designed to ensure that the potential for aircraft mishaps is reduced to the lowest possible level. These safety policies and procedures would continue under this alternative.

As discussed in Section 3.1.3.2, if a mishap were to occur, there are well-established procedures for responding to aircraft mishaps on USAF and non-USAF property. After all required investigations and related actions on a mishap site are complete, the aircraft would be removed from the mishap site. Installation personnel accomplishes cleanup of the site or contracts to an outside agency to accomplish the cleanup. Overall, the purpose of response planning is to:

- Save lives, property, and material by timely and correct response to mishaps
- Quickly and accurately report mishaps to higher HQ
- Investigate the mishap to preclude the reoccurrence of the same or a similar mishap

Also, the F-35 is primarily composed of composite materials. When these materials burn, as may be the case in a mishap-related fire, they may give off fumes containing toxic constituents; consequently, appropriate personal protective equipment, such as adequate respirators, would be required by response personnel. During mishap prevention training, the USAF would communicate any such requirements to local fire department personnel regarding the need for specific response procedures and/or protective equipment. No significant impacts to flight safety would occur with continued implementation of established and new mishap prevention procedures.

Bird/Animal Aircraft Strike Hazard

As discussed in Section 3.1.3.2.2, over the years 2009 to 2018, Tyndall AFB averaged approximately 20 bird strikes per year. Most incidents resulted in little or no damage to the aircraft, and none resulted in a Class A mishap (USAF, 2019c).

Under this alternative, aircrews would operate in the same general airspace environments. There would be an estimated total of about 50,000 operations at the airfield by based and transient aircraft. There were an average of 20 BASH incidents per year with the 60,660 operations in 2018. This means that the statistical average with the F-35A three-squadron Wing would be 13 BASH incidents per year. With nearly 17,000 operations currently conducted by based and transient aircraft, there would be a calculated four BASH incidents annually. The averages suggest that the overall potential for bird aircraft strikes would not be anticipated to statistically change

from what has occurred historically at Tyndall AFB. Personnel would continue to follow applicable procedures specified in the Tyndall AFB BASH Plan (Plan 901) and other guidance to minimize hazards from aircraft/animal strikes. These procedures would include vegetation manipulation, use of bioacoustics and pyrotechnics, and use of bird modeling and radar systems. Additionally, airfield users would be made aware of potential hazards via radio broadcasts whenever bird/animal activities are observed or reported. When local conditions show a potential for an increased risk, limits would be placed on low-altitude flights and some types of training. If a strike does occur, procedures for post-incident reporting and coordination would be followed in accordance with the BASH Plan (USAF, 2018b). With continued implementation of established BASH procedures, BASH risks would be not be expected to significantly increase.

Use of Flares

Under this alternative, the F-35A would deploy MJU-61A/B flares during training in airspace already approved for such use. Current restrictions define the altitude of flare use in the approved airspaces from Figure 2.2-4 during the training missions identified in Table 2.2-4. Three squadrons of operational F-35As are estimated to deploy 31,630 flares per year. (NOTE: An estimated 100 annual sorties would involve deploying inert munitions on existing ranges approved for these inert munitions. These weapons would be released between 20,000 and 40,000 feet MSL and would require no laser guidance. All munition training activities would be conducted in accordance with existing range safety procedures described in Appendix B, Section B.3).

Toxicity is not a concern, as the concentration and quantity of magnesium (primary material) contained in the flare would not be highly toxic, and it is very unlikely that humans or animals would ingest flare material. The main issue with flares is their potential to start fires that can spread and have significant adverse impacts on safety. A secondary issue is the potential for dud flares and falling debris to pose strike hazards. Although the probability of injury from falling debris has been found to be extremely remote, there may be a risk associated with untrained people finding dud flares dropped over land that is not controlled by the DoD (U.S. Department of Commerce, 1997).

Fire risk associated with flare use under any of the alternatives 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 best way to reduce the risk of fires caused by flares is to establish and enforce minimum altitudes for flare release. As discussed in Sections 2.2.4.4 and 3.1.3.2.3, current restrictions define where (what airspace) and at what altitude flares may be used. Table 2.2-6 shows roughly 90 percent of flare releases would occur above 15,000 feet MSL. At this altitude, most flares would be released more than 21 times higher than the minimum altitude required (700 feet) to ensure complete consumption; defensive flares typically burn out in 3.5 to 5 seconds, during which time the flare will fall between 200 and 400 feet (U.S. Department of Commerce, 1997). At Tyndall AFB, A large percentage of flare usage would occur over water; consequently, there would be no potential for fires to occur in these cases.

There is also slight potential for the public to encounter unexpended flares that have washed up on the shore from training in overwater ranges. The chemicals in unexpended or partially burned flares can reignite when exposed to air or water, resulting in severe burns, if handled. The presence

of any flares should be reported to appropriate agencies, such as the police or U.S. Coast Guard, who would then contact experienced personnel for their proper disposal.

No unusual or elevated safety risks would be expected on this alternative related to the use of flares under established procedures.

4.1.3.2 Health and Safety, Four-Squadron F-35A Alternative

4.1.3.2.1 Base Facilities Construction

Potential impacts associated with base facility construction would be the same as under the Three-Squadron F-35A Wing Alternative, as described in Section 4.1.3.1.

4.1.3.2.2 Airspace and Range Training Operations

Flight Safety and Mishap Prevention

Under this alternative, the F-35A would fly an estimated 22,960 hours per year (16,400 annual F-22 sorties multiplied by 1.5 hours per sortie). Assuming a historical mishap rate for the F-35 of 3.11 (see Section 4.1.3.1.2), this would mean that a mishap could occur approximately every 1.35 years under this alternative. With this alternative, F-35As would fly an estimated 18,403 hours of training overwater and 6,192 hours of training over land (see Table 2.2-6). Based on the projected Class A mishap rate, the four-squadron Wing would have an estimated annual average of 0.57 Class A mishaps training over water and 0.19 Class A mishaps training over land. The USAF has established procedures for dealing with mishaps, as described in Section 4.1.3.1.2. This would represent a statistical increase in the frequency of mishaps over the Three-Squadron F-35A Wing Alternative, discussed in Section 4.1.3.1.2. As previously discussed, this analysis makes only a statistical prediction regarding the frequency of mishaps and may not represent real-world conditions. Current aircraft flight safety policies and procedures at Tyndall AFB, designed to ensure that the potential for aircraft mishaps is reduced to the lowest possible level, would continue under this alternative.

Bird/Animal Aircraft Strike Hazard

Under this alternative, aircrews would operate in the same general airspace environments. There would be an estimated total of about 61,000 operations at the airfield by based and transient aircraft. There were an average of 20 BASH incidents per year with the 60,660 operations in 2018. This means that the statistical average with the F-35A three-squadron Wing would be 20 BASH incidents per year. With nearly 17,000 operations currently conducted by based and transient aircraft, there would be a calculated 4 BASH incidents annually. The averages suggest that the overall potential for bird aircraft strikes would not be anticipated to statistically change from what has occurred historically at Tyndall AFB. Personnel would continue to follow applicable procedures specified in the Tyndall AFB BASH Plan (USAF, 2018b) and other guidance to minimize hazards from aircraft/animal strikes. With continued implementation of established procedures, BASH risks would not be expected to significantly increase.

Use of Flares

The number of flares annually deployed during training for the four-squadron Wing would be 42,174 flares, up from the 31,640 flares deployed under the Three-Squadron F-35A Wing Alternative. As discussed for the three-squadron wing (Section 3.1.3.2), use of established operational procedures would ensure that strike, fire, and toxicity hazards would pose no unusual or elevated safety risks related to the increased use of flares.

4.1.3.3 Health and Safety, No Action Alternative

Under the No Action Alternative, flight activity at Tyndall AFB would be as described for the affected environment (Section 3.1.1). Statistically, this operational tempo would be expected to result in a lower potential for aircraft mishaps and BASH incidents, when compared to the Proposed Action. No F-35A–related personnel changes or construction would occur. All aspects of ground safety and safety in the airspace would continue as described in Section 3.1.3.

4.1.4 Air Quality, F-35A at Tyndall

The air quality analysis estimated the magnitude of emissions that would result from construction and operation of the proposed F-35A Wing alternatives at Tyndall AFB. Appendix B (Section B.4.3) presents the air quality analysis methodology. Appendix C presents the calculations used to estimate air pollutant emissions from proposed construction and operational sources for each project alternative.

The air quality analysis for the F-35A missions at Tyndall AFB evaluates F-35A take-off operations based on three afterburner scenarios. Activity levels and resulting emissions for all other proposed operational activities attributed to each alternative would remain the same under each afterburner scenario.

The immediate area surrounding Tyndall AFB within Bay County is currently in attainment of all NAAQS. Therefore, the analysis used the USEPA prevention of significant deterioration (PSD) permitting threshold of 250 tons per year for criteria pollutants as indicators of the significance of projected air quality impacts within the Tyndall AFB project region. The analysis uses this criterion as the PSD permitting process applies to areas that attain a NAAQS. If projected emissions exceed an indicator threshold, further analysis was conducted to determine whether impacts were significant. In such cases, if emissions do not contribute to an exceedance of an ambient air quality standard, then impacts would not be significant.

4.1.4.1 Air Quality, Three-Squadron F-35A Alternative

4.1.4.1.1 Base Facilities Construction

The Three-Squadron F-35A Wing Alternative at Tyndall AFB would require construction of airfield facilities (e.g., training facilities, hangars, taxiways, and maintenance and fueling facilities). Air quality impacts associated with proposed construction activities would result from

(1) combustive emissions generated by fossil fuel-powered equipment and (2) fugitive dust emissions ($PM_{10}/PM_{2.5}$) from operation of equipment on exposed soil.

The USAF Air Conformity Applicability Model (ACAM) version 5.0.16b was used to estimate air emissions that would be generated by construction activities associated with the Three-Squadron F-35A Wing Alternative (Solutio Environmental, Inc., 2020). Construction activity data developed for the alternative were used as inputs for ACAM. The air quality analysis assumed that the alternative would begin construction activities in 2021 and would complete all activities by 2024.

Inclusion of BMPs into proposed construction activities would reduce fugitive dust emissions generated from the use of construction equipment on exposed soil by 50 percent from uncontrolled levels (Countess Environmental, 2006). Table 2.7-1 of this EIS describes the air quality BMPs that would control fugitive dust during construction.

Table 4.1-17 presents estimates of annual emissions that would occur from the infrastructure improvements for the Three-Squadron F-35A Wing Alternative at Tyndall AFB. These data show that even if all construction activities occurred in 1 year, the total construction emissions would be well below the annual indicator thresholds. Therefore, construction emissions associated with the Three-Squadron F-35A Wing Alternative would not result in significant air quality impacts.

Table 4.1-17. Annual Construction Emissions for the Three-Squadron F-35A Wing Alternative at Tyndall AFB

Construction Year	Air Pollutant Emissions (tons)						
	VOCs	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	CO_2e (mt)
2021	1.53	5.81	5.22	0.01	1.68	0.23	1,201
2022	2.20	10.26	8.95	0.03	17.77	0.36	2,293
2023	1.08	4.88	3.73	0.01	1.01	0.14	982
Annual Indicator Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**NA**

Key: CO = carbon monoxide; CO_2e (mt) = carbon dioxide equivalent in metric tons; NA = not applicable; 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_x = sulfur oxides; VOCs = volatile organic compounds

4.1.4.1.2 Airfield Operations

The Three-Squadron F-35A Wing Alternative would generate air emissions from (1) F-35A aircraft operations, (2) F-35A engine maintenance and testing, (3) AGE, (4) space and water heaters, (5) solvent usages, and (6) personnel commuting activities. The analysis employed the ACAM to estimate emissions from these activities. The air quality analysis assumed that the alternative would reach full operations and resulting emissions in 2027, after the completion of all required infrastructure improvements. Sources would operate in compliance with applicable FDEP air quality regulations, emission limitations, and permitting requirements.

The analysis of proposed aircraft operations is limited to operations that would occur within the lowest 3,000 feet of the atmosphere, as this is the typical depth of the atmospheric mixing layer, where the release of aircraft emissions would affect ground-level pollutant concentrations. In general, aircraft emissions released above the mixing layer would not appreciably affect ground-level air quality.

The air emissions estimated for proposed F-35A operations are based on the same site-specific operational data as the project noise analyses. Both analyses of noise and air quality factor in the number and types of operations, location-specific flight patterns, aircraft power settings, and other relevant details. Site-specific representative time-in-mode (TIM) cycles developed for the alternative were used as inputs to ACAM. Calculations showing the F-35A TIM metrics derived for the air quality analyses and the ACAM output reports are presented in Appendix C.

Since the publication of the Draft EIS, it has been determined that the document was inadvertently released without relevant data from 100 percent of the flight profiles being directly used in the air quality impacts analysis as indicated above. Rather, profiles flown less than or equal to 5 percent frequency were indirectly analyzed in the Draft EIS by amalgamation with a more frequently utilized flight profile. The USAF has corrected this discrepancy in the Final EIS and updated the air quality impacts analysis calculations to incorporate 100 percent of the flight profiles as originally indicated above. Table 4.1-18 and Table 4.1-21 and the accompanying text contain the estimated emissions from these updated calculations and the analysis of projected air quality effects. Although annual F-35A operational emissions changed due to these updates, the previous conclusions regarding their significance remain unchanged from the Draft EIS.

Table 4.1-18 summarizes the annual operations emissions that would result from implementation of the Three-Squadron F-35A Wing Alternative at Tyndall AFB.

Table 4.1-18. Annual Operations Emissions for the Three-Squadron F-35A Wing Alternative at Tyndall AFB, Year 2027 – 50% Afterburner Scenarios

Afterburner Scenario/Activity Type	Air Pollutant Emissions (tons per year)[1]						
	VOCs	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	CO_2e (mt)
50% Afterburner Scenario							
Flight Operations/Engine Trim Tests – F-35A	0.39	170.76	166.69	17.99	27.74	24.93	48,356
Aircraft Engine Test Cells – F-35A	0.00	1.24	5.86	0.41	0.51	0.46	1,123
Aerospace Ground Equipment	21.78	38.22	62.67	4.39	6.46	6.27	3,000
Space and Water Heating	0.06	0.94	1.12	0.01	0.08	0.08	1,222
Solvent Usage	0.98	--	--	--	--	--	--
Personnel Commuting Activities	4.30	49.32	3.47	0.03	0.08	0.07	4,024
Total F-35A Mission Emissions	**27.52**	**260.47**	**239.81**	**22.82**	**34.87**	**31.80**	**53,701**
Annual Indicator Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**NA**
Bay County 2017 Emissions	**31,416**	**32,545**	**9,040**	**2,066**	**7,918**	**2,506**	**7,657,264**
Total F-35A Mission Emissions % of Bay County 2017 Emissions	**0.1%**	**0.8%**	**2.7%**	**1.1%**	**0.4%**	**1.3%**	**0.7%**

Key: CO = carbon monoxide; CO_2e (mt) = carbon dioxide equivalent in metric tons; NA = not applicable; 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_x = sulfur oxides; VOCs = volatile organic compounds

Note:

[1] Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.

These data show that emission increases for the alternative from the 50 percent afterburner use scenario would remain below all annual indicator thresholds except for CO. F-35A aircraft operations would be the primary contributors to these emission increases. Emissions of VOCs and CO would slightly increase and all other pollutants would slightly decrease with increasing

afterburner usage rates. Conversely, the opposite would occur with decreasing afterburner usage. Since the increase in emissions of VOCs, NO_x, SO_x, PM_{10}, and $PM_{2.5}$ would not exceed any indicator threshold, they would produce less than significant air quality impacts.

Emissions of CO resulting from implementation of the Three-Squadron F-35A Wing Alternative at Tyndall AFB were compared to the most recent complete Bay County emissions inventory (2017) (USEPA, 2020) to determine the relative magnitude of these emissions and their potential to combine with emissions in the affected environment and contribute to an exceedance of an ambient air quality standard. The annual CO emission increases that would result from operations of the alternative would amount to about 0.8 percent of the total CO emissions generated by Bay County in 2017 (see Section 3.1.4.1). These emission increases are lower than the amounts of CO emissions produced by Tyndall AFB in 2017 in comparison to the 2017 Bay County emissions. The majority of CO emissions that would result from the alternative would occur from intermittent F-35A aircraft operations up to an altitude of 3,000 feet AGL and across several square miles that comprise the Tyndall AFB airspace and adjoining aircraft flight patterns. These emissions would disperse through this volume of atmosphere to the point that they would not be expected to result in substantial ground-level impacts in a localized area. In addition, since Bay County attains the NAAQS for CO, these emission increases would not be substantial enough to contribute to an exceedance of the CO NAAQS. Therefore, the Three-Squadron F-35A Wing Alternative at Tyndall AFB would not result in significant impacts to air quality.

4.1.4.1.3 Airspace and Range Training Operations

To quantify the air quality effects of the Three-Squadron F-35A Wing Alternative within Tyndall AFB airspaces and training areas, the analysis employed the ACAM to estimate the increase in emissions due to the proposed F-35A aircraft operations within these areas. The analysis used aircraft flight profiles developed by the project noise analyses as inputs to the ACAM. The analysis focused on operations within the lowest 3,000 feet of the atmosphere. The only airspaces or training areas where proposed F-35A operations would occur below 3,000 feet AGL would be Warning Areas W-151 and W-470. These areas extend 3 NM or more offshore Florida into federal and international waters.

Table 4.1-19 presents the annual emissions that would result from implementation of the Three-Squadron F-35A Wing Alternative within airspaces and training areas.

Table 4.1-19. Annual Operations Emissions for the Three-Squadron F-35A Wing Alternative Within Tyndall AFB Airspaces and Training Areas – Year 2027

Activity Type	Air Pollutant Emissions (tons per year)						
	VOCs	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	CO_2e (mt)
Flight Operations - F-35A	0.00	0.67	37.00	1.80	1.97	1.77	4,944
Total F-35A Mission Emissions	**0.00**	**0.67**	**37.00**	**1.80**	**1.97**	**1.77**	**4,944**
Annual Indicator Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**NA**

Key: CO = carbon monoxide; NA = not applicable; 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_x = sulfur oxides; VOCs = volatile organic compounds

These data show that the proposed F-35A aircraft operations within these areas would result in air pollutant emissions within 3,000 feet AGL that would not exceed any annual indicator threshold. Therefore, the Three-Squadron F-35A Wing Alternative would not result in significant air quality impacts within any airspace or training area.

4.1.4.2 Air Quality, Four-Squadron F-35A Alternative

4.1.4.2.1 Base Facilities Construction

The Four-Squadron F-35A Wing Alternative at Tyndall AFB would have the same construction requirements as the three-squadron F-35A Wing mission, but it could require construction of additional facilities and infrastructure within the same construction footprint along the main runway flightline (Figure 2.2-1). For the purposes of this analysis, additional facilities were assumed to consist of one additional squadron operations/maintenance hangar. Air quality impacts associated with proposed construction activities would result from (1) combustive emissions generated by fossil fuel-powered equipment and (2) fugitive dust emissions ($PM_{10}/PM_{2.5}$) from operation of equipment on exposed soil.

Construction activity data developed for the alternative were used as inputs for ACAM. The air quality analysis assumed that the alternative would begin construction activities in 2021 and would complete all activities by 2025. The analysis assumed that the air quality BMPs identified in Table 2.7-1 would reduce fugitive dust resulting from the use of construction equipment on exposed soil by 50 percent from uncontrolled levels.

Table 4.1-20 presents estimates of annual emissions that would occur from the infrastructure improvements for the Four-Squadron F-35A Wing Alternative at Tyndall AFB.

Table 4.1-20. Annual Construction Emissions for the Four-Squadron F-35A Wing Alternative at Tyndall AFB

Construction Year	Air Pollutant Emissions (tons)						
	VOCs	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	CO_2e (mt)
2021	1.53	5.81	5.22	0.01	1.68	0.23	1,201
2022	2.20	10.26	8.95	0.03	17.77	0.36	2,293
2023	1.08	4.88	3.73	0.01	1.01	0.14	982
2024	0.57	2.46	1.83	0.01	0.88	0.07	510
Annual Indicator Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**NA**

Key: CO = carbon monoxide; CO_2e (mt) = carbon dioxide equivalent in metric tons; NA = not applicable; 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_x = sulfur oxides; VOCs = volatile organic compounds

These data show that even if all construction activities occurred in 1 year, the total construction emissions would be well below the annual indicator thresholds. Therefore, construction emissions associated with the Four-Squadron F-35A Wing Alternative would not result in significant air quality impacts.

4.1.4.2.2 Airfield Operations

The Four-Squadron F-35A Wing Alternative would generate air emissions from (1) F-35A aircraft operations, (2) F-35A engine maintenance and testing, (3) AGE, (4) space and water heaters, (5) solvent usages, and (6) personnel commuting activities. The analysis employed the ACAM to estimate emissions from these activities. The air quality analysis assumed that the alternative would reach full operations and resulting emissions in 2028, after the completion of all required infrastructure improvements. Sources would operate in compliance with applicable FDEP air quality regulations, emission limitations, and permitting requirements. Calculations showing the F-35A TIM metrics derived for the air quality analyses and the ACAM output reports are presented in Appendix C.

Table 4.1-21 summarizes the annual operations emissions that would result from implementation of the Four-Squadron F-35A Wing Alternative at Tyndall AFB. These data show that emission increases for the alternative from the 50 percent afterburner use scenario would remain below all annual indicator thresholds except for CO and NO_x. F-35A aircraft operations would be the primary contributors to these emission increases. Emissions of VOCs and CO would slightly increase and all other pollutants would slightly decrease with increasing afterburner usage rates. Conversely, the opposite would occur with decreasing afterburner usage. Since the increase in emissions of VOCs, SO_x, PM_{10}, and $PM_{2.5}$ would not exceed any indicator threshold, they would produce less than significant air quality impacts.

Table 4.1-21. Annual Operations Emissions for the Four-Squadron F-35A Wing Alternative at Tyndall AFB, Year 2028 – 50% Afterburner Scenario

Afterburner Scenario/Activity Type	Air Pollutant Emissions (tons per year)[1]						
	VOCs	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	CO_2e (mt)
50% Afterburner Scenario							
Flight Operations/Engine Trim Tests – F-35A	0.52	227.69	222.24	23.99	36.99	33.24	64,475
Aircraft Engine Test Cells – F-35A	0.00	1.65	7.81	0.55	0.68	0.61	1,498
Aerospace Ground Equipment	29.04	50.96	83.56	5.85	8.61	8.36	4,000
Space and Water Heating	0.07	1.10	1.31	0.01	0.10	0.10	1,430
Solvent Usage	1.30	--	--	--	--	--	--
Personnel Commuting Activities	5.74	65.79	4.63	0.04	0.10	0.09	5,367
Total F-35A Mission Emissions	**36.67**	**347.18**	**319.56**	**30.43**	**46.49**	**42.39**	**76,769**
Annual Indicator Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**NA**
Bay County 2017 Emissions	**31,416**	**32,545**	**9,040**	**2,066**	**7,918**	**2,506**	**7,657,264**
Total F-35A Mission Emissions % of Bay County 2017 Emissions	**0.1%**	**1.1%**	**3.5%**	**1.5%**	**0.6%**	**1.7%**	**1.0%**

Key: CO = carbon monoxide; CO_2e (mt) = carbon dioxide equivalent in metric tons; NA = not applicable; 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_x = sulfur oxides; VOCs = volatile organic compounds

Note:

[1] Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.

Emissions of CO and NO_x resulting from implementation of the Four-Squadron F-35A Wing Alternative at Tyndall AFB were compared to the most recent complete Bay County emissions inventory (2017) to determine the relative magnitude of these emissions and their potential to

combine with emissions in the affected environment and contribute to an exceedance of an ambient air quality standard. The annual CO and NO_x emission increases that would result from operations of the alternative would amount to about 1.1 and 3.5 percent, respectively, of the total CO and NO_x emissions generated by Bay County in 2017 (see Section 3.1.4.1). These emission increases are lower than the amounts of CO and NO_x emissions produced by Tyndall AFB in 2017 in comparison to the 2017 Bay County emissions. The majority of CO and NO_x emissions that would result from the alternative would occur from intermittent F-35A aircraft operations up to an altitude of 3,000 feet AGL and across several square miles that comprise the Tyndall AFB airspace and adjoining aircraft flight patterns. These emissions would disperse through this volume of atmosphere to the point that they would not be expected to result in substantial ground-level impacts in a localized area. In addition, since Bay County attains the NAAQS for O_3, CO, and NO_2, these emission increases would not be substantial enough to contribute to an exceedance of these NAAQS. Therefore, the Four-Squadron F-35A Wing Alternative at Tyndall AFB would not result in significant impacts to air quality.

4.1.4.2.3 Airspace and Range Training Operations

F-35A operations from the Four-Squadron F-35A Wing Alternative would affect the same airspaces and training areas below 3,000 feet AGL as those of the Three-Squadron F-35A Wing Alternative (Warning Areas W-151 and W-470). The analysis employed the ACAM to estimate the increase in emissions due to the proposed F-35A aircraft operations within these areas.

Table 4.1-22 presents the annual emissions that would result from implementation of the Four-Squadron F-35A Wing Alternative within the Tyndall AFB airspaces and training areas. These data show that the proposed F-35A aircraft operations within these areas would result in air pollutant emissions within 3,000 feet AGL that would not exceed any annual indicator threshold. Therefore, the Four-Squadron F-35A Wing Alternative would not result in significant air quality impacts within any airspace or training area.

Table 4.1-22. Annual Operations Emissions for the Four-Squadron F-35A Wing Alternative Within Tyndall AFB Airspaces and Training Areas – Year 2028

Activity Type	Air Pollutant Emissions (tons per year)						
	VOCs	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	CO_2e (mt)
Flight Operations - F-35A	0.00	0.89	49.12	2.39	2.61	2.34	6,565
Total F-35A Mission Emissions	**0.00**	**0.89**	**49.12**	**2.39**	**2.61**	**2.34**	**6,565**
Annual Indicator Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**NA**

Key: CO = carbon monoxide; CO_2e (mt) = carbon dioxide equivalent in metric tons; NA = not applicable; 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_x = sulfur oxides; VOCs = volatile organic compounds

4.1.4.3 Air Quality, No Action Alternative

The No Action Alternative would not include any of the facility, personnel, or operational changes proposed by the F-35A Wing beddown alternatives for Tyndall AFB. Air quality impacts from the No Action Alternative would be the same as those described for the affected environment within the Tyndall AFB project region (Section 3.1.4). No F-35A–related changes that could affect air quality would occur at Tyndall AFB or in the associated airspace.

4.1.5 Hazardous Materials and Waste, F-35A at Tyndall

4.1.5.1 Hazardous Materials and Waste, Three-Squadron F-35A Alternative

4.1.5.1.1 Base Facilities Construction and Base Airfield Operations

Hazardous Materials Management

New buildings would be constructed utilizing normal construction methods, which would limit, to the extent possible, the use of hazardous materials. There would be a short–term increase in the quantity of hazardous materials and petroleum substances stored at the installation to support construction activities since various fuels (e.g., diesel, gasoline) would be required to run earth-moving equipment and power tools and to provide electricity and lighting as conditions warrant. In addition, paints and solvents would be used during construction and renovation activities. These materials would be stored in proper containers, employing secondary containment as necessary to prevent and limit accidental spills. All spills and accidental discharges from these generators or from spills of other petroleum products or hazardous materials would be reported and mitigated. The installation has emergency response procedures and site-specific contingency plans for all hazardous materials locations (Tyndall AFB, 2019b).

The Three-Squadron F-35A Wing Alternative is not anticipated to add any types or quantities of hazardous materials and petroleum substances that would exceed the base's current hazardous waste processes. The F-35A is a new aircraft that omits the use of cadmium fasteners, chrome plating, copper-beryllium bushings, and it uses a non-chromium primer instead of primers containing cadmium and hexavalent chromium used for other aircraft. In 2004, there were a total of 162 aircraft and missiles/drones assigned to Tyndall AFB and the annual JP-8 fuel consumption was approximately 44.5 million gallons. In calendar year 2010, with 78 aircraft and drones assigned, the throughput of JP-8 on Tyndall AFB was approximately 20.9 million gallons. The F-22 and T-38 beddown increased the number of aircraft assigned at Tyndall to 119 (USAF, 2011a), but those aircraft have been reassigned from Tyndall AFB. The proposed beddown of 72 PAA F-35A aircraft is not anticipated to increase fuel consumption significantly over peak levels already experienced at the installation. Once the base infrastructure is restored from the Hurricane Michael damage, any insignificant increase in fuel consumption will be supportable by the infrastructure.

Therefore, there would be no significant negative impacts to hazardous materials from implementing the Three-Squadron F-35A Wing Alternative.

Hazardous Waste Management

Hazardous waste would be generated in small quantities during construction activities and would include spent solvents, waste paint, fluorescent bulbs, used oil, spill cleanup materials, and lead-acid batteries from construction equipment. These wastes would be stored in appropriate containers in accordance with applicable federal and state of Florida regulations. Wastes that cannot be recycled would be disposed of by the contractor at licensed facilities in a manner approved by the USEPA.

Management of hazardous waste or petroleum wastes would continue as they do currently. The status of Tyndall AFB as a large quantity generator pursuant to the Resource Conservation and Recovery Act would not change. Where needed, new satellite accumulation areas would be

established. These sites would be managed according to established procedures that include the use of properly labeled, approved containers using secondary containment. No change to permits or hazardous waste generator status would be required and hazardous waste generation would be continue to be managed in accordance with the installation's Hazardous Waste Management Plan and all applicable federal, state, and local regulations.

Contamination Sites

As Figure 3.1-2 shows, the footprints of various project components overlap or are adjacent to seven ERP sites (Table 4.1-23) (325 FW, 2019).

Table 4.1-23. Tyndall AFB ERP Sites (F-35A Proposed Action)

ERP Site Name	Project Component	Comments
SS0026 (IRP Site 26), Vehicle Maintenance Area	F-35A Parking Apron	Located over ERP site
	F-35A Operations and Maintenance Complex	Located over ERP site
SS015 (IRP Site 15), POL Area B	F-35A Operations and Maintenance Complex	Located over ERP site
TU204, Bldg 182 UST Site	F-35A Operations and Maintenance Complex	Located over ERP site
OW047, Bldg 188 OWS	F-35A Operations and Maintenance Complex	Located over ERP site
OW579, Bldg 7028 OWS	F-35A Munitions Storage Area	Located over ERP site

Source: (AFCEC, 2016)
Key: AFB = Air Force Base; Bldg = Building; ERP = Environmental Restoration Program; IRP = Installation Restoration Program; OWS = oil/water separator; POL = petroleum, oil, and lubricants; UST = Underground Storage Tank

In accordance with AFI 32-1021, *Planning and Programming Military Construction (MILCON) Projects* (USAF, 2004), construction must not adversely impact ongoing cleanup activities or impact migration of contaminants from the site. In addition, site contaminants must be adequately characterized and delineated. If soil contamination is present at the construction site, a permit for remediation may be required by the State and notification requirements to inform the FDEP would be met prior to the removal or disturbance of any potentially affected soils. Should soils need to be removed, transported, treated, and/or disposed, Resource Conservation and Recovery Act regulations would apply to the characterization, transportation, and disposal of this material. Additional worker precautions as well as a site-specific health and safety plan approved by a Certified Industrial Hygienist would also be required. Additionally, there is the potential for groundwater impacts associated with the historical use of PFOS/PFOA. To minimize the potential for any impacts, all development activities would be coordinated with the Environmental Management Office and the State to ensure that these would comply with all applicable regulatory requirements. As a BMP, to further minimize the potential for any impacts, prior to construction, workers would be educated on how to identify evidence of contamination, such as petroleum odors or soil staining. Should any unusual odor or staining be encountered, construction would cease and the Environmental Management Office would be contacted immediately. No significant impacts related to ERP sites are anticipated with compliance with appropriate regulations as described above.

4.1.5.2 Hazardous Materials and Waste, Four-Squadron F-35A Alternative

4.1.5.2.1 Base Facilities Construction and Base Airfield Operations

Hazardous Materials Management and Hazardous Waste Management

Potential impacts to hazardous materials and hazardous waste would be the same as those described for the Three-Squadron F-35A Wing Alternative. The beddown of 96 PAA is not

anticipated to increase fuel consumption significantly over peak levels already experienced at the installation, and any insignificant increase in fuel consumption would be supportable by the restored infrastructure planned at the installation. Any additional hazardous waste generation or handling areas that are established due to the four-squadron F-35A Wing beddown alternative would be managed in accordance with the installation's HWMP.

Contamination Sites

Construction activities for the Four-Squadron F-35A Wing Alternative would be the same as for the three-squadron F-35A Wing beddown with the addition of one hangar.

Since the Four-Squadron F-35A Wing Alternative would not materially change the amount of hazardous materials used and hazardous waste generated at Tyndall AFB, no significant impacts are anticipated. No significant impacts related to ERP sites are anticipated with adherence to USAF regulations as described above.

4.1.5.3 Hazardous Materials and Waste, No Action Alternative

Under the No Action Alternative, the beddown of the F-35A Wing would not occur at Tyndall AFB. The management of hazardous materials and the generation of hazardous waste at Tyndall AFB would continue as described for the affected environment in Section 3.1.5 as a result of the No Action Alternative.

4.1.6 Soils and Geologic Resources, F-35A at Tyndall

4.1.6.1 Soils and Geologic Resources, Three-Squadron F-35A Alternative

4.1.6.1.1 Base Facilities Construction

Up to 130.3 acres could be temporarily disturbed due to construction, renovation, and additions to base facilities associated with the proposed beddown of three squadrons of F-35A at Tyndall AFB. Actual acres of disturbance would likely be less as the facility footprints total approximately 26 acres. Areas immediately surrounding construction zones may also experience temporary disturbance from vehicle and equipment operations during construction. Disturbance in areas greater than 1 acre require a Construction General Permit under the NPDES program (see Section 4.1.7). Table 4.1-24 identifies the area of potential disturbance for construction areas of proposed facilities.

The majority of proposed construction would occur on areas designated as urban land or Arents soil. Urban land is a general category that designates land that has been previously developed. Construction activities occurring on urban land would not disturb or otherwise alter existing characteristics of the surrounding soil. Arents soils are a manmade mixture of various soil series resulting from earth moving operations such as dredging and filling. These soils have a neutral pH, are somewhat poorly drained, have a very low available water capacity, variable permeability, negligible surface runoff, and are not prone to either flooding or ponding. Arents soils at Tyndall AFB present challenges for shallow excavations due to a relatively shallow depth to the water table

and instability in excavated walls. These soils also present a moderate risk to the corrosion of exposed concrete and a high risk of corrosion to uncoated steel.

Proposed locations for F-35A munitions storage facilities would be on several soil types, including Arents, Leon sand, Osier fine sand, Pickney fine sand, and Rutlege sand. These soils are acidic, poorly to very poorly drained, have low to moderate available water capacity, and have rapid permeability. Leon sands are not subject to flooding or ponding, while Osier fine sand, Pickney fine sand, and Rutlege sand will not often flood, but will frequently pond. All of these soil types have high a degree of susceptibility to wind erosion and surface runoff and present a high risk of corrosion to both exposed concrete and uncoated steel. Limitations for shallow excavations in these soils are due to the relatively shallow depth to the water table and instability in excavated walls (USDA, 1984; NRCS, 2020a; NRCS, 2020b).

Table 4.1-24. Soil Types Associated With Proposed F-35A Facilities at Tyndall AFB

Area	Total Potential Disturbed Area, Acres	Building	Facility Footprint (Square Feet)	Facility Footprint (Acres)	Soil Types in Proposed Construction Area(s)
F-35A Operations and Maintenance Facilities Complex	72.7	Squad Ops/AMU Hangar #1	83,151	1.9	Arents, Urban land
		Squad Ops/AMU Hangar #2	78,006	1.8	Arents, Urban land
		Squad Ops/AMU Hangar #3	78,006	1.8	Arents, Urban land
		F-35 Maintenance Squadron Complex	105,605	2.4	Arents, Urban land
		F-35 AGE Facility	20,699	0.5	Arents, Urban land
		Weapons Load Training Hangar	26,522	0.6	Arents, Urban land
		F-35 Flight Simulator Facility	32,496	0.7	Arents, Urban land
		Aircraft MX Fuel Cell Hangar	29,525	0.7	Arents, Urban land
		Aircraft Wash Rack	15,758	0.4	Arents, Urban land
		Subtotal	469,768	11	NA
F-35 Parking Apron	16.7	F-35 Parking Apron	659,020	15.1	Arents, Urban land
F-35A Munitions Storage Area	72.7	F-35 Munitions Storage	15,156	0.3	Arents, Leon sand, Osier fine sand, Pickney fine sand, Rutlege sand
Total	**130.3**	**NA**	**1,143,944**	**26.2**	**NA**

Key: AFB = Air Force Base; AGE = Aerospace Ground Equipment; AMU = Aircraft Maintenance Unit; MX = Maintenance; NA = not applicable

Minimization of soil erosion and the siting of facilities in relation to soil limitations are considered when evaluating impacts to soil resources. If a Proposed Action were to substantially affect (or be substantially affected by) any of these features, impacts would be considered significant. Generally, impacts associated with soil resources can be avoided or minimized to a level of insignificance if proper construction techniques, erosion control measures, and structural engineering designs are incorporated into project development.

Practices to lessen potential impacts to soils resulting from the proposed F-35A Wing beddown are listed in Table 2.7-1.

With the employment of such practices, potential impacts to soils on Tyndall AFB from the siting of facilities associated with the proposed three-squadron F-35A Wing beddown alternative would be expected to be minimal, and there would be no changes to existing geologic conditions on Tyndall AFB. Therefore, potential impacts to soils and geologic resources would be minimal.

4.1.6.2 Soils and Geologic Resources, Four-Squadron F-35A Alternative

4.1.6.2.1 Base Facilities Construction

The potential environmental consequences to soil and geologic resources of the beddown of a four-squadron F-35A Wing on Tyndall AFB would be the same as those described in Section 4.1.6.1, with the exception of the construction of any additional facilities and infrastructure within the same construction footprint along the main runway flightline (Figure 2.2-1). The most likely setting for these additional facilities would be Arents or urban soil (or both), which are described in Section 4.1.6.1.1. Under this alternative, there would be no changes to existing geologic conditions on Tyndall AFB. Therefore, potential impacts to soils and geologic resources would be minimal.

4.1.6.3 Soils and Geologic Resources, No Action Alternative

Under the No Action Alternative, a beddown of an F-35A Wing would not occur at Tyndall AFB. None of the proposed construction to support the F-35A mission would occur, and no F-35A–related impacts to soils and geologic resources would result from implementation of the No Action Alternative.

4.1.7 Water Resources, F-35A at Tyndall

4.1.7.1 Water Resources, Three-Squadron F-35A Alternative

4.1.7.1.1 Base Facilities Construction

Surface Water – For the proposed three-squadron F-35A beddown at Tyndall, up to 130.3 acres could be temporarily disturbed due to construction, renovation, and additions to base facilities associated with the beddown of the F-35A at Tyndall AFB. Actual acres of disturbance would likely be less as the facility footprints total approximately 26 acres. However, the overall disturbed area is usually larger than the facility footprints when allowing for landscaping, utility connections, equipment laydown and staging, etc.). When it rains, stormwater washes over the loose soil on a construction site, along with various materials and products stored outside. As stormwater flows over the site, it can pick up pollutants like sediment, debris, and chemicals from that loose soil and transport them to nearby waters.

Construction of individual facilities associated with the proposed F-35A Wing beddown would not exceed 1 acre in many instances. However, the facilities to be constructed within the

Operations and Maintenance Facilities Complex and Parking Apron would be considered part of a "common plan of development" that would disturb 1 or more acres. USEPA's Construction General Permits define a common plan of development as "a contiguous area where multiple separate and distinct construction activities are occurring under one plan." The munitions storage facilities would not be part of the common plan of development because they are more than 0.25 mile away and there would be no contiguous land disturbance linking that area to the Operations and Maintenance Facilities Complex/Parking Apron.

Implementation of this alternative would require a Florida NPDES Generic Permit for Stormwater Discharge from Large and Small Construction Activities for construction of the Operations and Maintenance Facilities Complex and Parking Apron. The construction contractor would be responsible for obtaining the permit. Permit requirements include the preparation and implementation of a site-specific SWPPP to manage stormwater discharges as well as control erosion during and after construction until the area is stabilized. The SWPPP would require regular compliance inspections and specify BMPs that would minimize impacts to water quality. BMPs would be project specific but may include the use of silt fences, covering soil stockpiles, using secondary containment for hazardous materials, and revegetating the site in a timely manner.

Replacement of pre-development (natural) pervious surfaces with impervious surfaces, such as concrete, eliminates any potential for stormwater infiltration and can result in increases to the volume, peak flow, duration, pollutant load, and temperature of stormwater runoff. Because the siting of facilities are not final at this time, changes to impervious surface area at Tyndall AFB cannot be precisely determined. However, approximately 35 of 58 acres (60 percent) of the Operations and Maintenance Facilities Complex/Parking Apron area is currently impervious. All of the proposed facilities (26 acres total) could potentially be sited on currently impervious surfaces, but new impervious surfaces would likely be created.

The proposed F-35A Wing beddown projects with development or redevelopment footprints greater than 5,000 square feet (Table 2.2-1) would be subject to Energy Independence and Security Act Section 438. LID practices such as bioretention areas, permeable pavements, cisterns/recycling, or green roofs would be implemented to maintain pre-development site hydrology to the maximum extent practicable.

Because an SWPPP and BMPs would be employed during construction of the facilities associated with the common plan of development, significant impacts to surface waters would not be expected from construction activities. The proposed munitions storage facilities would not be expected to result in significant impacts, because only 0.35 acre would be disturbed. Because the pre-development hydrology of the site would be maintained through LID, significant impacts to surface waters would not be expected to result from the development and redevelopment actions associated with this alternative. For those areas that would be redeveloped under this alternative, there is potential for long-term, minor, beneficial effects due to reduced stormwater runoff from the potential return to pre-development site hydrology. It would not be expected that this alternative would affect CWA Section 303(d) impaired waters or cause nonimpaired waters to become impaired.

Groundwater

Due to the high water table in the area, groundwater (water table or surficial aquifer) may be encountered during construction activities. Some dewatering of groundwater may be required; however, the amount of dewatering would not be expected to have a significant effect on groundwater levels, and groundwater levels would return to normal upon completion of construction. If dewatering is required in or within 500 feet of an identified contaminated site (see Section 3.1.5.4), the groundwater would be tested/characterized prior to dewatering to surface waters. If groundwater does not meet disposal-to-surface-water criteria without treatment, the USAF would consult with the FDEP to determine the proper permit and method to dispose of groundwater. Land disturbance during construction can also create the potential for direct pollutant discharges to groundwater. These pollutants can include spills and leaks of fuels and other liquids and stormwater runoff from nearby impervious areas. BMPs contained in the SWPPP would be effective in minimizing groundwater impacts from pollutants. It would not be expected that the increase in personnel at Tyndall AFB would impact groundwater supplies of the Floridan aquifer; the base receives the majority of its potable water from Bay County, which has water supply sources sufficient to meet projected demands through 2035. For more information on potable water systems, see Section 4.1.11.

Floodplains

The facilities proposed for the MSA could potentially be located in the 100-year floodplain. As a conservative estimate of impacts, it was assumed that all floodplains within the action areas would be impacted. There are 37.6 acres of floodplains in the MSA.

Development in a floodplain can obstruct or divert floodwater to other areas, alter flood dynamics, flood adjacent areas, and increase flood duration. Final site selection and design will be done to minimize development within the floodplain as feasible, and final impacts may be reduced. For instance, for this alternative, depending on final siting of facilities and considering the areas presented in Table 2.2-1, could result in up to 0.35 acre of development within floodplains. as extent of development within the floodplain is not know at this time as there may be facility and operational requirements that preclude development outside of the floodplain.

Measures to minimize floodplain impacts include, siting facilities to minimize development within the floodplain, creating compensatory storage (excavating material within or adjacent to the same floodplain to be used as fill), or designing the facilities and related infrastructure to allow for dispersal of floodwaters. LID principles would also minimize impacts due to LID's goal of returning the site to pre-development hydrology to the maximum extent practicable. Any facilities constructed in the floodplain would be elevated or otherwise floodproofed per DoD floodplain construction requirements. Significant impacts from development within the floodplain would not be expected because there are very few upstream/upland facilities and the facilities that are located upstream are all on Tyndall AFB. There would be no floodplain or flooding impacts to off-base areas.

Therefore, no significant impacts to floodplains would result from implementation of the proposed three-squadron F-35A Wing beddown.

Coastal Zone Management

As federal land, Tyndall AFB is statutorily excluded from Florida's coastal zone. However, the proposed three-squadron F-35A Wing beddown would likely result in "spillover" effects to a Florida coastal use or resource. The effects potentially include negligible to minor impacts to water quality resulting from land disturbance/development.

The USAF submitted a Coastal Consistency Determination to the FDEP analyzing the four-squadron F-35A Wing plus MQ-9 Wing beddown combined action at Tyndall AFB. The Consistency Determination for combined actions was submitted because it encompasses all of the possible actions proposed for Tyndall AFB that are analyzed in this EIS. The USAF determined that the combined actions would be fully consistent with the enforceable policies of the Florida Coastal Zone Management Program. Therefore, any subset of possible actions would be fully consistent as well. The Florida State Clearinghouse indicated in comments on the Draft EIS (Comment A-003) that the project is consistent with the Florida Coastal Management Program (Appendix A).

4.1.7.2 Water Resources, Four-Squadron F-35A Alternative

4.1.7.2.1 Base Facilities Construction

Surface Water

Impacts would be similar to those described for the Three-Squadron F-35A Wing Alternative. The construction of any additional facilities and infrastructure in the Operations and Maintenance Facilities complex would result in disturbance of land already developed for the airfield. All of the proposed facilities could potentially be sited on currently impervious surfaces, but new impervious surfaces would likely be created.

Groundwater

Impacts would be similar to those described for the three-squadron F-35A Wing beddown alternative.

Floodplains

Impacts to floodplains would be the same as those described for the three-squadron F-35A Wing beddown alternative.

Coastal Zone Management

Impacts would be the same as those described for the three-squadron F-35A Wing beddown alternative.

4.1.7.3 Water Resources, No Action Alternative

Under the No Action Alternative, the USAF would not implement the proposed F-35A Wing beddown. None of the proposed construction to support the F-35A mission would occur and no F-35A–related impacts to water resources would result from implementation of the No Action Alternative.

4.1.8 Biological Resources, F-35A at Tyndall

4.1.8.1 Biological Resources, Three-Squadron F-35A Alternative

4.1.8.1.1 Base Facilities Construction

Flora

Activities associated with construction of the F-35A Parking Apron and the Operations and Maintenance Facilities Complex would occur in previously developed areas of Tyndall AFB. Minor, adverse impacts to vegetation would occur in these areas. Impacts would consist primarily of the permanent loss of turf grass and landscaped vegetation. Construction related to the F-35A munitions storage would occur within the existing MSA and would also include expansion of the MSA in one location to the southeast and two locations to the southwest. Vegetation to the southeast of the MSA consists of pine plantation that was logged in 2019. Construction in this area would result in minor, adverse impacts to vegetation as existing vegetation was heavily disturbed during logging operations. Vegetation in the areas to the southwest of the MSA is a mix of mowed right-of-way, pine plantation, and scrub shrub wetlands. For the purposes of analysis in this EIS, it is assumed that construction in these areas would result in the permanent loss of existing vegetation. Approximately 8.5 acres of habitat would be lost from the approximately 25,497 acres of forested and wetland habitats at Tyndall AFB. Potential impacts to wetlands and protected species are discussed in the following wetland and sensitive species subsections. No significant impacts to vegetation are anticipated to result from implementation of the F-35A Proposed Action at Tyndall AFB.

Wetlands

Wetland delineations were conducted in 2020 to identify wetlands and other Waters of the United States in project construction areas. Wetlands were observed in the proposed F-35A facility locations associated with the MSA. Approximately 2.7 acres of forested/scrub shrub and 0.6 acre of emergent wetlands would be adversely impacted by the proposed facilities (Figure 3.1-4). As a conservative estimate of impacts, it was assumed that all wetlands within the potential disturbed area would be impacted by fill activities, resulting in the permanent loss of the wetland. Final site selection and design will attempt to minimize impacts to Waters of the United States to the extent feasible, and final impacts could be reduced. Impacts are anticipated to be minor. Any unavoidable placement of fill in Waters of the United States will require a Section 404 permit and additional coordination with the U.S. Army Corps of Engineers (USACE), and a Finding of No Practicable Alternative would be required in the ROD.

Fauna

Construction of the F-35A Parking Apron and the Operations and Maintenance Facilities Complex would occur in previously developed areas of Tyndall AFB and would result in the permanent loss of habitat. Adverse impacts to wildlife would be minor because habitat in these areas is limited to turf grass and landscaped vegetation. Construction related to the F-35A munitions storage would occur within the existing MSA and would also include expansion of the MSA in one location to the southeast and two locations to the southwest. Minor habitat loss in the southeast location would result in minor potential impacts to wildlife.

Construction of the MSA expansion in the southwest locations would result in the loss of approximately 8.5 acres of mowed right-of-way, pine plantation, and scrub shrub wetlands. Adverse impacts to faunal species would include direct loss of habitat and associated common species that lack mobility to leave the impacted areas. No significant impacts to wildlife species are anticipated to result from construction of F-35A facilities.

Potential impacts to protected species are discussed in the following subsection. Potential impacts to wetlands are discussed in the preceding subsection.

Sensitive Species

Sixteen (16) federally listed species (Table 4.1-25 and Table 3.1-18) have been documented at Tyndall AFB. Surveys for the presence of federally threatened, endangered, candidate species, and species proposed for listing were conducted in January 2020 at the areas proposed for construction (Tyndall AFB, 2020a). A Biological Evaluation (Tyndall AFB, 2020a) with the results of these surveys was submitted to USFWS, who concurred with the findings in a letter dated August 3, 2020 (Appendix A). None of the federally listed species or other sensitive species (Table 3.1-18) have been documented to occur in the proposed construction area for the F-35A Proposed Action. This area does not support any federally listed species or suitable habitat and will have no effect on federally listed species or their habitats (Tyndall AFB, 2020a).

Table 4.1-25. Wildlife and Habitat Effect Determination Summary for F-35A, Tyndall AFB

Common Name	Scientific Name	Status	Effect Determination	Potential Occurrence on Tyndall AFB
Federally Listed Threatened or Endangered Species				
Choctawhatchee beach mouse	*Peromyscus polionotus allophrys*	FE	No Effect	O
St. Andrew beach mouse	*Peromyscus polionotus peninsularis*	FE	No Effect	O
West Indian manatee	*Trichechus manatus*	FE	No Effect	O
American alligator	*Alligator mississippiensis*	FT (S/A)	No Effect	O
Piping plover	*Charadrius melodus*	FT	No Effect	O
Red knot	*Calidris canutus rufa*	FT	No Effect	O
Wood stork	*Mycteria americana*	FT	No Effect	P
Atlantic sturgeon	*Acipenser oxyrinchus (=oxyrhynchus desotoi)*	FT	No Effect	O
Reticulated flatwoods salamander	*Ambystoma bishopi*	FE	No Effect	P
Eastern indigo snake	*Drymarcon corais couperi*	FT	No Effect	P
Green sea turtle	*Chelonia mydas*	FT	No Effect	O
Kemp's Ridley sea turtle	*Lepidochelys kempii*	FE	No Effect	O
Leatherback sea turtle	*Dermochelys coriacea*	FE	No Effect	O
Loggerhead sea turtle	*Caretta caretta*	FT	No Effect	O
Florida skullcap	*Scutellaria floridana*	FT	No Effect	P
Godfrey's butterwort	*Pinguicula ionantha*	FT	No Effect	O
Harper's beauty	*Harperocallis flava*	FE	No Effect	P
Telephus spurge	*Euphorbia telephioides*	FT	No Effect	O
Thick-leaved water willow	*Justicia crassifolia*	FE	No Effect	O
White birds-in-a-nest	*Macbridea alba*	FT	No Effect	P
Federally Listed Candidate or Other				

Table 4.1-25. Wildlife and Habitat Effect Determination Summary for F-35A, Tyndall AFB

Common Name	Scientific Name	Status	Effect Determination	Potential Occurrence on Tyndall AFB
Panama city crayfish	*Procambarus econfinae*	PT	No Effect	P
Gopher tortoise	*Gopherus polyphemus*	FC	No Effect	O
Bald eagle	*Haliaeetus leucocephalus*	BGEPA	No Take	O

Sources: (Tyndall AFB, 2019c; USFWS, 2020b; Florida Natural Areas Inventory, 2020)
Key: AFB = Air Force Base; FE = Federally Endangered; FT = Federally Threatened; FC = Federal Candidate; PT = Proposed Threatened; O = Observed; P = Potential; U = Unlikely; S/A = Similar Appearance; BGEPA = Bald and Golden Eagle Protection Act; USFWS = U.S. Fish and Wildlife Service

No adverse impacts to state listed or other species are anticipated to result from facility construction associated with the F-35A mission at Tyndall AFB. The FWC commented on the Draft EIS in a letter dated July 14, 2020 (Appendix A) and recommended management practices, which have been included as mitigations in Table 2.7-1. Under the proposed action, sensitive species would continue to be managed and monitored under the INRMP, and annual coordination with the USFWS and state agencies would continue.

4.1.8.1.2 Base Airfield Operations

No removal of or direct impacts to vegetation or wetlands would occur due to flight operations. Implementation of the F-35A mission at Tyndall AFB would increase the land area, and thus the number of wildlife, exposed to increased noise levels. Impacts would be similar, regardless of which afterburner scenario is used. Impacts to wildlife (including sensitive species) associated with aircraft noise are summarized below and also discussed in Appendix D of the Draft EIS, which is available upon request.

It is difficult to generalize animal responses to noise disturbances or to draw inferences across species, because reactions to jet aircraft noise appear to be species-specific. Consequently, some animal species could be more sensitive than other species and/or could exhibit different forms or intensities of behavioral responses. For instance, the results of one study indicate that wood ducks appear to be more sensitive to noise and more resistant to acclimation to jet aircraft noise than Canada geese (Conomy, Dubovsky, Collazo, & Fleming, 1998). Similarly, wild ungulates (e.g., deer) seem to be more easily disturbed than domestic animals (Manci, Gladwin, Villella, & Cavendish, 1988).

Animal responses to aircraft noise appear to be somewhat dependent on, or influenced by, the size, shape, speed, proximity (vertical and horizontal), engine noise, and flight profile of aircraft. Other factors influencing response to jet aircraft noise could 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 (Smith, Ellis, & Johnston, 1988).

Some physiological/behavioral responses (from both subsonic and supersonic noise), 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 (see Appendix D of the Draft EIS).

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 (see Appendix D of the Draft EIS).

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.

In summary, behavioral responses ranging from mild to severe could occur in individual animals as a result of loud overflights. Mild responses include head raising, body shifting, or turning to orient toward the aircraft. Moderate responses could include nervous behaviors, such as trotting a short distance. Escape is the typical severe response (Appendix D of the Draft EIS). Minor, short-term, adverse impacts to wildlife would be anticipated.

Any increase in operations could increase the potential for bird/wildlife-aircraft strikes. Tyndall AFB would continue to adhere to the installation's BASH Plan to minimize the risk of strikes. Adherence to the existing BASH program (see Section 3.1.3) would minimize the risk of bird-aircraft strikes to negligible levels.

4.1.8.1.3 Airspace and Range Training Operations (*F-35A*)

Impacts to biological resources occurring under the airspace proposed for use by F-35A pilots could result from overflights and associated noise, the use of munitions, and flares, and bird-aircraft collisions.

Flora

Ground disturbance beneath the existing airspace proposed for use would be limited to the use of flares and inert munitions at ranges that are currently approved for such use. No significant impacts to vegetation would result from implementation of the F-35A mission.

Fauna and Sensitive Species

All airspace proposed for use by F-35A pilots is currently used as active military airspace by military jet aircraft pilots; therefore, no new types of impact would be introduced into these areas as a result of introducing the F-35A aircraft. Potential impacts are described below for overflights and associated noise, inert munitions and flares, and bird-aircraft collisions. A comprehensive review of current literature evaluating potential effects on wildlife and habitat from overflight, noise, and sonic booms is presented in Appendix D of the Draft EIS.

Average noise levels would increase by a maximum of 2.5 dB beneath the airspace proposed for use by F-35A pilots (Table 4.1-29). See Section 4.1.2 for a discussion of noise impacts to wildlife.

As noted, animal responses to aircraft noise appear to be somewhat dependent on, or influenced by, physical characteristics, engine noise, and flight profile of aircraft. Environmental conditions such as wind direction and speed, topography, and local air turbulence also play a role and, in the case of bird species, life stage and function will contribute to the magnitude of a response. Proposed F-35A training would primarily occur at high altitudes, with 93 percent of total training

time spent at altitudes above 10,000 feet MSL. The higher flight profile could reduce the response of wildlife to aircraft noise.

Approximately 1 percent of flights would occur at altitudes between 500 and 2,000 feet AGL. For flights at these altitudes, wildlife under the flight path would be exposed to short, intense noise events from overflights. The literature does suggest that common responses include the "startle" (or "fright") response and, ultimately, habituation (see Appendix D of the Draft EIS).

F-35A pilots would conduct supersonic flight at altitudes and within airspace where permitted. The USAF anticipates that F-35A supersonic flight training would be conducted above 15,000 feet MSL, with 90 percent occurring above 30,000 feet MSL (Table 2.2-7). Because no airspace over land is approved for supersonic flight, F-35A pilots would not conduct supersonic training in any airspace located over land. Supersonic flights are currently authorized over water in W-168, W-174, and W-465. Supersonic flights are not authorized within 12 NM of Fort Jefferson in Dry Tortugas National Park unless flight paths are straight, level, and higher than 20,000 feet MSL. Supersonic flights would only be conducted over open ocean and more than 15 NM from any land area.

Flares would be used as a defensive countermeasure by F-35A pilots during training operations. Flares would only be used in airspace areas currently approved for such use. Flare use by F-35A pilots would conform to existing altitude and seasonal restrictions to ensure fire safety. In the event a flare were to reach the ground while still burning, it could ignite dry vegetation and start a wildland fire. Based on the emphasis on flight at higher altitudes for the F-35A, roughly 90 percent of flare releases throughout the authorized airspace would occur above 15,000 feet MSL, further reducing the potential risk for accidental fires or adverse impacts to underlying land areas and habitats. Inert ordnance delivery would only occur in ranges authorized for use. As a result, flare and ordnance deployment associated with the Proposed Action would have no significant impact on wildlife.

No F-35A low-level flight training is expected to occur below 500 feet AGL, and the potential for bird-aircraft collisions is anticipated to be minor. Most birds fly below 500 feet AGL, except during migration. No significant impacts to fauna or sensitive species would result from implementation of the F-35A mission.

4.1.8.2 Biological Resources, Four-Squadron F-35A Alternative

4.1.8.2.1 Base Facilities Construction

Facility-related impacts are described in Section 4.1.8.1.1 and were based on the complete use of the facility footprints shown on Figure 2.2-1. Construction of facilities for one additional squadron would not change the facility footprints used for the basis of impacts; therefore, the impacts for this alternative would be the same as those described in Section 4.1.8.1.1.

4.1.8.2.2 Base Airfield Operations

The addition of a fourth squadron would increase the number of aircraft operations, thus increasing the number of biological resources exposed to noise-related impacts. The types of noise-related impacts would remain the same as those described in Section 4.1.8.1.2.

4.1.8.2.3 Airspace and Range Training Operations

The addition of a fourth squadron would increase the number of aircraft operations, and the associated noise levels and chance for a bird/wildlife strike on base and beneath the training airspace would increase incrementally over the Three-Squadron F-35A Wing Alternative. The use of flares and ordnance would also be anticipated to increase proportionally to the increase in squadron size. The types of noise-related impacts to biological resources would remain the same as those described in Section 4.1.8.1.3 and the increase in the use of flares and ordnance would not be a significant impact to biological resources.

4.1.8.3 Biological Resources, No Action Alternative

Under the No Action Alternative, no F-35A aircraft would be beddown at Tyndall AFB. None of the proposed construction to support the F-35A mission would occur and biological resources would remain as described in Section 3.1.8. No F-35A–related impacts to biological resources would result from implementation of the No Action Alternative.

4.1.9 Cultural Resources, F-35A at Tyndall

4.1.9.1 Cultural Resources, Three-Squadron F-35A Alternative

4.1.9.1.1 Base Facilities Construction and Base Airfield Operations

Archaeological Resources

As described in Section 3.1.9, the APE for direct impacts for the F-35A Wing beddown was surveyed in 2019 and no archaeological sites were identified (USAF, 2020c). Much of the proposed construction areas are also highly disturbed and have low probability for the presence of unrecorded archaeological resources. Although unlikely, the remains of an unrecorded archaeological resource may be uncovered during ground-disturbing activities associated with facility construction. In the event of an inadvertent discovery during ground-disturbing activities, Tyndall AFB and its contractor would cease work immediately and the USAF would comply with Section 106 of NHPA, as specified in standard operating procedures established in the ICRMP (USAF, 2019d). Therefore, facility construction for the beddown of three squadrons of F-35A aircraft would have no adverse effect on archaeological resources. Noise from airfield operations would have no effect on archaeological resources.

Architectural Resources

As described in Section 3.1.9, there is one NRHP-eligible building within the APE for indirect effects, which is scheduled for demolition (due to hurricane damage) and for which the Section 106 consultation process is in progress (USAF, 2020a). No other NRHP-eligible or –listed buildings or structures are located within the direct or indirect APEs for the F-35A Wing beddown. Therefore, there would be no historic properties affected by the beddown of three squadrons of F-35A aircraft.

Traditional Cultural Properties

The USAF has consulted with the Florida SHPO, federally recognized tribes, and interested parties as described in Section 1.4.1. As described in Section 3.1.9, there are no known traditional cultural

properties or sacred sites within the direct or indirect APEs for the F-35A Wing beddown. Therefore, the beddown of three squadrons of F-35A aircraft would have no adverse effect on traditional cultural properties or sacred sites.

4.1.9.1.2 Airspace and Range Training Operations

As described in Section 3.1.9, there are eight NRHP-listed properties located underneath the MOAs proposed for F-35A training operations. Scientific studies of the effects of noise and vibration on historic properties have considered potential impacts on historic buildings, prehistoric structures, water tanks, archaeological cave/shelter sites, and rock art. These studies have concluded that overpressures generated by supersonic overflight were well below established damage thresholds and that subsonic operations would be even less likely to cause damage (Committee on Hearing and Bio Acoustics, 1977; Sutherland L. C., 1989; Sutherland L. R., 1990). Therefore, no adverse effects on NRHP-eligible and –listed cultural resources are expected to result from proposed F-35A airspace and range training operations.

Consultation

In accordance with NHPA Section 106, the USAF consulted with the Florida SHPO, federally recognized tribes, and interested parties regarding the determination of *no historic properties affected*, as described in Section 1.4.1.2. In a letter dated July 29, 2020, the Florida SHPO concurred with the USAF determination that the proposed F-35A Wing beddown will have no effect to historic properties listed or eligible for listing in the NRHP. Consultation with federally recognized tribes is described in Section 1.4.1.1.

4.1.9.2 Cultural Resources, Four-Squadron F-35A Alternative

4.1.9.2.1 Base Facilities Construction and Base Airfield Operations

Impacts to archaeological resources, architectural resources, and traditional cultural properties would be similar to the Three-Squadron F-35A Wing Alternative described in Section 4.1.9.1. Facility construction would entail an additional hangar in an area that is already highly disturbed from an archaeological perspective. Therefore, facility construction for the beddown of four squadrons of F-35A aircraft would have no adverse effect on archaeological resources. Similarly, the beddown of four squadrons and associated increase in airfield operations would have no effect on NRHP-eligible or –listed buildings or structures, and would have no adverse effect on traditional cultural properties or sacred sites.

4.1.9.2.2 Airspace and Range Training Operations

Impacts to cultural resources would be the same as for the Three-Squadron F-35A Wing Alternative, even with the higher number of proposed operations associated with four squadrons. No adverse effects on NRHP-eligible and –listed cultural resources are expected to result from F-35A airspace and range training operations.

4.1.9.3 Cultural Resources, No Action Alternative

Under the No Action Alternative, the beddown of an F-35A Wing would not occur at Tyndall AFB and there would be no change to cultural resources described in Section 3.1.9. There would be no F-35A–related impacts to cultural resources from implementation of the No Action Alternative.

4.1.10 Land Use and Recreation, F-35A at Tyndall

4.1.10.1 Land Use and Recreation, Three-Squadron F-35A Alternative

4.1.10.1.1 Base Facilities Construction

Land use plans are being updated as integral to the reconstruction of the base following Hurricane Michael. Facilities proposed on Tyndall AFB supporting a three-squadron beddown would not conflict with updated land use plans. Increased truck traffic for base construction may affect safety of pedestrians, indirectly affecting commercial uses and public uses (schools and businesses in the City of Parker). These indirect effects on local land use would lessen as most of rebuilding of the base and proposed facilities are completed in 2025.

4.1.10.1.2 Base Airfield Operations

The primary consideration for base airfield operations is compatibility of resultant noise with surrounding land uses. Table 4.1-26 and Table 4.1-27 show that the majority of the area affected by noise levels of 65 dB DNL occurs on base.

Most of the functions supporting the mission are noise-tolerant, with the exception of on-base housing and some community functions. The Base Civil Engineer is responsible for ensuring that on-base uses, development, and activities, both current and future, do not cause conditions that conflict with the mission, nor cause unhealthy or unsafe conditions for military personnel, civilians, and dependents. Reconstruction following the hurricane results in site-specific construction, barriers, or other design methods to maintain security, safety, and desirable living and working conditions.

Figure 4.1-5 (inset: Proposed 3 Squadrons F-35A) shows the projected extent of off-base land exposed to noise levels of 65 dB DNL and greater for a three-squadron F-35A Wing beddown at Tyndall AFB. Table 4.1-28 reports that this land area includes a range of land uses. Notably, the majority of the affected area is over water. This leaves a relatively small amount of land (ranging from 61 and 68 acres for the 95 percent and 5 percent afterburner scenarios, respectively) affected by incompatible noise levels incompatible noise levels. Of this affected land, about 10 acres of incompatible residential land is within the noise footprint for the 5 percent afterburner scenario and 9 acres for the 95 percent scenario.

Compared to the No Action Alternative, the increase in the size of the total noise-exposure footprint is notable, increasing from 4,404 acres to up to 15,938 acres (F-35A 5 percent afterburner condition). However, this represents a beneficial decrease in noise exposure compared to the pre-hurricane situation (31,641 acres). For context, under the three-squadron F-35A Wing beddown alternative, residential land exposure of 10 acres is less than half the extent of 25 acres (see Table 4.1-26), under the pre-hurricane conditions. Overall, incompatible land use effects would be notably less than the pre-hurricane conditions.

Table 4.1-26. Areas Exposed to Noise Levels of 65 dB DNL and Greater – Three-Squadron F-35A Wing Alternative at Tyndall AFB (Acres)

Alternative	Area 65 dB DNL or Greater (Acres)			
	Total Area[1]	Off-Base Area[2]	Off-Base Land Area[3]	Residential[4]
No Action	4,404	247	2	0
Pre-Hurricane 2016 AICUZ[5]	31,641	14,145	217	25
F-35A 3 Squadrons 5% AB	15,938	3,939	68	10
F-35A 3 Squadrons 50% AB	15,663	4,024	64	9
F-35A 3 Squadrons 95% AB	15,304	4,115	61	9

Key: AB = afterburner; AFB = Air Force Base; AICUZ = Air Installations Compatible Use Zone; dB = decibel; DNL = day-night average sound level

Notes:

[1] Includes all areas at or above 65 dB DNL (including on-base land, off-base land, and water areas.

[2] Includes off-base land and water at or above 65 dB DNL.

[3] Includes off-base land area (Land use categories include commercial, industrial, open/agriculture/low-density, public/quasi-public, residential, transportation, undesignated, and water.)

[4] Residential land within the 65 dB DNL noise contour. (Assume area is within the 65 to 70 dB DNL contours, unless noted.)

[5] Residential land includes 1 acre affected by noise levels just over 70 dB DNL.

[6] Includes 2 acres of transportation land.

Table 4.1-27. Areas Exposed to Noise Levels of 65 dB DNL and Greater – Tyndall AFB for Three-Squadron F-35A Wing Alternative

Noise Level (dB) DNL	Three-Squadron F-35A Noise Exposure Area (Acres)									
	Pre-Hurricane		No Action		5% Afterburner		50% Afterburner		95% Afterburner	
	Off Base	Tyndall AFB	Off Base	Tyndall AFB	Off Base	Tyndall AFB	Off Base	Tyndall AFB	Off Base	Tyndall AFB
65–69	10,718	7,608	247	1,996	2,827	5,001	2,997	4,835	3,196	4,533
70–74	2,951	5,375	0	1,045	932	3,401	891	3,244	825	3,139
75–79	468	2,431	0	526	178	1,906	136	1,896	94	1,870
80–84	8	1,086	0	343	2	780	0	727	0	690
≥85	0	996	0	277	0	911	0	937	0	957
Total	14,145	17,496	247	4,157	3,939	11,999	4,024	11,639	4,115	11,189

Key: ≥ = greater than or equal to; AFB = Air Force Base; dB = decibel; DNL = day-night average sound level

Table 4.1-28. Off-Base Noise Exposure by Land Use at Tyndall AFB for Three-Squadron F-35A Wing Alternative

Land Use Classification	Noise Level (dB DNL) (Acres)					
	65–69[1]	70–74[1]	75–79[1]	80–84	≥85	Total
Commercial	7/3	0	0	0	0	7/3
Industrial	0/0	0	0	0	0	0/0
Open/Ag/Low Density	15/13	0	0	0	0	15/13
Public/Quasi-Public	6/6	0	0	0	0	6/6
Residential	10/9	0	0	0	0	10/9
Transportation	12/14	7/3	0	0	0	19/17
Undesignated	11/13	0	0	0	0	11/13
Subtotal (land areas only)	61/58	7/3	0	0	0	68/61
Water	2,766/3,138	925/822	178/94	2/0	0	3,871/4,054
Total (land and water areas)	**2,827/3,196**	**932/825**	**178/94**	**2/0**	**0**	**3,939/4,115**

Key: ≥ = greater than or equal to; dB = decibel; DNL = day-night average sound level

Note:

[1] x/y represents range of noise exposure for 5 percent afterburner (AB) operations/95 percent AB operations. Exposure for 50 percent AB lies between the 5 and 95 percent AB values. The afterburners cause the aircraft to climb more quickly, causing the acoustic energy to contract along the departure and arrival axis, and to expand horizontally around the runway.

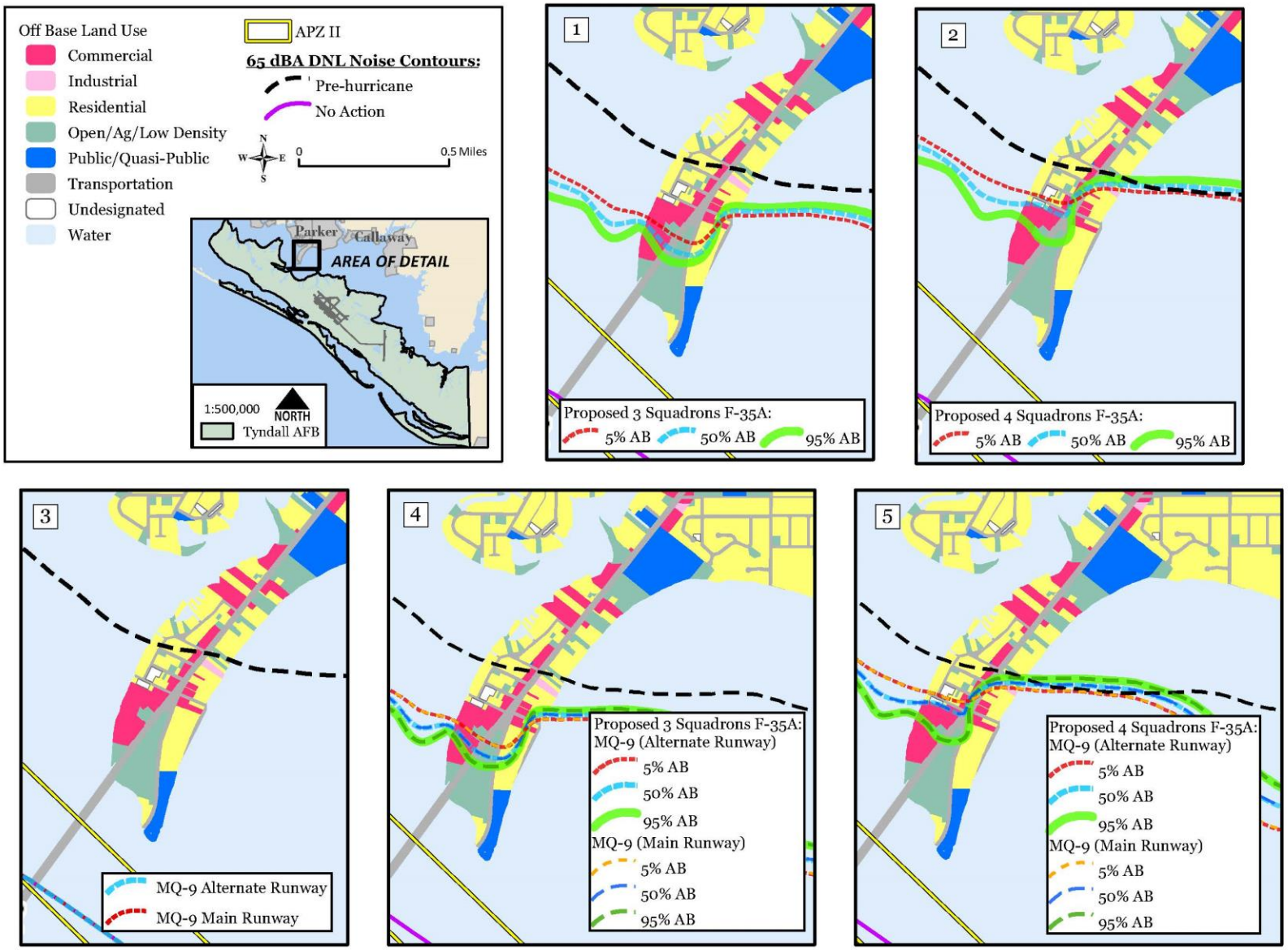

Figure 4.1-5. Noise Exposure and Off Base Land Use – All Alternatives at Tyndall AFB

Figure 4.1-5 shows that most of the noise-affected off-base land (65 dB DNL and greater) for the Three-Squadron F-35A Wing Alternative is on the peninsula leading to the DuPont Bridge, along the southern shores of the City of Parker. This area is smaller than the pre-hurricane 2016 AICUZ-affected land. The impacted area has commercial use, a park and public dock, and some residential land. Other areas to the south and southwest of the base, including St. Andrews State Park, Shell Island, Allenton, Bayou Point, Water's edge, and Piney Point, are outside the noise footprint, but would experience noise from departures of the F-35A aircraft comparable to what had been experienced with the F-22 aircraft (see Table 4.3-2). Particularly, the high sound levels of individual overflights arriving and departing from the airfield could annoy some people who enjoy outdoor recreational activities in the park (see Table 3.1-4). Section 4.1.2 describes annoyance from elevated single events.

The F-35A operations include about one to two nighttime operations per day. These would generally occur at twilight in the summer, or during the winter when "nighttime" hours occur earlier, prior to sleep hours. These events would not change land use, but could be annoying to a small number of persons.

Tyndall AFB would continue to work with surrounding communities to plan areas around the base for mutually compatible land use. Restoration and new development in these areas within the noise overlay planning area should consider using sound attenuating construction, as recommended in the AICUZ program guidelines.

Outdoor recreation has been an important part of local life and important for local tourism and the economy. As operations at the base build up over time, aircraft noise would become perceptible to locals while outdoors, but popular recreational activities would likely continue without a decline in local or non-local participation.

Overall, the minimal difference among the three afterburner scenarios would make little difference on land use impacts. Table 4.1-26 and Table 4.1-27 also reveal a slight shrinking of the 65 dB DNL footprint for higher afterburner options. The use of afterburner power causes aircraft to climb more quickly, so that noise energy is concentrated vertically and laterally, rather than spread out horizontally under the departure track. Off-base areas benefit slightly from the 95 percent afterburner option, which would increase noise levels for some areas on base.

4.1.10.1.3 Personnel Increase

Under the Three-Squadron F-35A Wing Alternative, USAF personnel would need an estimated 3,763 off-base housing units. Since the hurricane, there has been a lack of available rental housing in the area. This situation would result in a demand for housing and the need to construct suitable off-base housing. Assuming densities of four to eight dwelling units per acre, this would translate into development of about 1,868 to 934 acres for residential use by 2025. This could also create a demand for additional community services in smaller communities (see Section 4.1.13.1). On base, reconstruction of community areas and other support functions is planned to occur prior to the arrival of new personnel providing some of these services and amenities.

Current Future Land Use Maps for surrounding jurisdictions include vacant residential land, providing a supply of available land for development. A total of about 32,800 acres in Bay County is categorized as vacant residential land (GeoPlan Center, University of Florida, 2019). Not all of this land would meet suitability criteria for off-base military housing (e.g., commute distance, proximity of schools and services, existing infrastructures). Other factors could also indirectly affect land use development in the future, such as the current lack of rental housing or the desire to build on higher ground away from storm surge areas. Recent trends in the Tyndall AFB housing-market area show that new construction is occurring in areas away from storm surge dangers. This could affect local land-use patterns by shifting new residential development further from the coastal areas (i.e., into Lynn Haven, northern Springfield and smaller communities along Highway 231 [such as Hiland Park], and eastward towards Port St. Joe). The socioeconomics section projects personnel off-base locations based on past choices by USAF personnel. The USAF establishes criteria for housing military families. An updated Housing Requirement and Market Analysis (HRMA) would include an identification of suitable housing. The HRMA specifically defines suitable housing and excludes housing such as mobile homes (frequently occupied by the elderly), housing that is not acceptable for health or safety reasons, or housing outside a 60-minute commute. USAF personnel receive a monthly Basic Allowance for Housing designed to ensure that USAF personnel are adequately housed.

Increased demand for new housing is driving development at a more rapid rate than previously planned. Community planners and city managers are working to ensure that build-out of various urban land uses are complimentary and adequate for expanded residential development. Residential development further from the coast would provide safer sites, but would add to commute times for base personnel. The base would continue to cooperate with local communities to preserve mutually compatible development through its AICUZ program and any future Land Use Compatibility Study initiatives by the local jurisdictions.

New military and civilian personnel and dependents who reside off base may use public recreational facilities and parks, and commercial recreational amenities in surrounding communities (such as gyms, running tracks, amusement parks, and swimming facilities), to some degree. Use of commercial facilities by base employees and families would contribute some beneficial revenue in commercial businesses, but could strain the capacity of some public facilities and parks to provide quality experiences. The demand for off-base recreation is somewhat offset by the provision of recreational amenities on base for military personnel and dependents and civilian personnel.

4.1.10.1.4 Airspace and Range Training Operations

The F-35A would train in the Tyndall AFB MOAs/ATCAAs/Work Areas, Warning Areas, and at Grand View, Pinecastle, and Avon Park ranges. As reported in Table 4.1-29, F-35A training in the Compass Lake Work Area underlying Tyndall C MOA would result in a decrease of about 2 dB L_{dnmr} when compared to pre-hurricane conditions, and little change from the No Action Alternative affected environment. This would be a slight benefit for underlying rural areas and dispersed homesteads, benefitting the acoustic environment for residential, community, and recreational uses. There are no SULMAs underlying the Compass Lake Work Area.

Table 4.1-29. Noise Levels Beneath Training Airspace for Proposed F-35A Mission at Tyndall AFB

Airspace Area	Pre-Hurricane	No Action Affected Environment		Three-Squadron F-35A Wing Beddown		Four-Squadron F-35A Wing Beddown	
	L_{dnmr} (dBA)	L_{dnmr} (dBA)	Change (dBA)[2]	L_{dnmr} (dBA	Change (dBA)[2]	L_{dnmr} (dBA)	Change (dBA)[2]
Compass Lake Work Area (underlying Tyndall B MOA)	<45	<45	0	47.5	2.5	48.8	3.8
Compass Lake Work Area (underlying Tyndall C MOA)	51.1	48.5	-2.6	48.4	-0.1	49.4	0.9
Carabelle Work Area	<45	<45	0	47	2	48.3	3.3

Key: < = less than; MOA = Military Operations Area; dBA = A-weighted decibel; L_{dnmr} = onset rate-adjusted monthly day-night average sound level
Note:
[1] Change is relative to No Action.

A slight projected increase in noise (about 2 to 2.5 dB L_{dnmr}) under the Compass Lake Work Area (under Tyndall B MOA) and the Carabelle Work Area would remain under levels of concern for all land uses, but may be noticeable to a few persons who are accustomed to the current low noise levels. The small change would have minimal impact on underlying land uses. SULMAs underlying the Carabelle Work Area that are affected by this slight increase are listed in Table 3.1-23. Increase in noise over wilderness areas is not desirable. Most visitors to the Mud Swamp Wilderness would likely not notice this incremental change, especially given that military-aircraft activity in this airspace has varied over time and visitor use is usually intermittent.

Training in the Warning Areas would have no impact on land use. Military aircraft have used these areas for training for a long time; overflights are a common occurrence. Exposure of persons in boats to aircraft overflight would cause changes in water-based recreation, most of which is accompanied by the sound of on-board equipment. Supersonic events and noise levels would not increase in the Warning Areas (see Table 4.1-8); therefore, no impact on water-based activities would result from this action.

The training proposed at the three training ranges do not represent an increase in operations at those facilities and associated military-use airspace. No change in noise levels or level of use would occur at these remote locations, therefore, no impact on land uses would result.

4.1.10.2 Land Use and Recreation, Four-Squadron F-35A Alternative

4.1.10.2.1 Base Facilities Construction

For the Four-Squadron F-35A Wing Alternative, proposed construction includes all the construction for three squadrons plus any additional facilities and infrastructure within the same construction footprint along the main runway flightline (Figure 2.2-1). The impacts on on-base land use would be similar to those described in Section 4.1.10.1.1.

4.1.10.2.2 Base Airfield Operations

The Four-Squadron F-35A Wing Alternative increases aircraft operations at the airfield and the training ranges; this contributes to increased noise surrounding the base and in the local and remote training airspace and ranges. Table 4.1-30 shows that the areas both on and off base, within the 65 dB DNL footprint, would increase over No Action, but are substantially smaller than the areas for the pre-hurricane condition. A comparison of Line 2 (Pre-Hurricane) with Line 7 and 8 in Table 4.3-17 in Section 4.3.10 indicates that the total area within the 65 dB DNL footprint for the 5 percent afterburner option is 18,157 acres (or less for other afterburner options). This footprint is about 43 percent smaller than the pre-hurricane condition.

Table 4.1-30 Areas Exposed to Noise Levels of 65 dB DNL and Greater-Tyndall AFB for Four-Squadron F-35A Wing Alternative

Noise Level (dB) DNL	Four-Squadron F-35A Noise Exposure Area (Acres)									
	Pre-Hurricane		No Action Affected Environment		5% Afterburner		50% Afterburner		95% Afterburner	
	Off Base	Tyndall AFB	Off Base	Tyndall AFB	Off Base	Tyndall AFB	Off Base	Tyndall AFB	Off Base	Tyndall AFB
65–69	10,718	7,608	247	1,996	3,486	5,015	3,612	4,868	3,824	4,619
70–74	2,951	5,375	0	1,045	1,351	3,849	1,378	3,681	1,357	3,452
75–79	468	2,431	0	526	234	2,189	194	2,179	140	2,177
80–84	8	1,086	0	343	17	1,004	5	927	2	849
≥85	0	996	0	277	0	1,012	0	1,038	0	1,057
Total	**14,145**	**17,496**	**247**	**4,157**	**5,088**	**13,069**	**5,189**	**12,693**	**5,323**	**12,154**

Key: ≥ = greater than or equal to; AFB = Air Force Base; dB = decibel; DNL = day-night average sound level

Table 4.3-17 also reveals that projected off-base land (exposed to 65 dB DNL or greater) ranges from 84 acres for 95 percent afterburners to 93 acres for 5 percent afterburners. This would be an increase over No Action, but less than half that of the pre-hurricane condition (217 acres). The amount of residential land (18 acres) is 28 percent smaller than 25 acres under the pre-hurricane condition. Table 4.1-31 indicates that of the 18 acres, about 1 acre of residential land may experience noise levels just above 70 dB DNL. The remaining land affected includes a variety of land uses that are less sensitive to noise, according to the AICUZ guidelines. However, some locations may have specific noise-sensitive uses, such as eldercare facilities and schools (see Section 4.1.2.1.1).

Figure 4.1-5 (inset: Proposed 4 Squadrons F-35A) shows that most of the land exposed to noise levels of 65 dB DNL or greater for the Four-Squadron F-35A Wing Alternative is located along the southern shores of the City of Parker and Panama City, similar to the description in Sections 3.1.10.1 and 4.1.10.1.2. The same general areas (but slightly larger) would experience incompatible exposure, as described for the Three-Squadron F-35A Wing Alternative in Section 4.1.10.1.2. Tyndall AFB would continue to work with surrounding communities to plan areas around the base for mutually compatible land use. Restoration and new development of noise-sensitive land uses, in these areas within the noise overlay planning area, should be discouraged and, where necessary, should incorporate sound-attenuating construction as recommended in the AICUZ program guidelines.

Table 4.1-31. Off-Base Noise Exposure by Land Use at Tyndall AFB for Four-Squadron F-35A Wing Alternative

Land Use Classification	Noise Level (dB DNL) (Acres)					
	65–69[1]	70–74[1]	75–79[1]	80–84[1]	≥85	Total
Commercial	15/9	0	0	0	0	15/9
Industrial	0/1	0	0	0	0	0/1
Open/Ag/Low Density	17/16	0	0	0	0	17/16
Public/Quasi-Public	¾	3/2	0	0	0	6/6
Residential	17/18	1/0	0	0	0	18/18
Transportation	14/14	10/7	0	0	0	24/23
Undesignated	13/12	0/1	0	0	0	13/13
Subtotal (land areas only)	79/74	14/10	0	0	0	93/84
Water	3,407/3,750	1,337/1,347	234/140	17/2	0	4,995/5,239
Total	**3,486/3,824**	**1,364/1,374**	**234/141**	**17/2**	**0**	**5,088/5,337**

Key: ≥ = greater than or equal to; AFB = Air Force Base; Ag = agriculture; dB = decibel; DNL = day-night average sound level
Note:
[1] x/y represents range of noise exposure for 5 percent afterburner operations/95 percent afterburner operations. The afterburners cause the aircraft to climb more quickly, causing the acoustic energy to contract along the departure and arrival axis, and to expand horizontally around the runway.

Noise exposure on base would be similar to that described in Section 4.1.10.1.2. The Base Civil Engineer would manage construction and the implementation of appropriate noise attenuating construction measures for new and rehabilitated facilities.

Impacts on recreation on base and in the surrounding areas would be similar to those described in Section 4.1.10.1.2.

4.1.10.2.3 Personnel Increase

This alternative would result in increased demand for an estimated 3,763 new off-base housing units. Assuming densities of four to eight dwelling units per acre, this would translate into development of about 467 to 934 acres for residential use by 2026. Impacts from the personnel increase under the four-squadron F-35A beddown would be similar, but increased compared to those described in Section 4.1.10.1.3. The surrounding area likely has adequate vacant residential land available for new development (see Section 4.1.10.1.3); however, as the supply is used, areas harder to develop could have higher costs for installation of basic infrastructures. The capital costs for infrastructure and community-service expansions, and the human resource costs to build out this amount of new residential land, could strain local governments in an effort to keep pace with demands. Many of the surrounding communities have depleted funds due to the hurricane-relief efforts.

4.1.10.2.4 Airspace and Range Training Operations

Regional land use impacts for areas underlying airspace used for training would be similar to those described in Section 4.1.10.1.4. Persons residing and recreating under the Compass Lake Work Area under the Tyndall B MOA would likely notice increases of greater than 3.8 dB L_{dnmr}, and greater than 3.5 dB L_{dnmr} under the Carabelle Work Area (see Table 4.1-15). Table 3.1-23 lists the

SULMAs affected by this change. While these noise levels are well below compatibility guidelines for all land uses, and particularly for residential use and outdoor recreation, these changes could affect some individuals who are sensitive to noise and accustomed to quiet conditions.

Supersonic events would not increase in the Warning Areas (see Table 4.1-16); therefore, no impact on water-based activities would result from this action. Land uses and recreational activities are not likely to change in these areas, although the satisfaction and quality enjoyed by local residents may decline for some persons. Overall, the Four-Squadron F-35A Wing Alternative training operations would have minor impacts on regional recreational resources. Impacts would be similar, but slightly higher, than impacts reported for the three-squadron F-35A beddown in Section 4.1.10.1.4.

4.1.10.3 Land Use and Recreation, No Action Alternative

Under the No Action Alternative, land use and recreational resources at Tyndall AFB and under the airspace would remain as described in Section 3.1.10. Residential land on- and off-base would remain compatible with existing noise levels, and noise levels at recreational areas near each of the bases and below the airspace would remain unchanged.

4.1.11 Infrastructure, F-35A at Tyndall

Potential impacts on infrastructure elements are assessed in terms of the effects of implementing construction projects and personnel changes on existing service levels. Impacts on utilities are assessed with respect to the potential for disruption or improvement of current utility systems, deterioration or improvement of existing levels of service, and changes in existing levels of utility safety. Impacts may arise from physical changes to utility corridors, construction activity, and changes in the demand for services caused by changes in personnel.

4.1.11.1 Infrastructure, Three-Squadron F-35A Alternative

4.1.11.1.1 Base Facilities Construction and Personnel Increase

Potable Water System

The proposed beddown of 72 F-35A aircraft at Tyndall AFB would result in an increase in the overall number of personnel and dependents as compared to levels previously experienced at Tyndall AFB. The demand for potable water would be spread across various municipal utility systems because base personnel would occupy housing in a number of nearby communities, including Panama City, Lynn Haven, rural areas north of Panama City, and Gulf County. It is anticipated that only a portion of the additional population would live on base. The average per capita on-base water use is estimated to be about 82 gpd (USAF, 2015). Therefore, the additional demand for potable water could be serviced under the current contract with Bay County. Tyndall AFB receives its water supply from Bay County at three locations on base, and the installation currently has onsite potable water storage of approximately 400,000 gallons as well as additional water storage for fire suppression. Water pressure on the base ranges from 60 to 78 pounds per

square inch (psi), well above the DoD requirement of 40 psi and the state recommendation of 20 psi (USAF, 2011a). This system would experience minimal impact from this alternative.

Sanitary Sewer System

Tyndall AFB discharges its wastewater to the Bay County AWWTP; the base is allowed by contract to discharge a monthly average of up to 1.26 MGD. The average discharge in FY15 was approximately 0.77 MGD. The existing base sanitary sewer system is adequate to serve the current number of personnel at Tyndall AFB, and new construction would reduce inflow and infiltration. USEPA estimates that the average person generates approximately 70 gpd of wastewater between showering, toilet use, and general water use (USAF, 2011a). As new personnel locate either on base or in one of the nearby communities, additional wastewater would be generated throughout the region. Tyndall AFB would need to monitor the amount of wastewater it sends to Bay County to ensure it remains within the contract limits. There would be no significant impact to the sanitary system of Tyndall AFB under this alternative.

Stormwater Drainage System

Tyndall AFB has an extensive stormwater piping network, which would be updated as new construction is completed. Stormwater from the industrial areas of the base and the property that surrounds the runway would continue to be channeled to one of the seven outfall locations via the storm drain network (USAF, 2011a). The Tyndall AFB SWPPP would be amended to reflect changes in facility design, construction, operation, or maintenance associated with this alternative, and no significant impacts are anticipated.

Solid Waste Management

Off-base contractors completing any construction projects at Tyndall AFB would be responsible for disposing of waste generated from these activities. Contractors would be required to comply with federal, state, and local regulations for the collection and disposal of municipal solid waste from the installation. Much of this material can be recycled, reused, or otherwise diverted from landfills. All nonrecyclable construction waste would be collected in a dumpster until removal. Construction waste contaminated with hazardous waste, asbestos-containing material (ACM), lead-based paint (LBP), or other undesirable components would be identified and managed in accordance with AFMAN 32-7002, which requires compliance with federal regulations. Only minor impacts are anticipated to the solid waste management system at the Tyndall AFB installation due to the limited amount of proposed construction. Solid wastes generated by additional personnel and dependents would occur in communities housing these persons. Bay County's waste-to-energy facility and landfill would continue to adequately handle this flow.

Electrical System

The demand for electricity could increase during activities associated with the beddown of 72 F-35A aircraft. Construction of new facilities would result in an increase in electrical consumption. USAF expects increases in electrical use associated with new facilities to be less than current standard consumption given the new requirement to reduce energy levels in federal facilities. This is achieved through using Leader in Energy and Environmental Design (LEED®)

strategies and "green" specifications. The supply grid for the Tyndall AFB electrical energy would be adequate and unaffected by the increased demand.

Natural Gas System

There could be an increase in natural gas consumption at Tyndall AFB under this alternative. This increase could occur as additional working and administrative spaces are developed and heated and operations change with the beddown of 72 F-35A aircraft at the base. The natural gas energy supply grid at Tyndall AFB is currently operating well within its capacity (USAF, 2015) and would be adequate to support the increased demand.

As each component of the Tyndall AFB infrastructure would function below capacity with the implementation of the proposed three-squadron F-35A beddown, there would be no significant impact to infrastructure.

4.1.11.2 Infrastructure, Four-Squadron F-35A Alternative

4.1.11.2.1 Base Facilities Construction and Personnel Increase

The proposed beddown of four F-35A squadrons at Tyndall AFB would result in an increase in the overall number of personnel and dependents as compared to levels previously experienced. The impacts of this alternative would be very similar to the impacts documented in Section 4.1.11.1, and there would be no significant impact to infrastructure.

4.1.11.3 Infrastructure, No Action Alternative

Under the No Action Alternative, the beddown of an F-35A Wing at Tyndall AFB would not occur. The use of utilities and power and waste generation at the base would remain at the levels described for the affected environment in Section 3.1.11. No F-35A–related impacts to the Tyndall AFB reconstructed infrastructure system would result from implementation of the No Action Alternative.

4.1.12 Transportation, F-35A at Tyndall

4.1.12.1 Transportation, Three-Squadron F-35A Alternative

4.1.12.1.1 Base Facilities Construction and Personnel Increase

Potential Traffic Impacts

The analysis of traffic conditions for a three-squadron F-35A Wing beddown at Tyndall AFB includes several key assumptions. First, the analysis assumes that the 2,200 additional employees would produce 2,200 trips inbound during the morning peak period and outbound during the afternoon peak period. Second, the analysis includes a 1 percent ambient annual traffic growth rate through 2025, when the USAF expects full buildout. Third, the analysis distributes the trips across the network based on existing proportions of traffic movements for right turns, left turns,

and through movements. Lastly, the analysis assumes the same 97 percent and 3 percent split for traffic generators from the west and the east, respectively.

Table 4.1-32 summarizes the operational conditions with the added trips that would result from the three-squadron F-35A Wing beddown.

Table 4.1-32. Three-Squadron F-35A Wing Alternative Intersection and Road Segment LOS and Performance Metrics

Intersection or Road Segment	Time Period	2025 Analysis Year			
		LOS	V/C Ratio	Control Delay	Highest Contributing Lane Group
US-98 and Tyndall Drive and Airey Avenue	a.m. p.m.	F F	2.1 2.5	276 sec/veh 554 sec/veh	US-98 right turns onto Airey Avenue Airey Avenue left turns onto US-98
US-98 Near Tyndall Drive	a.m. p.m.	F E	1.08 0.98	NA	NA

Key: LOS = Level of Service; NA = not applicable; sec/veh = seconds per vehicle; US-98 = U.S. Highway 98; V/C = volume-to-capacity

The analysis shows degraded LOS as compared with No Action Alternative LOS in 2025. The right turn movements onto Airey Avenue have a finite right turn lane length, thereby affecting the through movements as well as degrading the overall LOS for the intersection. The table also includes results for the worst-case segment location, and US-98 exceeds capacity during the morning peak period and is at capacity during the afternoon peak period. The Highway Capacity Software intersection analysis includes assumptions for right turns on red, along with a fully actuated signal to optimize the signal timing and phasing based on demand. Further discussion of potential treatments and strategies to alleviate these impacts are included in Section 2.7.

4.1.12.2 Transportation, Four-Squadron F-35A Alternative

4.1.12.2.1 Base Facilities Construction and Personnel Increase

Potential Traffic Impacts

The analysis of the Four-Squadron F-35A Wing Alternative includes the addition of 2,932 trips above the affected environment levels. The same assumptions made for the three-squadron F-35A Wing beddown apply to the four-squadron F-35A Wing beddown. Table 4.1-33 summarizes the traffic impacts that would result from implementation of the four-squadron F-35A Wing beddown.

Table 4.1-33. Four-Squadron F-35A Wing Alternative Intersection and Road Segment LOS and Performance Metrics

Intersection or Road Segment	Time Period	Analysis Year 2025			
		LOS	V/C Ratio	Control Delay	Highest Contributing Lane Group
US-98 and Tyndall Drive and Airey Avenue	a.m. p.m.	F F	2.4 2.6	377 sec/veh 692 sec/veh	US-98 right turns onto Airey Avenue Airey Avenue left turns onto US-98
US-98 Near Tyndall Drive	a.m. p.m.	F F	1.3 1.2	NA	NA

Key: LOS = Level of Service; NA = not applicable; sec/veh = seconds per vehicle; US-98 = U.S. Highway 98; V/C = volume-to-capacity

Both the US-98, Tyndall Drive, and Airey Avenue intersection and the US-98 worst-case road segment would experience LOS F during the morning and afternoon peak hours. As outlined in the table, the V/C ratios increase due to the added trips. The table includes estimates of control delay at the intersection, but as the Highway Capacity Manual procedures evaluate saturated conditions, a simulation model is better equipped to analyze the full impacts that drivers would experience during the peak periods. The Highway Capacity Software evaluation indicates the LOS and the impacts that would result from this action, given the existing infrastructure and without modifications, would be significant for the local network.

4.1.12.3 Transportation, No Action Alternative

Under the No Action Alternative, no mission-related construction or personnel increases would occur. No Action for Tyndall AFB includes the assumption of a 1 percent ambient traffic growth rate annually through the year 2025. The analysis bases future conditions on the data collected from the ECF study and estimated through the future year 2025 (Table 4.1-34).

The intersection of US-98, Tyndall Drive, and Airey Avenue would experience LOS D during the afternoon peak hour, largely due to traffic turning left onto US-98 from Airey Avenue. Some impacts would occur due to the shared left turn and through lane, restricting the operating compared to an exclusive left turn phase at the intersection to clear traffic exiting the base south of US-98. Traffic conditions for the No Action Alternative are acceptable for the future year based on the assumption for ambient traffic increase. No F-35A–related impacts to the Tyndall AFB transportation system would result from implementation of the No Action Alternative.

Table 4.1-34. No Action (2025) Intersection and Road Segment LOS and Performance Metrics

Intersection or Road Segment	Time Period	Analysis Year 2025			
		LOS	V/C Ratio	Control Delay	Highest Contributing Lane Group
US-98 and Tyndall Drive and Airey Avenue	a.m. p.m.	C D	0.95 0.94	24.7 sec/veh 37.5 sec/veh	US-98 right turns onto Airey Avenue Airey Avenue left turns onto US-98
US-98 Near Tyndall Drive	a.m. p.m.	C B	0.47 0.37	NA	NA

Key: LOS = Level of Service; NA = not applicable; sec/veh = seconds per vehicle; US-98 = U.S. Highway 98; V/C = volume-to-capacity

4.1.13 Socioeconomics, F-35A at Tyndall

4.1.13.1 Socioeconomics, Three-Squadron F-35A Alternative

4.1.13.1.1 Base Facilities Construction and Personnel Increase

Construction expenditures for three-squadron F-35A Wing would total approximately $320 million and be expended over a 4-year period beginning in 2022. The increase in personnel would be 2,200 new USAF jobs.

Regional Economy, Employment, and Income

The increased employment and payroll of 2,200 new USAF jobs would be expected to have a positive, long-term economic impact on the regional economy. Table 4.1-35 indicates the number and type of incoming personnel by pay grade. The average annual salary for incoming personnel was estimated and is displayed in Table 4.1-36.

Table 4.1-35. Personnel by Pay Grade, Three-Squadron F-35A Wing Alternative

Type	O1-O2	O3 & Above	E1-E4	E5 & Above	Total
Officers	32	137	0	0	169
Enlisted	0	0	821	1,110	1,931
Total Active Duty	**32**	**137**	**821**	**1,110**	**2,100**
Department of Defense Civilian	0	13	0	0	13
Base Operating Support	43	44	0	0	87
System Support	0	0	0	0	0
Total	**75**	**194**	**821**	**1,110**	**2,200**

Key: O = officer; E = enlisted

Table 4.1-36. Annual Basic Income, Three-Squadron F-35A Wing Alternative

Grade	Average Annual Salary	Total Personnel	Annual Summary Basic Income
O1-O2	$54,000	75	$4,050,000
O3 & Above	$96,000	194	$18,624,000
E1-E4	$25,200	821	$20,689,200
E5 & Above	$50,000	1,110	$55,500,000

Key: O = officer; E = enlisted (2020 dollars)

The direct employment of USAF personnel would result in indirect and induced employment (see Table 4.1-37).

Table 4.1-37. Employment (Jobs) Resulting from Personnel Changes in Bay County, Three-Squadron F-35A Wing Alternative

	Employment[1]		
	Direct	Indirect and Induced[3]	Total
Per Year	550	302	852
Total[2]	**2,200**	**1,206**	**3,406**

Notes:
[1] Employment includes direct employment from incoming personnel and indirect and induced employment.
[2] Totals may not add due to rounding.
[3] IMPLAN economic model (IMPLAN, 2018)

The increase in personnel at Tyndall AFB would generate tax revenues (see Table 4.1-38).

Table 4.1-38. Tax Revenues, Three-Squadron F-35A Wing Alternative

Description	Total
State and Local Tax	$12,139,008
Federal Tax	$55,699,732
Total State, Local, and Federal Tax	**$67,838,740**

Approximately $320 million in construction expenditures would create direct, indirect, and induced employment and earnings (see Table 4.1-39).

Table 4.1-39. Employment (Jobs) Resulting from Construction Expenditures in Bay County, Three-Squadron F-35A Wing Alternative

Year	Construction Costs (millions)	Total Labor Income	Employment (Jobs)			
			Direct	Indirect	Induced	Total
2021	$40	$30,987,145	450	67	140	657
2022	$80	$60,777,357	882	131	275	1,288
2023	$80	$59,603,543	865	129	270	1,264
2024	$80	$58,452,396	849	126	264	1,239
2025	$40	$28,661,743	416	62	130	608
Total	**$320**	**$238,482,184**	**3,462**	**515**	**1,079**	**5,056**

The estimated total increase in on-base and off-base jobs would be 657 in 2021, 2,140 in 2022, 3,795 in 2024, peak at 4,645 jobs in early 2025, and then level off at approximately 3,406 jobs after 2025 (from combining Table 4.1-37 and Table 4.1-39).

Population

Table 4.1-40 presents the military personnel expected at Tyndall AFB by year. Military personnel would be accompanied by 2,992 dependents for a total incoming population of 5,912. Personnel and dependents would be expected to arrive over 4 years or approximately 1,298 people per year beginning in 2022. (See Table 4.1-41.) The population growth per year is estimated to peak at 3.3 percent. This is a substantial growth rate for an area that experienced an average of less than 1-percent growth rate in the years prior to the hurricane.

Table 4.1-40. Personnel Estimates at Tyndall AFB per Year, Three-Squadron F-35A Wing Alternative

Personnel	2022	2023	2024	2025	2026	2027
Total With Base Reconstruction[1]	2,200	2,200	2,200	2,200	2,200	2,200
Total Three-Squadron F-35A with Reconstruction	2,750	3,300	3,850	4,400	4,400	4,400

Note:
[1] Based on the pre-hurricane estimate minus approximately 1,400 personnel departing with the F-22 Squadrons

Table 4.1-41. Population Estimates in Bay County, Three-Squadron F-35A Wing Alternative

Year	Population (Affected Environment as of 2023)	Year-Over-Year Growth	Incoming Population with 3 F-35A Squadrons	Estimated Population with 3 F-35A Squadrons
2018	182,482	-	-	182,482
2019	167,283	-8.33%	-	167,283
2020	170,963	2.2%	-	170,963
2021	175,237	2.5%	-	175,237
2022	180,494	3.0%	1,298	181,792
2023	186,451	3.3%	1,298	189,047
2024	190,180	2.0%	1,298	194,074
2025	191,891	0.9%	1,298	197,083
2026	192,083	0.1%	-	197,275
2027	192,275	0.1%	-	197,467

Housing

By 2025 there would be 4,400 personnel at Tyndall AFB, of which 1,297 would reside on base and the remaining 3,103 would reside off base. Off-base personnel would be distributed throughout the region as identified in Table 3.1-36. Approximately 9 percent of military personnel would have a spouse in the military (Air Force Personnel Center, 2020). The total off-base population of 3,103 personnel would require 2,847 homes. The demand for off-base housing units would increase from 828 units to 2,847 units, an increased demand of 2,019 housing units.

Prior to Hurricane Michael, Bay County had a limited number of affordable properties available for sale or for rent. Hurricane Michael destroyed or severely damaged older, lower cost residences. The 2010 census had 1.14 employees per household in Bay County (USCB, 2010a). The increased cost of housing and the availability of jobs would be expected to increase that ratio to at least 1.5 employees per household (the Florida state average is 1.46). Construction workers and secondary employees would also demand housing. The additional demand by construction and secondary workers would be up to 1,630 ([1,206+1,239]/1.5) housing units in the community for the years 2022 through 2025 (combing Table 4.1-37 and Table 4.1-39). Adding that to the USAF off-base housing demand of 2,019 units would result in a demand for 3,649 units by the end of 2024. Housing costs in the next several years could continue rising by 10 to 15 percent or more per year as supply tries to catch up with demand before leveling off as new housing is constructed.

After 2025, housing demand could decline from the 2024 peak to represent total housing demand for 2,019 off-base USAF personnel plus 804 units for secondary personnel, for a demand for 2,823 housing units.

One off-base census block group in the City of Parker is affected by noise levels of 65 dB DNL or greater. Several studies have attempted to quantify the impact aircraft noise has on property values. Results suggest a discount on property values in the range of 0.51 and 0.67 percent per decibel change associated with aircraft noise above 65 dB DNL (Nelson, 2003).

Education

Incoming USAF personnel would be accompanied by an estimated 2,992 dependents, approximately 1,496 would be children between the ages of 0 to 18 and, of those, an estimated 1,100 children would be of school age. There would be an average increase of 275 students per year (see Table 4.1-42).

The majority of students would attend schools in Panama City proper and Lynn Haven (see Table 3.1-36). The damage from Hurricane Michael had a major impact on the Bay County District schools. An increase in students to the district would be seen as a benefit to post-hurricane school concerns. Following initial crowding, the additional students would contribute to obtaining state funding and help restore schools that had been temporarily closed after the hurricane.

An estimated 1,100 children at a rate of 9 children per school employee in Bay County would result in an increased demand for 123 additional school employees including administrators, teachers, support, and maintenance.

Table 4.1-42. Total Enrollment Estimates in Bay County, Three-Squadron F-35A Wing Alternative

School Year	Estimated Enrollment	Incoming Students (with 3 F-35A Squadrons)	Estimated Enrollment (with 3 F-35A Squadrons)
2018	28,129	-	28,129
2019	23,927	-	23,927
2020	24,933	-	24,933
2021	25,949	-	25,949
2022	26,968	275	27,243
2023	27,508	275	27,793
2024	27,975	275	28,618
2025	28,395	275	29,718
2026	28,821	-	29,921
2027	29,253	-	30,353

Public Services

The addition of three squadrons of F-35A aircraft and associated 5,192 USAF personnel and dependents would result in increased demand for public services such as police, fire, and medical services (see Table 4.1-43).

Table 4.1-43. Public Services, Three-Squadron F-35A Wing Alternative

Year	Police			Fire			Medical		
	Total Safety Personnel	Total Personnel (with 3 squadron)	Change	Total Safety Personnel	Total Personnel (with 3 squadron)	Change	Total Medical Personnel	Total Personnel (with 3 squadron)	Change
2019	366	366	0	251	251	0	423	423	0
2020	374	374	0	256	256	0	433	433	0
2021	382	382	0	262	262	0	442	442	0
2022	390	393	3	267	269	2	450	454	4
2023	398	403	5	272	276	4	459	466	7
2024	404	413	9	277	283	6	467	477	10
2025	411	422	11	281	289	8	474	487	13
2026	417	428	11	285	293	8	481	495	14
2027	423	434	11	290	297	7	489	502	13

Approximately 60 percent more public service personnel would be needed for secondary workers and their families, and more than twice that number of public service personnel could be needed during construction. Public service personnel would compete with all others for housing in Bay County.

4.1.13.2 Socioeconomics, Four-Squadron F-35A Alternative

4.1.13.2.1 Base Facilities Construction and Personnel Increase

The total cost of facilities construction associated with the Four-Squadron F-35A Wing Alternative would be $400 million expended over a 5-year period beginning in 2022. The total increase in personnel would be 2,932 new USAF jobs.

Regional Economy, Employment, and Income

The increased employment and payroll of 2,932 new USAF jobs would be expected to have a positive, long-term economic impact on the regional economy. Table 4.1-44 indicates the number and type of incoming personnel by pay grade.

Table 4.1-44. Personnel Changes by Pay Grade, Four-Squadron F-35A Wing Alternative

Type	O1-O2	O3 & Above	E1-E4	E5 & Above	Total
Officers	43	183	0	0	225
Enlisted	0	0	1,094	1,480	2,574
Total Active Duty	**43**	**183**	**1,094**	**1,480**	**2,800**
Department of Defense Civilian	0	17	0	0	17
Base Operating Support	57	59	0	0	116
System Support	0	0	0	0	0
Total	**100**	**259**	**1,094**	**1,480**	**2,933**

Key: O = officer; E = enlisted

The average annual salary for incoming personnel was estimated and is displayed in Table 4.1-45.

Table 4.1-45. Annual Basic Income, Four-Squadron F-35A

Grade	Average Annual Salary	Total Personnel	Annual Basic Income
O1-O2	$54,000	100	$5,398,650
O3 & Above	$96,000	258	$24,794,208
E1-E4	$25,200	1,094	$27,578,704
E5 & Above	$50,000	1,480	$73,981,500

Key: O = officer; E = enlisted

The direct employment of USAF personnel would result in indirect and induced employment (see Table 4.1-46).

Table 4.1-46. Employment (Jobs) Resulting from Personnel Changes in Bay County, Four-Squadron F-35A

	Employment[1]		
	Direct	Indirect and Induced	Total
Per Year (2022–2026)	587	322	908
Total[2]	**2,933**	**1,609**	**4,542**

[1] Employment includes direct employment from incoming personnel and indirect and induced employment.
[2] Totals may not add due to rounding errors.

The increase in personnel at Tyndall AFB would generate tax revenues (see Table 4.1-47).

Table 4.1-47. Tax Revenues, Four-Squadron F-35A

Description	Total
State and Local Tax	$12,930,548
Federal Tax	$59,331,576
Total State, Local, and Federal Tax	**$72,262,124**

Construction expenditures for four F-35A squadrons would total approximately $400 million. Construction expenditures would create direct, indirect, and induced employment and earnings (see Table 4.1-48). The estimated total increase in on-base and off-base jobs would be 1,314 in 2021, 3,105 in late 2022, 3,963 in late 2024, peak at 5,733 jobs in early 2026, and then level off at approximately 4,542 jobs after 2026 (from combining Table 4.1-46 and Table 4.1-48).

Table 4.1-48. Employment (Jobs) Resulting from Construction Expenditures in Bay County, Four-Squadron F-35A

Year	Construction Costs (millions)	Total Labor Income	Employment (Jobs)			
			Direct	Indirect	Induced	Total
2021	$80	$61,974,291	900	134	280	1,314
2022	$80	$60,777,357	882	131	275	1,288
2023	$80	$59,603,543	865	129	270	1,264
2024	$80	$58,452,396	849	126	264	1,239
2025	$80	$56,216,380	816	121	254	1,191
Total	**$400**	**$297,023,967**	**4,312**	**641**	**1,343**	**6,296**

Population

Table 4.1-49 presents military personnel expected at Tyndall AFB by year, including mission personnel. Arriving military personnel would be accompanied by 3,988 dependents for a total incoming population of 6,920. Personnel and dependents would be expected to arrive over 5 years or approximately 1,384 people per year beginning in 2022. Table 4.1-50 estimates population growth per year with a potential peak growth rate up to 3.3 percent. This is a substantial growth rate for an area that experienced an average of less than 1-percent growth rate in the years prior to the hurricane.

Table 4.1-49. Personnel Estimates at Tyndall AFB per Year, Four-Squadron F-35A

Personnel	2022	2023	2024	2025	2026	2027
Total With Base Reconstruction[1]	2,200	2,200	2,200	2,200	2,200	2,200
Total Four-Squadron F-35A with Reconstruction	2,786	3,373	3,959	4,546	5,132	5,132

Note:
[1] Based on the pre-hurricane estimate minus approximately 1,400 personnel that would be departing with the F-22 Squadron

Table 4.1-50. Population Estimates in Bay County, Four-Squadron F-35A

Year	Population (Affected Environment as of 2023)	Year-Over-Year Growth	Incoming Population with 4 F-35A Squadrons	Estimated Population with 4 F-35A Squadrons
2018	182,482	-	-	182,482
2019	167,283	-8.33%	-	167,283
2020	170,963	2.2%	-	170,963
2021	175,237	2.5%	-	175,237
2022	180,494	3.0%	1,384	181,888
2023	186,451	3.3%	1,384	189,239
2024	190,180	2.0%	1,384	194,362
2025	191,891	0.9%	1,384	197,467
2026	192,083	0.1%	1,384	199,053
2027	192,275	0.1%	-	199,245

Housing

By 2026 there would be 5,132 personnel at Tyndall AFB, of which 1,297 would reside on base and the remaining 3,835 would reside off base. Off-base personnel would be distributed throughout the region as identified in Table 3.1-36.

Approximately 9 percent of the military personnel have a spouse in the military (Air Force Personnel Center, 2020). The total off-base population of 3,835 personnel would require 3,519 homes. The demand for off-base housing units during reconstruction would increase from 829 units to 3,519 units, an increased demand of 2,690 housing units.

Prior to Hurricane Michael, Bay County had a limited number of affordable properties available for sale or for rent. Hurricane Michael destroyed or severely damaged older, lower-cost residences. The 2010 census had 1.14 employees per household in Bay County (USCB, 2010a). The increased cost of housing and the availability of jobs would be expected to increase that ratio to at least 1.5 employees per household (Florida State average is 1.46). Construction workers and secondary employees would also demand housing (combining Table 4.1-46 and Table 4.1-48). The additional demand by construction and secondary workers would be for up to 1,899 ([1,239+1,609]/1.5) housing units in the community by 2025. Adding that to the 2025 USAF off-base housing demand of 2,690 would result in a total demand of 4,589 units. Housing costs through 2024 could continue rising by 10 to 15 percent or more per year as supply tries to catch up with demand before leveling off as new housing is constructed.

After 2025, housing demand could decline from the 2024 peak to represent total housing demand for 2,690 off-base USAF personnel plus 1,073 units for secondary personnel, for a demand for 3,763 housing units.

One off-base census block group in the City of Parker is affected by noise levels of 65 dB DNL or greater. Several studies have attempted to quantify the impact aircraft noise has on property values. Results suggest a discount on property values in the range of 0.51 and 0.67 percent per decibel change associated with aircraft noise above 65 dB DNL (Nelson, 2003).

Education

Incoming USAF personnel would be accompanied by an estimated 3,998 dependents. Approximately 1,994 dependents would be children between the ages of 0 to 18 and, of those, an estimated 1,466 children would be of school age. There would be an average increase of approximately 293 students per year (see Table 4.1-51). The effects on students and schools would be as described for the three-squadron F-35A Wing.

The majority of students would attend schools in Panama City and Lynn Haven (see Table 3.1-36). The damage from Hurricane Michael had a major impact on the Bay County District schools. After initial crowding, the additional students would contribute to obtaining state funding and help restore schools that had been mothballed after the hurricane.

Table 4.1-51. Total Enrollment Estimates in Bay County, Four-Squadron F-35A

School Year	Estimated Enrollment	Incoming Students (with 4 F-35A Squadrons)	Estimated Enrollment (with 4 F-35A Squadrons)
2018	28,129	-	28,129
2019	23,927	-	23,927
2020	24,933	-	24,933
2021	25,949	-	25,949
2022	26,968	294	27,262
2023	27,508	293	27,848
2024	27,975	293	28,727
2025	28,395	293	29,899
2026	28,821	293	30,286
2027	29,253	-	30,719

Public Services

The addition of four squadrons of F-35A aircraft and associated 5,192 USAF personnel and dependents would result in increased demand for public services such as police, fire, and medical services (see Table 4.1-52). Approximately 60 percent more public service personnel would be needed for secondary workers and their families, and more than twice that number of public service personnel could be needed during construction. Public service personnel would have to compete with all others for housing in Bay County.

Table 4.1-52. Public Services, Four-Squadron F-35A

Year	Police			Fire			Medical		
	Total Safety Personnel	Total Personnel (with 4 squadrons)	Change	Total Safety Personnel	Total Personnel (with 4 squadrons)	Change	Total Medical Personnel	Total Personnel (with 4 squadrons)	Change
2019	366	366	0	251	251	0	423	423	0
2020	374	374	0	256	256	0	433	433	0
2021	382	382	0	262	262	0	442	442	0
2022	390	393	3	267	269	2	450	454	4
2023	398	404	6	272	277	5	459	466	7
2024	404	414	10	277	283	6	467	478	11
2025	411	423	12	281	289	8	474	488	14
2026	417	432	15	285	296	11	481	499	18
2027	423	438	15	290	300	10	489	506	17

4.1.13.3 Socioeconomics, No Action Alternative

Under the No Action Alternative, there would be no beddown of an F-35A Wing. There would be no facilities, construction, personnel changes, or flight operations associated with the F-35A Wing at this time. Under the No Action Alternative, socioeconomic conditions would be as described for the affected environment in Section 3.1.13. However, without the influx of base expenditures and personnel spending, the Bay County area would lack some of the economic foundation needed for a healthy economy and sustainable community development.

4.1.14 Environmental Justice, F-35A at Tyndall

4.1.14.1 Environmental Justice, Three-Squadron F-35A Alternative

4.1.14.1.1 Base Airfield Operations and Personnel Increase

Noise contours of 65 dB DNL or greater extend into one census block group. Census block group 1 in census tract 9 would be within the 65 dB DNL and greater noise contours (see Table 4.1-53). The number of minority and low-income populations during reconstruction compared to pre-hurricane numbers declined. Because the percentages of minority and low-income populations in the ROI are less than they are in the COC, there would be no disproportionately high and adverse impacts from aircraft noise anticipated under any three-squadron F-35A Wing afterburner take-off scenario (see Appendix B, Section B.13.3).

The increase in the cost of housing has the potential to amplify any adverse impacts on low-income residents since low-income residents typically spend a larger proportion of their income on housing than the general population. Available low-cost housing, which is often occupied by minorities or the elderly on fixed incomes, was severely reduced by the hurricane. In the year since Hurricane Michael struck, multiple comments have appeared in the media about the rapid increase in housing costs, the unavailability of lower-cost housing, and the higher rental costs from increased construction costs and new construction standards.

Table 4.1-53. Environmental Justice Populations in the COC and ROI During Reconstruction

Geographic Region	During Reconstruction						
	Total Population	Minority		Dispro-portionate	Low-Income		Disproportionate
		#	%		#	%	
Census Tract 9, Census Block Group 1 (ROI)	1,834	264	14.4%	No	273	14.9%	No
Community of Comparison							
Census Tract 9 (COC)	3,897	830	21.3%	-	647	16.6%	-

Key: COC = Community of Comparison; ROI = region of influence

One factor that normally reduces the potential demand for low-cost housing by USAF personnel is the Basic Allowance for Housing. This monthly allotment is designed to ensure that USAF personnel are adequately housed. An HRMA is performed to determine suitable housing. The HRMA specifically defines suitable housing and excludes housing such as mobile homes (frequently occupied by the elderly), housing that is not acceptable for health or safety reasons, or housing outside a 60-minute commute. Typically, this means that some lower-income housing is not considered adequate housing for USAF personnel. The 2020 Tyndall AFB monthly nontaxed allotment for USAF personnel ranges from $1,515 to $2,271, depending on rank and number of dependents (Tyndall AFB, 2020b). This means that housing demand by USAF personnel is normally concentrated above low-cost housing and, instead, is more in the medium price range.

In the case of Bay County following the hurricane, all income groups will be impacted by rising housing costs. Although, as a result of USAF housing policies, off-base personnel would not be expected to compete for low-income housing, the overall price increases from regional growth would impact low-income persons who typically spend a greater portion of their incomes on

housing. The elderly on fixed incomes would be affected by the reduced supply of affordable housing and the overall increase in the cost of new or rebuilt housing.

As shown in Table 4.1-54, approximately 20.6 percent (378 people) of the estimated population in the ROI would be elderly and 19.5 percent (358 people) of the population would be children. There are no schools, daycares, nursing homes, assisted living facilities, or hospitals within the 65 dB DNL and greater noise contours.

Table 4.1-54. Children and Elderly Populations in the ROI, Pre-Hurricane and During Reconstruction

Geographic Region	2018 (Pre-Hurricane)					During Reconstruction				
	Total Population	Children		Elderly		Total Population	Children		Elderly	
		#	%	#	%		#	%	#	%
Census Tract 9, Census Block Group 1	2,111	411	19.5%	434	20.6%	1,834	358	19.5%	378	20.6%
Census Tract 9	4,488	845	18.8%	758	16.9%	3,897	733	18.8%	659	16.9%

Key: ROI = region of influence

The number of people that fall within the 65 dB DNL or greater noise contours varies according to what percent of departures use afterburners as shown in Table 4.1-55. Fewer people are affected by aircraft noise of 65 dB DNL or greater with a higher percent of departures that use afterburner. There is no disproportionate number of environmental justice persons in the ROI and no disproportionate impacts to minority or low-income populations.

Table 4.1-55. Total Populations Affected by Aircraft Noise in the ROI, Three-Squadron F-35A, 5%, 50%, and 95% Afterburner Departures

DNL (dB)	Pre-Hurricane	No Action	Three-Squadron F-35A Wing Beddown					
			Afterburner Scenario A (5%)		Afterburner Scenario B (50%)		Afterburner Scenario C (95%)	
	Population	Population	Population	Change[1]	Population	Change[1]	Population	Change[1]
65–69	184	0	70	70	63	63	57	57
70–74	6	0	0	0	0	0	0	0
75–79	0	0	0	0	0	0	0	0
Total >65 dB DNL	**190**	**0**	**70**	**70**	**63**	**63**	**57**	**57**

Key: > = greater than; dB = decibels; DNL = day-night average sound level; ROI = region of influence
Note:
[1] Change is relative to No Action.

4.1.14.2 Environmental Justice, Four-Squadron F-35A Alternative

4.1.14.2.1 Base Airfield Operations and Personnel Increase

Effects on environmental justice populations and effects on children and the elderly would be as described for the three-squadron F-35A Wing because the percentages of minority and low-income populations in the ROI are less than they are in the COC (see Appendix B, Section B.13.3).

The number of people within the 65 dB DNL or greater noise contours varies according to what percent of departures use afterburner and are shown in Table 4.1-56. There is no disproportionate

number of environmental justice persons in the ROI and no disproportionate impacts to minority or low-income populations.

Table 4.1-56. Total Populations Affected by Aircraft Noise in the ROI, Four-Squadron F-35A, 5%, 50%, and 95% Afterburner Departures

DNL (dB)	Pre-Hurricane	No Action	Four-Squadron F-35A Wing Beddown					
			Afterburner Scenario A (5%)		Afterburner Scenario B (50%)		Afterburner Scenario C (95%)	
	Population	Population	Population	Change[1]	Population	Change[1]	Population	Change[1]
65–69	184	0	112	0	114	114	117	117
70–74	6	0	5	0	0	0	0	0
75–79	0	0	0	0	0	0	0	0
Total >65 dB DNL	**190**	**0**	**117**	**0**	**114**	**114**	**117**	**117**

Key: > = greater than; dB = decibels; DNL = day-night average sound level; ROI = region of influence
Note:
[1] Change is relative to No Action.

4.1.14.3 Environmental Justice, No Action Alternative

Under the No Action Alternative, the F-35A Wing would not beddown at Tyndall AFB. There are no residential land areas or populations impacted by noise levels of 65 dB DNL associated with affected environment aircraft operations at Tyndall AFB. There would be no disproportionate noise effect to minority or low-income populations as a result of the No Action Alternative. There would be no anticipated health or safety effects from aircraft noise levels of 65 dB DNL or greater on children and the elderly residing off base.

4.2 MQ-9 OPERATIONAL WING BEDDOWN PROPOSAL AT EITHER TYNDALL AFB OR VANDENBERG AFB

4.2.1 Alternative to Beddown the MQ-9 Operational Wing at Tyndall AFB (Preferred)

4.2.1.1 Airspace Management and Air Traffic Control, MQ-9 at Tyndall (Preferred)

Assessment of the proposed MQ-9 beddown at Tyndall AFB also considered those factors discussed in Appendix B that were most relevant for assessing potential impacts of this UAS on airspace management and ATC.

4.2.1.1.1 Base Airfield Operations

The Tyndall AFB airfield airspace environment in which the estimated 2,820 MQ-9 annual sorties would be conducted is described in Section 3.1.1.1 and shown in Figure 2.3-2. As explained in Section 2.2.5.3, a sortie includes all aircraft activities conducted during the course of a single mission to include the take-off and landing. Therefore, the 2,820 sorties projected for MQ-9s would equate to about 5,640 airfield operations plus any additional closed pattern practice

takeoffs/landings the operator may perform as part of a single sortie. The MQ-9 departures/arrivals would be conducted on either the Main Runway or the Alternate Runway where those operations would be coordinated between the tower, RAPCON, and drone operators as these RPAs transition between the respective Class D and terminal airspace areas so as not to conflict with other airfield operations on Runways 14/32.

As noted in Chapter 2, MQ-9 operations would be conducted in the airfield environment within a 3-NM radius of the Main or Alternate Runway Options, depending on the location of the Maintenance Complex (see Figure 2.3-2). Use of either the Main Runway or the Alternate Runway Option would have little effect on how the Tyndall AFB tower would manage these RPA runway and pattern activities to separate them from other airfield operations within the Class D airspace. Any flights departing the Tyndall AFB Class D airspace into unrestricted airspace would require an approved COA while transiting to the adjacent offshore Warning Areas. Otherwise, no changes would be required to this airspace structure or the manner in which ATC manages airfield operations within this Class D airspace. RPA operations require the same ATC attention and separation as other manned aircraft operating in any controlled airspace environment.

Tyndall AFB local operating procedures would dictate how the MQ-9 flights are to be coordinated and communicated between the ground control crews/operators, ATC, and other responsible interests that ensure FAA and DoD UAS operational requirements are met. Therefore, considering those controls required for RPA operations and the manner in which those operations could be accommodated at Tyndall AFB, the proposed MQ-9 beddown could be integrated into the airfield operations without having adverse impacts on other military and civilian airspace uses in this environment.

4.2.1.1.2 Transit and Training Operations

MQ-9 transit to/from and use of the local SUA and ATCAAs and the Grand Bay and Avon Park Ranges are described in Section 3.1.1.1 and shown in Figure 2.3-2 and Figure 2.3-3. An FAA approved COA corridor would be required for transit through unrestricted airspace to those areas. As noted above, these flights would require a closely coordinated effort between ATC, system operators, and other responsible entities per regulatory requirements to ensure RPA flights are separated from other nonparticipating aircraft in any shared airspace environment.

The scheduled use of the SUA areas and COAs would be publicized through NOTAMs and other advisory means that would make VFR pilots aware of any MQ-9 flights within the lower altitudes where VFR aircraft typically operate. However, the majority of the MQ-9 flights would be climbing to higher altitudes above FL180 where only IFR aircraft operate. ATC would ensure IFR aircraft are separated from the active COAs and the restricted airspace where MQ-9 are operating. Considering the strict measures taken to manage, monitor, and control these aircraft while transiting to/from the different SUA training areas, this proposed beddown would have minimal impact on other airspace uses within the transiting and training areas.

4.2.1.2 Airspace Management and Air Traffic Control, MQ-9 No Action Alternative at Tyndall

The No Action Alternative would not beddown an MQ-9 Wing at Tyndall AFB. Airfield and training area operations under the No Action Alternative and the manner in which these operations are managed by ATC would remain the same as typically occurs at Tyndall AFB under affected environment conditions.

4.2.1.3 Noise, MQ-9 at Tyndall (Preferred)

4.2.1.3.1 Base Airfield Operations with MQ-9 Main Runway Option

The MQ-9 is a propeller-driven aircraft powered by a 950-horsepower turboprop engine. Because measured MQ-9 noise levels are sensitive information, the T-6 aircraft, which is powered by a 1,100-horsepower turboprop engine, was used as a source noise-level surrogate. MQ-9 individual overflight noise levels are substantially lower than noise levels generated by other aircraft types that regularly use Tyndall AFB (Table 4.2-1).

The MQ-9 Wing would conduct an estimated 2,820 sorties annually, with an average of 16 practice approaches per sortie. Operations would be conducted in accordance with current flying procedures.

Table 4.2-1. MQ-9 Individual Overflight Noise Levels Compared Against Aircraft Currently Using Tyndall AFB

Aircraft (engine type)	Power Setting[1]	Power Unit	L_{max} Values (in dB) at Varying Distances (in feet)				
			500	1,000	2,000	5,000	10,000
Takeoff/Departure Operations							
MQ-9 (T-6 surrogate)[3]	100%	Torque	85	78	71	61	52
F-35A[2]	100%	ETR	119	111	103	90	79
F-35A (afterburner)[2]	150%	ETR	124	117	108	97	87
QF-16 (P220)	92.40%	NC	111	103	95	83	72
F-22	100%	ETR	120	113	104	92	81
Landing/Arrival Operations							
MQ-9 (T-6 surrogate)[3]	17%	Torque	82	75	67	57	47
T-38	96%	RPM	96	88	79	66	54
F-35A[2]	40%	ETR	100	93	85	72	60
QF-16 (P220)	80%	NC	90	83	75	63	53
F-22	43%	ETR	111	104	96	83	71

Source: Omega10 using standard weather conditions of 59 degrees Fahrenheit and 70 percent relative humidity.
Key: dB = decibel; ETR = engine thrust request; L_{max} = Maximum Noise Level; RPM = revolutions per minute; NC = engine core; Torque = engine torque
Notes:
[1] Engine power settings are not constant during flight. Power settings shown are typical; departure configurations are non-afterburner departure unless otherwise noted.
[2] Values are based on field noise-level measurements conducted at Edwards Air Force Base in 2013 (USAF, 2020b).
[3] MQ-9 noise levels are not available in the Noisemap reference noise-level database; T-6 is used as surrogate.

Annoyance and Land Use Compatibility

As shown in Figure 4.2-1, noise levels exceeding 65 dB DNL under the Main Runway or Alternate Runway Option would not change dramatically relative to noise levels under No Action Alternative operations. Noise levels exceeding 65 dB DNL would continue to remain entirely within the boundaries of the installation, open-water areas, and the same 2 acres of US-98 right-of-way that are affected under No Action Alternative operations. All off-installation land uses would continue to be compatible with DoD noise-land use guidelines, and no off-base residents would be exposed to noise levels greater than 65 dB DNL. Noise levels under both the Main Runway and Alternate Runway Options would be substantially lower than under pre-hurricane conditions (included as a point of reference), as reflected by the larger pre-hurricane 65 dB DNL contour extent shown in Figure 4.2-1.

Additional noise calculations were run at several representative noise-sensitive locations, which are depicted in Figure 4.2-1. Under the MQ-9 Wing beddown alternative Main Runway and Alternate Runway Options, DNL would remain the same or increase by approximately 1 dB relative to No Action Alternative operations. The largest DNL increase (1.3 dB) would occur at Bayou Point (residences) under the Alternate Runway Option. Aircraft noise would remain similar to presumed ambient noise levels (45 dB) at several locations, and annoyance due to aircraft noise would continue to be minimal. Noise impacts would be minimal relative to No Action Alternative operations. Noise levels would be substantially lower at all of the locations studied than they had been under pre-hurricane conditions (included as a point of reference).

Table 4.2-2. Day-Night Average Sound Level at Representative Noise-Sensitive Locations Under Tyndall AFB MQ-9 Wing Beddown Alternative

Location Description	Pre-Hurricane	No Action	MQ-9 Wing Beddown			
			Main Runway Option		Alternate Runway Option	
	dB DNL	dB DNL	dB DNL	Change[1]	dB DNL	Change[1]
First Baptist Church of Parker	58.6	<45	<45	0	<45	0
Allenton (town)	59.2	46.5	46.5	0	46.8	0.3
Saint Andrews State Park, Campground	45.4	<45	<45	0	<45	0.6
Bayou Point (residences)	58.3	47	47.1	0.1	48.3	1.3
Long Point Condominiums	70.5	58.7	58.8	0.1	58.7	0
Mexico Beach (community)	58.1	<45	<45	0	<45	0
Panama City (community)	65.5	50.7	50.7	0	50.7	0
Parker Elementary School	55.1	<45	<45	0	<45	0
Piney Point (residences)	47.1	<45	<45	0	<45	1
Saint Andrews State Park, Shell Island	64	<45	<45	0	<45	0
Saint Andrews (community)	50.8	46.5	46.5	0	46.5	0
Tyndall AFB Dormitories	75.5	67.6	67.7	0.1	67.6	0
Tyndall Elementary School	75.2	61	61.2	0.2	61	0
Tyndall AFB on-base housing	63.6	48	48	0	48	0
Water's Edge (residences)	58.9	47.1	47.1	0	47.4	0.3

Key: AFB = Air Force Base; dB = decibel; DNL = day-night average sound level
Note:
[1] Change is relative to No Action.

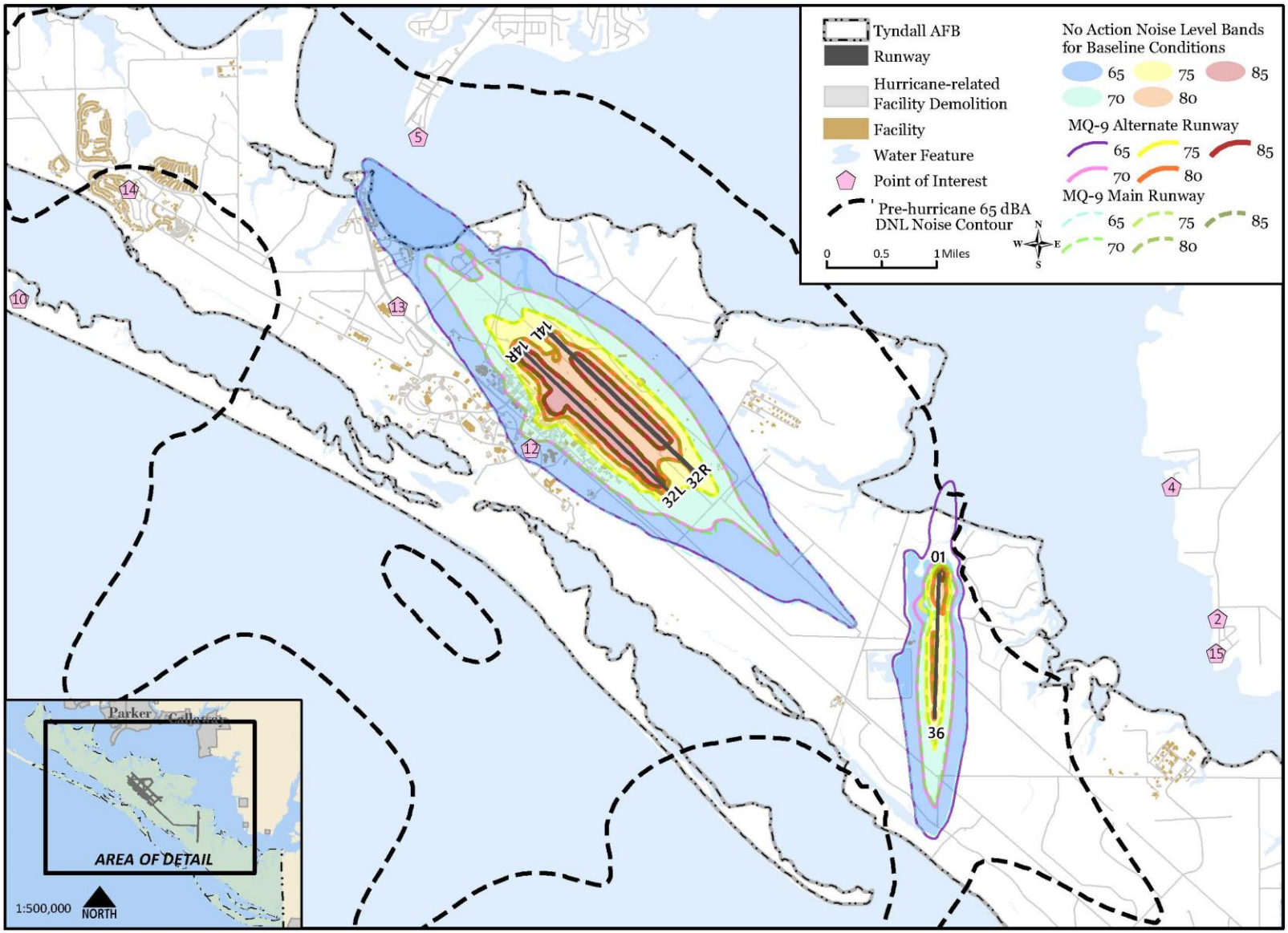

Figure 4.2-1. Noise Levels at Tyndall AFB Under MQ-9 Main Runway and MQ-9 Alternate Runway Options

Speech Interference

Overflight events that exceed 50 dB, even momentarily, have some potential to interfere with speech. MQ-9 overflights would increase the number of outdoor noise events with potential to interfere with speech momentarily by up to three events per hour, at the locations studied relative to No Action Alternative operations (Table 4.2-3). The highest number of potential speech-interference events would occur at the Tyndall AFB Dormitories, where the number of events would increase by three to an end-state of five events per hour. Speech-interference events are brief, lasting only for the duration of the overflight. The number of outdoor potential speech-interference events per average hour would be lower under the MQ-9 Wing beddown alternative than under pre-hurricane conditions (included as a point of reference).

Table 4.2-3. Number of Speech-Interference Events per Average Daytime Hour Under Tyndall AFB MQ-9 Wing Beddown Alternative

Location Description	Pre-Hurricane	No Action	MQ-9 Wing Beddown			
			Main Runway Option		Alternate Runway Option	
	Events	Events	Events	Change[1]	Events	Change[1]
First Baptist Church of Parker	7	1	2	1	1	0
Allenton (town)	8	2	2	0	4	2
Saint Andrews State Park, Campground	5	1	1	0	1	0
Bayou Point (residences)	7	1	2	1	4	3
Long Point Condominiums	8	2	4	2	2	0
Mexico Beach (community)	4	1	1	0	1	0
Panama City (community)	8	2	4	2	2	0
Parker Elementary School	7	1	1	0	1	0
Piney Point (residences)	5	1	1	0	3	2
Saint Andrews State Park, Shell Island	7	1	2	1	1	0
Saint Andrews (community)	6	1	1	0	2	1
Tyndall AFB Dormitories	9	2	5	3	2	0
Tyndall Elementary School	8	2	4	2	2	0
Tyndall AFB on-base housing	7	1	2	1	1	0
Water's Edge (residences)	8	2	2	0	4	2

Key: AFB = Air Force Base
Note:
[1] Change is relative to No Action.

Classroom Noise

Outdoor noise levels at Tyndall Elementary School would exceed 60 dB $L_{eq\text{-}8hr}$ under No Action Alternative operations, and would continue to do so under the MQ-9 Wing beddown, increasing by 0.3 dB under the Main Runway Option or by 0 dB under the Alternate Runway Option (Table 4.2-4). The number of events per hour at Tyndall Elementary School with potential to interfere with speech (above 50 dB L_{max}) would increase by one event (to an end-state of two) with windows open or closed under the Main Runway Option, but would not change under the Alternate Runway Option. Outdoor noise levels at Parker Elementary School would remain below 60 dB $L_{eq\text{-}8hr}$ under the MQ-9 Wing beddown alternative, and the number of potential speech-interference events would remain the same.

Table 4.2-4. Indicators of Classroom Interference Under Tyndall AFB MQ-9 Wing Beddown Alternative

Location Description	Pre-Hurricane	No Action	MQ-9 Wing Beddown			
			Main Runway Option		Alternate Runway Option	
	L_{eq-8hr}	L_{eq-8hr}	L_{eq-8hr}	Change[1]	L_{eq-8hr}	Change[1]
Parker Elementary School	56.9	<45	<45	0.0	<45	0.0
Tyndall Elementary School	77.0	62.9	63.2	0.3	62.9	0.0
	Events (Windows Open)	Events (Windows Open)	Events (Windows Open)	Change[1]	Events (Windows Open)	Change[1]
Parker Elementary School	4	1	1	0	1	0
Tyndall Elementary School	6	1	2	1	1	0
	Events (Windows Closed)	Events (Windows Closed)	Events (Windows Closed)	Change[1]	Events (Windows Closed)	Change[1]
Parker Elementary School	1	0	0	0	0	0
Tyndall Elementary School	5	1	2	1	1	0

Key: < - less than; AFB = Air Force Base; L_{eq-8hr} = 8-hour equivalent noise level
Note:
[1] Change is relative to No Action.

Sleep Disturbance

An estimated 5 percent of MQ-9 initial approach, 3 percent of MQ-9 departure operations, and 0 percent of practice-approach operations are expected to be conducted during the late-night time period (10:00 p.m. to 7:00 a.m.), when most people are trying to sleep. Although late-night operations would occur occasionally, MQ-9 noise levels are not sufficiently high to awaken people regularly who are sleeping indoors. The probability of sleep disturbance at the representative noise-sensitive locations would remain the same except at the Tyndall AFB Dormitories and Tyndall Elementary School (representative of nearby locations where people are more likely to sleep), where the probability would increase to 1 percent under the Main Runway Option. Probabilities were calculated with windows open, assuming a 15-dB noise-level reduction is provided by the structure.

Table 4.2-5. Percent of People Awakened by Aircraft Noise at Least Once per Night at Representative Locations Under the Tyndall AFB MQ-9 Beddown Alternative

Location Description	Pre-Hurricane	No Action	MQ-9 Wing Beddown			
			Main Runway Option		Alternate Runway Option	
	Events	Events	Events	Change[1]	Events	Change[1]
First Baptist Church of Parker	1	0	0	0	0	0
Allenton (town)	1	0	0	0	0	0
Saint Andrews State Park, Campground	0	0	0	0	0	0
Bayou Point (residences)	1	0	0	0	0	0
Long Point Condominiums	2	0	1	1	0	0
Mexico Beach (community)	1	0	0	0	0	0

Table 4.2-5. Percent of People Awakened by Aircraft Noise at Least Once per Night at Representative Locations Under the Tyndall AFB MQ-9 Beddown Alternative

Location Description	Pre-Hurricane	No Action	MQ-9 Wing Beddown			
			Main Runway Option		Alternate Runway Option	
	Events	Events	Events	Change[1]	Events	Change[1]
Panama City (community)	1	0	0	0	0	0
Parker Elementary School	1	0	0	0	0	0
Piney Point (residences)	0	0	0	0	0	0
Saint Andrews State Park, Shell Island	1	0	0	0	0	0
Saint Andrews (community)	1	0	0	0	0	0
Tyndall AFB Dormitories	2	0	1	1	0	0
Tyndall Elementary School	2	0	1	1	0	0
Tyndall AFB on-base housing	1	0	0	0	0	0
Water's Edge (residences)	1	0	0	0	0	0

Key: AFB = Air Force Base
Note:
[1] Change is relative to No Action.

Noise-Induced Hearing Impairment

Noise levels would not exceed 80 dB DNL off base under the Proposed Action, and potential hearing-loss risk would continue to be minimal in accordance with DoD policy.

Workplace Noise

Noise exposure for people working on Tyndall AFB would continue to be managed in accordance with applicable policies minimizing the risk of hearing damage.

Nonauditory Health

Nonauditory health effects of long-term noise exposure (e.g., cardiovascular health risks) have not been documented at levels below those at which noise-induced hearing loss is a substantial risk.

Training Airspace

While operating at mission altitudes (above 18,000 feet MSL), the MQ-9 generates approximately 40 dB L_{max} on the ground, which is inaudible in a typical rural, ambient acoustic environment. No noise impacts are generated by the MQ-9 while operating in training airspace.

4.2.1.4 Noise, MQ-9 No Action Alternative at Tyndall

Under the No Action Alternative, aircraft operations and noise levels would not increase due to an MQ-9 Wing beddown. There would be no additional noise impacts to the affected environment from implementation of the No Action Alternative.

4.2.1.5 Health and Safety, MQ-9 at Tyndall (Preferred)

4.2.1.5.1 Base Facilities Construction

Ground operations and maintenance activities on Tyndall AFB would continue to be conducted using the same processes and procedures as under current operations. All actions would be accomplished by technically qualified personnel and would be conducted in accordance with applicable USAF safety requirements, approved technical data, and AFOSH standards.

To support the MQ-9 Wing beddown at Tyndall AFB, new facilities would be constructed. No unique construction practices or materials are required to construct these facilities. During construction, standard industrial safety standards and BMPs would be followed. These would include: implementing procedures to ensure that guards, housekeeping, and personal protective equipment are in place; establishing programs and procedures for lockout, right-to-know, confined space, hearing conservation, forklift operations, and so on; conducting employee safety orientations and performing regular safety inspections; and developing a plan of action for the correction of any identified hazards. No unusual ground safety risks are expected from these activities.

4.2.1.5.2 Base Airfield Operations with Main Runway Option

Flight Safety and Mishap Prevention

The primary safety concerns associated with MQ-9 operations are the potential for an aircraft mishap or a mid-air collision with other aircraft. (NOTE: This alternative would involve deploying inert munitions on existing ranges approved for these munitions. All munition training activities would be conducted in accordance with existing range safety procedures described in Appendix B, Section B.3.)

Since it began flying operations in 2001, the MQ-9 has recorded over 2 million hours of flight time, with a lifetime Class A mishap rate of 2.5 (or approximately one mishap every 40,000 hours) (USAF, 2019k). Under this alternative, the MQ-9 would fly an estimated 33,840 hours per year (2,820 annual sorties multiplied by 12 hours per sortie). Using the MQ-9 mishap rate of 2.5, this would mean that, statistically, a mishap could occur approximately every 1.2 years.

As discussed in Section 4.1.3, this analysis makes only a statistical prediction regarding the frequency of mishaps and may not represent real-world conditions. The DoD has implemented a formal training program for RPA pilots that includes classroom, simulator, and actual flight training on the RPA. This formalized training would enhance the safe operation of the RPA. Additionally, current safety policies and procedures at each installation are designed to ensure that the potential for aircraft mishaps is reduced to the lowest possible level. These safety policies and procedures would continue under the proposed MQ-9 Wing beddown.

Ensuring uninterrupted command and control for an RPA is important because without it, the RPA could collide with another aircraft or, if it crashes to the earth, cause injury or property damage. MQ-9 aircraft have pre-programmed maneuvers to follow if the command and control link becomes interrupted (called a “lost-link” scenario). A lost-link can occur if communication is lost from a satellite, from a ground station, or within the aircraft. In nearly all cases, communication

can be restored from an alternate ground location or using an alternate satellite network. If communication cannot be restored immediately, the RPA will enter a flight path known as the lost-link profile, which is predetermined and performed autonomously, until the ground control station operation can be restored and a data link can be reestablished. The lost-link profile, including the initial lost-link heading and altitude, is uploaded to the RPA before each mission and updated frequently throughout the flight.

In the unlikely event that communication between control personnel could not be maintained through primary or secondary systems, the aircraft would proceed to its pre-programmed controlled landing point and, if aircraft condition allows, the aircraft would be landed safely. Otherwise, the aircraft would loiter at this location until its fuel was consumed. At that time, the aircraft would be allowed to crash land into the pre-established cleared area below.

Like any other aircraft, it is impossible to predict the precise location of an MQ-9 accident, should one occur. Major considerations in any accident are loss of life and damage to property. The probability of an MQ-9 crashing into a populated area is extremely low but like other aircraft, it cannot be totally discounted. Several factors are relevant in the ROI: areas where MQ-9 operations would occur are areas with relatively low population densities, over water, or over military-controlled lands. Also, the unique nature of MQ-9 operations and the relative size and speed of the MQ-9 would lessen the impact of a potential crash compared to other military aircraft.

Tyndall AFB-based MQ-9 aircraft would perform daily flight patterns near the base or would operate in regional designated airspaces (e.g., restricted areas, ATCAAs, and/or MOAs) (see Section 2.3.3.2). Operation in these areas would minimize the potential for mid-air collisions hazards. MQ-9 aircraft would transition to these designated training airspaces by means of FAA-approved COAs. These COAs would be 2 miles wide and are designed to avoid, to the extent possible, civil aviation flight operations, which would further minimize the potential for mid-air collision hazards. Finally, the potential for mid-air collision hazards would be further reduced through strict airspace planning and procedures.

Bird/Animal Aircraft Strike Hazard

As discussed in Section 3.1.3.2.2, over the years 2009 to 2018, Tyndall AFB averaged approximately 20 bird strikes per year. Most incidents resulted in little or no damage to the aircraft, and none resulted in a Class A mishap (USAF, 2019c). The 17,000 operations currently conducted by based and transient aircraft have approximately four to six BASH incidents annually. An increase in flight operations from MQ-9 aircraft could be expected to double the number of BASH incidents.

Under this alternative, aircrews would operate in the same general airspace environments. An increase in flight operations may result in an associated increase in the potential for BASH incidents. However, due to its size, the MQ-9 presents a smaller "target," such that the overall potential for bird aircraft strikes would not be anticipated to be significantly different than what would be experienced already in the affected environment. Personnel would continue to follow applicable procedures specified in the Tyndall AFB BASH Plan (Plan 901) to minimize hazards from aircraft/animal strikes. These procedures would include vegetation manipulation, use of bioacoustics and pyrotechnics, and the use of bird modeling and radar systems. Additionally, airfield users would be made aware of potential hazards via radio broadcasts whenever bird/animal

activities are observed or reported. When local conditions show a potential for an increased risk, limits would be placed on low-altitude flights and some types of training. If a strike does occur, procedures are established for post-incident reporting and coordination in accordance with the BASH Plan. With continued implementation of established BASH procedures, BASH risks would be not be expected to significantly increase.

4.2.1.5.3 Base Airfield Operations with Alternate Runway Option (BASH)

The environmental consequences associated with safety under this alternative are the same as those described for the Base Airfield Operations with Main Runway Option in Section 4.2.1.5.2.

4.2.1.5.4 Airspace and Range Operations

All operations within respective airspaces or ranges would be conducted in accordance with standard safety procedures, as specified in Section 3.1.1 and Appendix B, Section B.3. These procedures exist to ensure limited public access to affected areas during training and to keep the designated training areas clear of all nonparticipating aircraft and surface vessels. The environmental consequences associated with other aspects of safety (i.e., flight safety, mishap prevention, and BASH) under this alternative are the same as those described for the Base Airfield Operations with Main Runway Option in Section 4.2.1.5.2.

4.2.1.6 Health and Safety, MQ-9 No Action Alternative at Tyndall

Under the No Action Alternative, flight activity at Tyndall AFB would be as described for the affected environment (Section 3.1.1). Statistically, this operational tempo would be expected to result in a lower potential for aircraft mishaps and BASH incidents, when compared to the Proposed Action. No MQ-9–related personnel changes or construction would occur. All aspects of ground safety and safety in the airspace would continue as described in Section 3.1.3.

4.2.1.7 Air Quality, MQ-9 at Tyndall AFB (Preferred)

4.2.1.7.1 Base Facilities Construction

The alternative to beddown the MQ-9 Wing at Tyndall AFB would require construction of operational, maintenance, and base support facilities. Construction of the Operations Complex under Option 2 of the alternative would result in slightly more construction effort and air emissions compared to Option 1. Air quality impacts associated with proposed construction activities would result from (1) combustive emissions generated by fossil fuel-powered equipment and (2) fugitive dust emissions ($PM_{10}/PM_{2.5}$) from operation of equipment on exposed soil.

Construction activity data developed for the MQ-9 at Tyndall AFB Alternative were used as inputs for ACAM. The air quality analysis assumed that the alternative would begin construction activities in 2021 and would complete all activities by 2025. The analysis assumed that the air quality BMPs identified in Table 2.7-1 would reduce fugitive dust resulting from the use of construction equipment on exposed soil by 50 percent from uncontrolled levels.

Table 4.2-6 presents estimates of annual emissions that would occur from the infrastructure improvements for the MQ-9 at Tyndall AFB Alternative. These data show that even if all construction activities occurred in 1 year under either Option 1 or Option 2, the total construction emissions would be well below the annual indicator thresholds. Therefore, construction emissions associated with the MQ-9 Wing beddown at Tyndall AFB Alternative would not result in significant air quality impacts.

Project construction equipment would emit toxic air contaminants (TACs) (promulgated as HAPs by the USEPA) that could impact public health. The main source of TACs would occur in the form of particulates from the combustion of diesel fuel. Due to the mobile and intermittent operation of diesel-powered construction equipment, there would be minimal ambient impacts of TACs in a localized area. Table 2.7-1 identifies measures that would be implemented to minimize diesel emissions from project construction equipment.

Table 4.2-6. Annual Construction Emissions for the MQ-9 at Tyndall AFB Alternative

Construction Year	Air Pollutant Emissions (tons)						
	VOCs	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	CO_2e (mt)
Option 1							
2021	1.14	2.53	2.38	0.01	1.52	0.10	547
2022	1.77	5.01	4.54	0.01	5.18	0.19	1,130
2023	0.51	2.85	2.15	0.01	0.21	0.08	584
2024	0.80	2.28	1.70	0.01	0.51	0.06	467
Option 2							
2021	1.14	2.53	2.38	0.01	1.52	0.10	547
2022	1.87	5.68	5.04	0.01	5.52	0.21	1,275
2023	0.51	2.85	2.15	0.01	0.21	0.08	584
2024	0.80	2.28	1.70	0.01	0.51	0.06	467
Annual Indicator Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**NA**

Key: CO = carbon monoxide; CO_2e (mt) = carbon dioxide equivalent in metric tons; NA = not applicable; 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_x = sulfur oxides; VOCs = volatile organic compounds

4.2.1.7.2 Base Airfield Operations

The MQ-9 at Tyndall AFB Alternative would generate air emissions from (1) MQ-9 aircraft operations, (2) MQ-9 engine maintenance and testing, and (3) space and water heaters, (4) solvent usages, and (5) personnel commuting activities. The analysis employed the ACAM to estimate emissions from these activities. The air quality analysis assumed that the alternative would reach full operations and resulting emissions in 2025, after the completion of all required infrastructure improvements. Sources would operate in compliance with applicable FDEP air quality regulations, emission limitations, and permitting requirements. Calculations showing the MQ-9 TIM metrics derived for the air quality analyses and the ACAM output reports are presented in Appendix C.

Table 4.2-7 summarizes the annual operations emissions that would result from implementation of the MQ-9 Wing beddown at Tyndall AFB Alternative. These data show that emission increases for the alternative would remain below all annual indicator thresholds and would equate to very small portions of the Bay County 2017 emissions. Therefore, operations from the MQ-9 Alternative at Tyndall AFB would not result in significant impacts to air quality. MQ-9 aircraft operations would be the primary contributors to emissions of NO_x, SO_x, PM_{10}, and $PM_{2.5}$. Personnel commuting activities would be the main source of VOCs and CO emissions.

Table 4.2-7. Annual Operations Emissions for the MQ-9 at Tyndall AFB Alternative – Year 2025

Afterburner Scenario/Activity Type	Air Pollutant Emissions (tons per year)[1]						
	VOCs	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	CO_2e (mt)
Flight Operations/Engine Trim Tests – MQ-9	3.18	2.87	3.68	0.37	0.67	0.60	1,013
Aircraft Engine Test Cells – MQ-9	0.03	0.03	0.04	0.00	0.01	0.01	10
Space and Water Heating	0.08	1.24	1.47	0.01	0.11	0.11	1,614
Solvent Usage	0.65	--	--	--	--	--	--
Personnel Commuting Activities	4.35	49.83	3.51	0.03	0.08	0.07	4,065
Total MQ-9 Mission Emissions	**8.28**	**53.97**	**8.69**	**0.41**	**0.86**	**0.78**	**6,702**
Annual Indicator Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**NA**
Bay County 2017 Emissions	**31,416**	**32,545**	**9,040**	**2,066**	**7,918**	**2,506**	**7,657,264**
Total MQ-9 Mission Emissions % of Bay County 2017 Emissions	**0.03%**	**0.17%**	**0.10%**	**0.02%**	**0.01%**	**0.03%**	**0.09%**

Key: CO = carbon monoxide; CO_2e (mt) = carbon dioxide equivalent in metric tons; NA = not applicable; 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_x = sulfur oxides; VOCs = volatile organic compounds

Note:

[1] Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.

4.2.1.7.3 Airspace and Range Training Operations

Under the MQ-9 at Tyndall AFB Alternative, MQ-9 operations within airspaces and training areas would occur above 3,000 feet AGL at all times and therefore, these operations would not appreciably affect ground-level air quality. As a result, the alternative would not result in significant air quality impacts within any airspace or training area.

4.2.1.8 Air Quality, MQ-9 No Action Alternative at Tyndall

The No Action Alternative would not include any of the facility, personnel, or operational changes proposed by the MQ-9 Wing beddown alternatives for Tyndall AFB. Air quality impacts from the No Action Alternative would be the same as those described for the affected environment within the Tyndall AFB project region (Section 3.1.4). No MQ-9–related changes that could affect air quality would occur at Tyndall AFB or in the associated airspace.

4.2.1.9 Hazardous Materials and Waste, MQ-9 at Tyndall (Preferred

4.2.1.9.1 Base Facilities Construction and Base Airfield Operations

Although there are two site options for the MQ-9 Maintenance Complex at Tyndall AFB, the hazardous materials and hazardous waste generation would not differ, so the analysis does not distinguish between the two options.

Hazardous Materials Management

New buildings would be constructed utilizing normal construction methods, which would limit, to the extent possible, the use of hazardous materials. There would be a short–term increase in the quantity of hazardous materials and petroleum substances stored at the installation to support construction activities since various fuels (e.g., diesel, gasoline) would be required to run earth-moving equipment and power tools, and to provide electricity and lighting as conditions warrant. In addition, paints and solvents would be used during construction activities. These materials would be stored in proper containers, employing secondary containment as necessary to prevent and limit accidental spills. All spills and accidental discharges from these generators or from spills of other petroleum products or hazardous materials would be reported and mitigated. The installation has emergency response procedures and site-specific contingency plans for all hazardous materials locations.

The proposed MQ-9 Wing beddown at Tyndall AFB is not anticipated to change the quantities of hazardous materials and petroleum substances used at the installation. The beddown of MQ-9 is not anticipated to increase fuel consumption significantly over peak levels already experienced at the installation. Any insignificant increase in fuel consumption would be supportable by the restored infrastructure planned at the base.

Hazardous Waste Management

Hazardous waste would be generated in small quantities during construction activities and would include spent solvents, waste paint, fluorescent bulbs, used oil, spill cleanup materials, and lead-acid batteries from construction equipment. These wastes would be stored in appropriate containers in accordance with applicable federal and state of Florida regulations. Wastes that cannot be recycled would be disposed of by the contractor at licensed facilities in a manner approved by the USEPA; consequently, no significant impacts would be expected.

Management of hazardous waste or petroleum wastes would continue as they do currently. The status of Tyndall AFB as a large quantity generator pursuant to the Resource Conservation and Recovery Act would not change. Where needed, new satellite accumulation areas would be established. These sites would be managed according to established procedures that include the use of properly labeled, approved containers using secondary containment. No change to permits or hazardous waste generator status would be required, and no significant environmental impacts from implementing the proposed MQ-9 Wing beddown at Tyndall AFB would be anticipated.

Contamination Sites

As Figure 3.1-2 shows, there are 11 active ERP sites located in proximity to proposed construction sites for an MQ-9 beddown at Tyndall AFB (Table 4.2-8) (325 FW, 2019).

Table 4.2-8. Tyndall AFB ERP Sites (MQ-9 at Tyndall AFB)

ERP Site Name	Project Component	Comments
SS0026 (IRP Site 26), Vehicle Maintenance Area	MQ-9 Gym Option 2	Located over ERP site
TU205, Former Bldg 239 Engine Test Cell	MQ-9 Maintenance Complex Option 1	Located over ERP site
FT017, Hwy 98 Fire Training Areas	MQ-9 Maintenance Complex Option 1	Located adjacent to ERP site
OW040, Bldg 315 OWS	MQ-9 Maintenance Complex Option 1	Located over ERP site
Bldg 319 WAA	MQ-9 Maintenance Complex Option 1	Located over ERP site
TU207, Bldg 1274 ASTs	MQ-9 Consolidated Operations Complex	Located over ERP site
SA181, Tower Range	MQ-9 Consolidated Operations Complex	Located adjacent to ERP site
TA534, Bldg 1280 AST	MQ-9 Consolidated Operations Complex	Located over ERP site
OW579, Bldg 7028 OWS	MQ-9 Munitions Storage Area	Located over ERP site
OT022, Pesticide Disposal Area	MQ-9 Maintenance Complex Option 2	Located over ERP site
SS219, Wash Rack	MQ-9 Maintenance Complex Option 2	Located over ERP site

Source: Tyndall Site Management Plan (AFCEC, 2016)
Key: AFB = Air Force Base; AST = above ground storage tank; Bldg = building; ERP = Environmental Restoration Program; IRP = Installation Restoration Program; OWS = oil/water separator; UST = Underground Storage Tank; WAA = Waste Accumulation Area

No significant impacts related to ERP sites are anticipated with the appropriate procedures in accordance with the AFI 32-1021, *Planning and Programming Military Construction (MILCON) Projects*, dated February 2016, and procedures as described in Section 4.1.5.1.

4.2.1.10 Hazardous Materials and Waste, MQ-9 No Action Alternative at Tyndall

Under the No Action Alternative, the beddown of the MQ-9 Wing would not occur at Tyndall AFB. The management of hazardous materials and the generation of hazardous waste in the affected environment at Tyndall AFB would continue as described for the affected environment in Section 3.1.5 as a result of the No Action Alternative.

4.2.1.11 Soils and Geologic Resources, MQ-9 at Tyndall (Preferred)

4.2.1.11.1 Base Facilities Construction

Up to approximately 121 (Maintenance Complex Option 1) or 680 (Maintenance Complex Option 2) acres could be temporarily disturbed due to construction of base facilities for the beddown of an MQ-9 at Tyndall AFB (see Figure 3.1-3 in Section 3.1.6). Actual acres of disturbance would likely be less as the facility footprints total approximately 23 acres with Maintenance Complex Option 1 and 24 acres for Maintenance Complex Option 2. Areas immediately surrounding construction zones may also experience temporary disturbance from vehicle and equipment

operations during construction. Disturbance in areas greater than 1 acre requires a Construction General Permit under the NPDES program (see Section 4.2.1.13). Table 4.2-9 identifies the area of potential disturbance for construction areas of proposed facilities for multiple options and provides a total range of potential acreage disturbed and predominant soil types in each proposed area of disturbance. In addition to the potential disturbances shown in Table 4.2-9, there would be up to approximately 1 acre of surface disturbance for the installation of infrastructure and communication conduit extensions.

Table 4.2-9. Soil Types Associated With Proposed MQ-9 Wing Facilities and Infrastructure at Tyndall AFB

Area	Total Potential Disturbed Area (Acres)	Building	Facility Footprint (Square Feet)	Facility Footprint (Acres)	Soil types in Proposed Area(s)
Consolidated Operations Complex	8.7	Operations Complex	271,600	6.2	Leon sand
GTD Towers	24.6	GTD Towers and Road	36,488	0.8	Rutledge sand, Leon sand, Arents
Maintenance Complex Option 1	38.2	Maintenance Complex (Option 1)	496,400	11.4	Urban land
Maintenance Complex Option 2	596.4	Maintenance Complex (Option 2) – includes GTD Towers and Road	531,808	12.2	Arents, Chipley sand, Leon sand, Mandarin sand, Osier fine sand, Pickney fine sand, Resota fine sand, Rutlege sand
MQ-9 Child Development Center	16.9	Child Development Center	44,000	1.0	Mandarin sand, Resota sand
MQ-9 Airmen Dorm	24.9	Airmen Dormitory	107,800	2.5	Mandarin sand
MQ-9 Fitness Center Option 1 and 2	0.7	Fitness Center (Options 1 and 2)	20,000	0.5	Urban land
MQ-9 Munitions Storage Area	31.3	Munitions Storage	4,320	0.1	Arents, Rutledge sand
Total	**120.7–678.9**	**NA**	**980,608–1,016,016**	**22.5–23.3**	**NA**

Key: AFB = Air Force Base; GDT = Ground Data Terminal; NA = not applicable

All, or portions, of the footprints for the Operations Complex, Maintenance Complex (Option 2), Maintenance Complex (Options 1 and 2), the Fitness Center, and Munitions Storage projects would occur on areas designated as urban land or Arents soil. Urban land is a general category that denotes land that has been previously developed. Construction activities occurring on areas designated as urban land would not disturb or otherwise alter existing characteristics of the surrounding soil. Arents soils are a manmade mixture of various soil series resulting from earth moving operations such as dredging and filling. These soils have a neutral pH, are somewhat poorly drained, have a very low available water capacity, variable permeability, negligible surface runoff, and are not prone to either flooding or ponding. Arents soils present challenges for shallow excavations due to a relatively shallow depth to the water table and instability in excavated walls.

These soils also present a moderate risk to the corrosion of exposed concrete and a high risk of corrosion to uncoated steel.

The Operations Complex and portions of the Maintenance Complex (Option 2) are proposed to be sited on Leon sand. Leon sands are acidic, poorly drained, have low water capacity, high surface runoff potential and variable permeability. These sands are not subject to flooding or ponding, but have a high degree of susceptibility to wind erosion and surface runoff. Leon sands present a high risk of corrosion to both exposed concrete and uncoated steel. A short depth to the underlying water table and instability of excavated walls presents limitations to shallow excavations in this soil type.

The Airmen Dormitory, portions of Child Development Center, and portions of the Maintenance Complex (Option 2) would be located on Mandarin sand. Mandarin sands are acidic, somewhat poorly drained, have low water capacity, very low levels of runoff, and moderate permeability. Like Leon sands, these sands are not subject to flooding or ponding, but have a high degree of susceptibility to wind erosion and surface runoff. Mandarin sands present a high risk of corrosion to both exposed concrete and uncoated steel. A short depth to the underlying water table and the instability of excavated walls presents limitations to shallow excavations in this soil type.

A portion of the Child Development Center would be constructed on areas of Resota sand. These sands are slightly acidic, moderately well drained, have very low available water capacity, negligible runoff, and very rapid permeability. These sands are not subject to flooding or ponding, but have a high degree of susceptibility to wind erosion and surface runoff. Resota sands present a high risk of corrosion to exposed concrete but a low risk of corrosion to uncoated steel. A short depth to the underlying water table and the instability of excavated walls presents limitations to shallow excavations in this soil type.

In addition to Arents soil, the MSA would be located on areas of Rutlege sand. These sands are acidic, very poorly drained, have low available water capacity, negligible runoff, and rapid permeability. These sands are not subject to flooding but will frequently pond and have a high degree of susceptibility to wind erosion but negligible surface runoff potential. Rutlege sands present a high risk of corrosion to both exposed concrete and uncoated steel. A short depth to the underlying water table, the potential for ponding, and the instability of excavated walls presents limitations to shallow excavations in this soil type.

In addition to the soil types listed above, the Maintenance Complex (Option 2) would be located on areas consisting of Chipley sand and Pickney fine sand. These sands are slightly to very acidic, somewhat to very poorly drained, have negligible surface runoff potential, but are highly susceptible to wind erosion. Chipley sands are not likely to pond or flood, while Pickney sands will pond frequently and occasionally flood. Both sands present a high risk of corrosion to exposed concrete. Pickney sands present a high corrosion risk to uncoated steel, while Chipley sands present a low risk. Both soil types are limited for shallow excavations due to the surface proximity of the underlying water table and the instability of excavated walls.

Minimization of soil erosion and the siting of facilities in relation to soil limitations is considered when evaluating impacts to soil resources. If a Proposed Action were to substantially affect (or be substantially affected by) any of these features, impacts would be considered significant. Generally, impacts associated with soil resources can be avoided or minimized to a level of insignificance if proper construction techniques, erosion control measures, and structural engineering designs are incorporated into project development.

BMPs to reduce potential impacts to soils resulting from the Proposed Action would include those described in Section 4.1.6.

With the employment of such practices, potential impacts to soils on Tyndall AFB from the construction of facilities for the proposed MQ-9 Wing beddown would be expected to be minimal. The Proposed Action would result in no changes to existing geologic conditions on Tyndall AFB. Therefore, potential impacts to soils and geologic resources would be minimal and no significant impacts would occur due to implementation of the proposed MQ-9 Wing beddown at Tyndall AFB.

4.2.1.12 Soils and Geologic Resources, MQ-9 No Action Alternative at Tyndall

Under the No Action Alternative, a beddown of the MQ-9 Wing would not occur at Tyndall AFB. None of the proposed construction to support the MQ-9 mission would occur, and no MQ-9–related impacts to soils and geologic resources would result from implementation of the No Action Alternative.

4.2.1.13 Water Resources, MQ-9 at Tyndall (Preferred)

4.2.1.13.1 Base Facilities Construction

Impacts, BMPs, and permitting requirements would be similar to those described in Section 4.1.7.1. The following provides information that is unique to this alternative.

Surface Water, Main Runway Option

No significant impacts to surface waters would occur. Under this option for the proposed MQ-9 Wing beddown at Tyndall, 120.7 acres could be temporarily disturbed due to construction, renovation, and additions to base facilities associated with the beddown of the MQ-9 at Tyndall AFB. Actual acres of disturbance would likely be less as the facility footprints total approximately 23 acres.

Approximately 15 of 38 acres (40 percent) of the Maintenance Complex area is currently impervious. All of the proposed Maintenance Complex facilities (9 acres total) could be sited on currently impervious surfaces, but some new impervious surfaces would likely be created. Other facilities and improvements would be constructed on pervious surfaces, resulting in an increase of impervious surfaces at Tyndall of approximately 10.5 acres. In total, impervious surfaces at Tyndall AFB would increase by between 10.5 and 19.5 acres under this alternative, depending on how much new impervious surface is created for the Maintenance Complex at the Main Runway.

Surface Water, Alternate Runway Option

No significant impacts to surface waters would occur. This option, which would construct the MQ-9 Maintenance Complex at the drone runway, would disturb up to 678.9 acres could be temporarily disturbed due to construction, renovation, and additions to base facilities associated with the beddown of the MQ-9 at Tyndall AFB. Actual acres of disturbance would likely be less as the facility footprints total approximately 23 acres for Maintenance Complex Option 2.

Groundwater, Both MQ-9 Maintenance Complex Options

No significant impacts to groundwater would occur.

Floodplains, Main Runway Option

No significant impacts to floodplains would occur. The facilities proposed for the MSA, GDT Towers, and GDT Towers access road could potentially be located in the 100-year floodplain. As a conservative estimate of impacts, it was assumed that all floodplains within the action areas would be impacted. There are 6.5 acres of floodplains in the MSA, and 22 acres in the GDT Tower area. This alternative, depending on final siting of facilities, could result in up to 0.9 acres of development within the floodplain.

Floodplains, Alternate Runway Option

No significant impacts to floodplains would occur. The facilities proposed for the Maintenance Complex, MSA, GDT Towers, and GDT Towers access road could potentially be located in the 100-year floodplain. As a conservative estimate of impacts, it was assumed that all floodplains within the action areas would be impacted. There are 207.1 acres of floodplains in the Maintenance Complex Option 2 area, 6.5 acres in the MSA, and 22.0 acres in the GDT Towers area. This alternative, depending on final siting of facilities and considering the areas presented in Table 2.3-1, could result in as few as 1 to 18 acres of development within floodplains. The area designated for Maintenance Complex Option 2 has enough space outside of the floodplain to fit all of the Maintenance Complex facilities, however, extent of development within the floodplain is not know at this time as there may be facility and operational requirements that preclude development outside of the floodplain.

Coastal Zone Management, Both MQ-9 Maintenance Complex Options

No significant impacts related to coastal zone management would occur. The Florida State Clearinghouse indicated in comments on the Draft EIS (Comment A-003) that the project is consistent with the Florida Coastal Management Program (Appendix A).

4.2.1.14 Water Resources, MQ-9 No Action Alternative at Tyndall

Under the No Action Alternative, the USAF would not implement the proposed MQ-9 Wing beddown. None of the proposed construction to support the MQ-9 mission would occur and no MQ-9–related impacts to water resources would result from implementation of the No Action Alternative.

4.2.1.15 Biological Resources, MQ-9 at Tyndall

4.2.1.15.1 Base Facilities Construction

Flora

Activities associated with construction of the MQ-9 Consolidated Operations Complex, Child Development Center, Airmen Dormitory, Gym Options, and Maintenance Complex 1 would occur in previously developed areas of Tyndall AFB. Vegetative impacts in these areas would be minimal and would consist primarily of the loss of turf grass and landscaped vegetation.

Construction related to the MQ-9 munitions storage would occur within the existing MSA. Construction in this area would result in minor, adverse impacts to vegetation. Construction of the GDT Towers and the Maintenance Complex Option 2/New Fire Department would occur in relatively undisturbed portions of the installation. Vegetation in both of these areas consists of a mix of mowed airfield right-of-way, pine plantation, and forested/scrub shrub wetlands. For the purposes of analysis in this EIS, it is assumed that construction in these areas would result in the permanent loss of existing vegetation. Approximately 596 acres of vegetation would be lost within the Maintenance Complex Option 2/New Fire Department construction footprint and 25 acres of vegetation would be lost within the GDT Towers area. This loss of vegetation would result in moderate, long-term adverse impacts. Potential impacts to wetlands and protected species are discussed in the wetlands and sensitive species subsections below.

Approximately 25 acres of vegetation would be lost within the GDT Towers area if Maintenance Complex Option 1 is selected. This option would result in minor, long-term adverse impacts to vegetation.

Wetlands

Wetlands were identified in the MQ-9 facility locations associated with the GDT Towers and the Maintenance Complex Option 2. Approximately 258.6 acres of forested/scrub shrub and 36.7 acres of emergent wetlands would be impacted by the proposed facilities (Figure 3.1-4, Table 4.2-10).

Table 4.2-10. Wetland and Surface Water Features Associated With the MQ-9 Facilities

Facility	Wetland Type	Acres of Impact
GDT Towers[1]	Freshwater Forested/Scrub Shrub	7.5
	Freshwater Emergent	0.6
Subtotal Wetlands	**8.1**	
Maintenance Complex Option 2(1)	Freshwater Forested/Scrub Shrub	258.6
	Freshwater Emergent	36.7
Subtotal Wetlands	**295.3**	
Total Wetlands	**303.4**	

Note:
[1] Wetland acres based on preliminary results of 2019 and 2020 field delineations (USAF, 2019l; USAF, 2020e)

No wetlands are located within the Maintenance Complex Option 1 footprint. Therefore, if Option 1 of the Maintenance Complex is selected over Option 2, then impacts to wetlands would be limited to approximately 8.1 acres of wetlands (associated with the GDT Towers). A Section 404 permit and additional coordination with USACE would be required for any placement of fill in wetlands or other Waters of the United States.

Fauna

Potential impacts to wildlife could include ground disturbance and the associated loss of habitat, and construction noise from the associated facility projects; however, activities associated with construction of the MQ-9 Consolidated Operations Complex, Child Development Center, Airmen Dormitory, Gym Options, and Maintenance Complex 1 would occur in previously developed areas of Tyndall AFB. Minor, short-term, adverse impacts to wildlife would be anticipated because habitat in these areas is limited to turf grass and landscaped vegetation.

Construction related to the MQ-9 munitions storage would occur within the existing MSA. Construction of the GDT Towers and Maintenance Complex Option 2 would result in the loss of 621 acres of vegetation/habitat (approximately 2.4 percent of Tyndall AFB's forested/wetland habitat). Impacts in these areas would primarily occur to mowed airfield right-of-way, pine plantation, and forested/scrub shrub wetland, resulting in moderate, long-term, adverse impacts to habitat. Potential impacts to protected species are discussed in the following subsection. Potential impacts to wetlands are discussed in the preceding subsection. Selection of Maintenance Complex Option 1 would reduce the amount of vegetation/habitat impacted to 25 acres and result in minor, long-term adverse impacts to habitat.

Sensitive Species

Sixteen (16) federally listed species (Table 4.1-25 and Table 3.1-18) have been documented at Tyndall AFB. Surveys for the presence of federally threatened, endangered, candidate species, and species proposed for listing were conducted in January 2020 at the areas proposed for construction (Tyndall AFB, 2020a). The results of these surveys are included in Appendix A. During the survey of the Maintenance Complex Option 2/New Fire Department area, a population of federally threatened Godfrey's butterwort was discovered. The population consisted of 285 plants within the proposed boundary of the construction area. Impacts to Godfrey's butterwort could be avoided if this alternative location for the Maintenance Complex is not selected. However, should this Maintenance Complex site be selected and the Godfrey's butterwort could not be avoided, consultation with USFWS would be required to address the impacts. No threatened or endangered species were found at the Maintenance Complex Option 1 (preferred location). Based on the above analysis, the proposed action is Not Likely to Adversely Affect the population of the federally threatened Godfrey's butterwort (Tyndall AFB, 2020a). The USFWS concurred with this determination in a letter dated August 3, 2020 (Appendix A).

No other federally listed species or other sensitive species (Table 3.1-18) are documented to occur in the other areas proposed for construction (Child Development Center, Consolidated Operations Complex, Gym locations, Munition Storage Areas, Airmen Dormitory, Maintenance Complex Option 1, GDT Towers, and the New Gate) (Tyndall AFB, 2020a). Therefore, a finding of no effect has been made for the remainder of the species listed in Table 4.2-11. The USFWS has

reviewed this determination and no further consultation is required (see letter dated August 3, 2020, Appendix A). The FWC provided several recommendations for management practices related to beach-nesting birds, the Florida black bear, and the Florida pine snake (see Section 4.1.8). These recommendations would be implemented as feasible for the MQ-9 beddown (see Table 2.7-1).

Table 4.2-11. Wildlife and Habitat Effect Determination Summary for MQ-9, Tyndall AFB

Common Name	Scientific Name	Status	Effect Determination	Potential Occurrence on Tyndall AFB
Federally Listed Threatened or Endangered Species				
Choctawhatchee beach mouse	*Peromyscus polionotus allophrys*	FE	No Effect[1]	O
St. Andrew beach mouse	*Peromyscus polionotus peninsularis*	FE	No Effect[1]	O
West Indian manatee	*Trichechus manatus*	FE	No Effect	O
American alligator	*Alligator mississippiensis*	FT (S/A)	No Effect	O
Piping plover	*Charadrius melodus*	FT	No Effect	O
Red knot	*Calidris canutus rufa*	FT	No Effect	O
Wood stork	*Mycteria americana*	FT	No Effect	P
Atlantic sturgeon	*Acipenser oxyrinchus (=oxyrhynchus desotoi)*	FT	No Effect	O
Reticulated flatwoods salamander	*Ambystoma bishopi*	FE	No Effect	P
Eastern indigo snake	*Drymarcon corais couperi*	FT	No Effect	P
Green sea turtle	*Chelonia mydas*	FT	No Effect[1]	O
Kemp's Ridley sea turtle	*Lepidochelys kempii*	FE	No Effect[1]	O
Leatherback sea turtle	*Dermochelys coriacea*	FE	No Effect[1]	O
Loggerhead sea turtle	*Caretta caretta*	FT	No Effect[1]	O
Florida skullcap	*Scutellaria floridana*	FT	No Effect	P
Godfrey's butterwort	*Pinguicula ionantha*	FT	May Affect, Not Likely to Adversely Affect	O
Harper's beauty	*Harperocallis flava*	FE	No Effect	P
Telephus spurge	*Euphorbia telephioides*	FT	No Effect	O
Thick-leaved water willow	*Justicia crassifolia*	FE	No Effect	O
White birds-in-a-nest	*Macbridea alba*	FT	No Effect	P
Federally Listed Candidate or Other				
Panama city crayfish	*Procambarus econfinae*	PT	No Effect	P
Gopher tortoise	*Gopherus polyphemus*	FC	No Effect	O
Bald eagle	*Haliaeetus leucocephalus*	BGEPA	No Take	O

Sources: (Tyndall AFB, 2019c; USFWS, 2020b; Florida Natural Areas Inventory, 2020; Tyndall AFB, 2020a)
Key: AFB= = Air Force Base; FE = Federally Endangered; FT = Federally Threatened, FC = Federal Candidate, PT = Proposed Threatened, O = Observed, P = Potential, U = Unlikely, S/A = Similar Appearance, BGEPA = Bald and Golden Eagle Protection Act; USFWS = U.S. Fish and Wildlife Service
Note:
[1] if allowances are made to avoid impact from lighting disturbance

The proposed locations for the Consolidated Operations Complex, Child Development Center, and Airmen Dormitory on the support side of the installation are located close to the barrier islands, and improper lighting could have an adverse effect on federally listed coastal species (Tyndall AFB, 2020a). The potential effects of nighttime lighting on federally protected species (i.e., beach mice, shorebirds, and sea turtles) occurring on Tyndall AFB's beaches are outlined below:

- Disruption of nocturnal foraging and movement of beach mice
- Disorientation of migrating birds, disrupting roosting behaviors, and increase bird detectability by predators during nesting
- Disorientation of nesting females on the dry beach, and hatchlings after emerging from their nests, potentially detrimental to sea turtles by reducing nesting attempts

Modifications to decrease lighting effects on coastal species include (1) long wavelength "wildlife friendly" lights (560 nanometers or greater—amber, orange, red), (2) bulbs with the lowest acceptable lumens, (3) shields, such as aluminum flashing, to direct light to the ground, and (4) repositioning lights to face away from the barrier islands. Wildlife friendly lighting and other lighting modifications to deter impacts to coastal species have been incorporated into the draft post-storm Installation Facility Standards. The proposed construction would have *no effect* on listed beach mice, sea turtles, and shorebirds as long as allowances are made to avoid impact from lighting disturbance using appropriate lighting outlined above (Tyndall AFB, 2020a). FWC management practices for lighting would be implemented. The Biological Evaluation was submitted to USFWS. In a letter dated August 3, 2020, the USFWS reviewed the determination of effects and no further consultation is required. No adverse impacts to state listed or other species would result from facility construction associated with the MQ-9 mission at Tyndall AFB with the Maintenance Complex Option 1 (preferred location). Under the proposed MQ-9 Wing beddown, sensitive species would continue to be managed and monitored in accordance with the INRMP, and annual coordination with the USFWS and state agencies would continue.

4.2.1.15.2 Base Airfield Operations

No removal of or direct impacts to vegetation or wetlands would occur due to flight operations. Implementation of the MQ-9 mission at Tyndall AFB would have a minimal increase on the land area, and thus the number of wildlife, exposed to increased noise levels. As noted, animal species exhibit a wide variety of responses to noise. Additional information on these responses is available in Section 4.1.8.1.2; however, in summary, behavioral responses ranging from mild to severe could occur in individual animals as a result of loud overflights. Mild responses include head raising, body shifting, or turning to orient toward the aircraft. Moderate responses could include nervous behaviors, such as trotting a short distance. Escape is the typical severe response (Appendix D of the Draft EIS). This noise impact to wildlife and sensitive species is anticipated to result in no long-term adverse impacts. As shown in the noise section, an MQ-9 flying at 1,400 feet MSL has a maximum noise level of 63 dBA. To put this number in perspective, a typical vacuum cleaner at a distance of 10 feet generates approximately 70 dB, and normal conversation at a distance of 3 feet generates approximately 65 dB (Los Angeles World Airports, 2020). These common sound sources are qualitatively different from an aircraft overflight, but provide a general idea of relative loudness.

Any increase in operations could increase the potential for bird/wildlife-aircraft strikes. Tyndall AFB would continue to adhere to the installation's BASH Plan to minimize the risk of strikes. Adherence to the existing BASH program (see Section 3.1.3) would minimize the risk of bird-aircraft strikes to negligible levels.

4.2.1.16 Biological Resources, MQ-9 No Action Alternative at Tyndall

Under the No Action Alternative, the MQ-9 aircraft would not be beddown at Tyndall AFB. None of the proposed construction to support the MQ-9 mission would occur and biological resources would remain as described in Section 3.1.8. No MQ-9–related impacts to biological resources would result from implementation of the No Action Alternative.

4.2.1.17 Cultural Resources, MQ-9 at Tyndall (Preferred)

4.2.1.17.1 Base Facilities Construction and Base Airfield Operations

Archaeological Resources

As described in Section 3.1.9, the APE for direct impacts for the MQ-9 Wing beddown was surveyed in 2019 and no archaeological sites were identified. Much of the proposed construction areas are also highly disturbed and have low probability for the presence of unrecorded archaeological resources. Although unlikely, the remains of an unrecorded archaeological resource may be uncovered during ground-disturbing activities associated with facility construction. In the event of an inadvertent discovery during ground-disturbing activities, Tyndall AFB and its contractor would cease work immediately and the USAF would comply with Section 106 of NHPA, as specified in standard operating procedures established in the ICRMP (USAF, 2019d). Therefore, facility construction for the beddown of MQ-9 aircraft would have no adverse effect on archaeological resources. Noise from airfield operations would have no effect on archaeological resources.

Architectural Resources

As described in Section 3.1.9, there is one NRHP-eligible building within the APE for indirect effects, which is scheduled for demolition and for which the Section 106 consultation process is in progress (USAF, 2020a). No other NRHP-listed or –eligible buildings or structures are located within the direct or indirect APEs for the MQ-9 Wing beddown. Therefore, there would be no historic properties affected by the beddown of MQ-9 aircraft at Tyndall AFB.

Traditional Cultural Properties

The USAF has initiated consultation with the Florida SHPO, federally recognized tribes, and interested parties as described in Section 1.4.1. As described in Section 3.1.9, there are no known traditional cultural properties or sacred sites within the direct or indirect APEs for the MQ-9 Wing beddown. Therefore, the beddown of MQ-9 aircraft would have no adverse effect on traditional cultural properties or sacred sites.

In accordance with NHPA Section 106, the USAF consulted with the Florida SHPO, federally recognized tribes, and interested parties regarding the determination of *no historic properties*

affected, as described in Section 1.4.1.2. In a letter dated July 29, 2020, the Florida SHPO concurred with the USAF determination that the proposed MQ-9 Wing beddown will have no effect to historic properties listed or eligible for listing in the NRHP. Consultation with federally recognized tribes is described in Section 1.4.1.1.

4.2.1.18 Cultural Resources, MQ-9 No Action Alternative at Tyndall AFB

Under the No Action Alternative, the MQ-9 Wing beddown would not occur at Tyndall AFB and there would be no change to cultural resources affected environment as described in Section 3.1.9. There would be no MQ-9–related impacts to cultural resources from implementation of the No Action Alternative.

4.2.1.19 Land Use, MQ-9 at Tyndall (Preferred)

The beddown of the MQ-9 Wing at Tyndall AFB would have no noise effect on land use. The proposed locations for facilities on the base (shown in Figure 2.3-1) are both viable options evaluated in recent post-hurricane base planning efforts. The optional locations for the Maintenance Complex either along the flightline of the main runway, or a new area along the drone runway further east are both congruent and compatible with base functions. The Alternate Runway Option provides better circulation on base, with a new entry gate for the MQ-9 Complex, relieving congestion at the main gate. This option also provides more flexibility along the flightline, by occupying suitable land away from the main runway.

As shown in Lines 3 and 4 in Table 4.2-12, noise from the MQ-9 operations would expose about 4,230 to 4,290 acres on base to noise levels of 65 dB DNL or greater for the main runway and drone runway, respectively. This represents a substantial contraction in noise exposure for on-base land use compared to the pre-hurricane situation (Line 2). On base, noise exposure of the proposed Child Development Center and proposed Airmen Dormitories would fall within the 65 dB DNL noise contour. Daily pattern work, for either the Main or Alternate Runway Options, would occur within 3 NM of the respective airfields. Table 4.2-1 indicates that the sound of overflights of MQ-9 aircraft are lower than the QF-16s that typically operate at the drone runway.

Table 4.2-12. Areas Exposed to Noise Levels of 65 dB DNL and Greater – MQ-9 Wing at Tyndall AFB (Acres)

Line #	Alternative	Area 65 dB DNL or Greater (Acres)			
		Total Area[1]	Off-Base Area[2]	Off-Base Land Area[3]	Residential[4]
1	No Action	4,404	247	2	0
2	Pre-Hurricane 2016 AICUZ[5]	31,641	14,145	217	25
3	MQ-9 Main Runway[6]	4,477	248	2	0
4	MQ-9 Alternate Runway[6]	4,567	275	4	2

Key: AB = afterburner; AFB = Air Force Base; AICUZ = Air Installations Compatible Use Zone; dB = decibel; DNL = day-night average sound level

Notes:

[1] Includes all areas at or above 65 dB DNL (including on-base land, off-base land, and water areas.

[2] Includes off-base land and water at or above 65 dB DNL.

[3] Includes off-base land area. (Land use categories include commercial, industrial, open/agriculture/low-density, public/quasi-public, residential, transportation, undesignated, and water.)

[4] Residential land within the 65 dB DNL noise contour. (Assume area is within the 65 to 70 dB DNL contours, unless noted.)

[5] Residential land includes 1 acre affected by noise levels just over 70 dB DNL.

[6] Includes 2 acres of transportation land.

Noise exposure for MQ-9 operations using the Main Runway Option is almost identical to the No Action condition described in Section 4.1.10.3 (see Figure 4.2-1 and Figure 4.1-5 inset: MQ-9 Alternate and Main Runways). An estimated 248 acres off base would fall within the 65 dB DNL and greater footprint, mostly over water. Only 2 acres of off-base land used for transportation would experience these noise levels of 65 dB DNL or greater. All other off-base land uses would be consistent with AICUZ land-use compatibility guidelines. The Alternate Runway Option would expose about 275 acres off base to noise levels of 65 dB DNL or greater, almost all over water. Only about 2 acres of transportation land off base is within the footprint, and it is compatible with this noise exposure. Pattern work for the MQ-9 aircraft would not overfly off-base land areas.

MQ-9 operations in training airspace would have no measurable effect on noise levels under training airspace. While operating at mission altitudes (above 18,000 feet MSL), the MQ-9 generates approximately 40 dB L_{max} on the ground. In typical rural acoustic environments, this noise level is masked by ambient sound sources such as wind and birds, and therefore inaudible. MQ-9 training operations in the over-water ranges, ATCAAs, Work Areas, MOAs, FAA-approved transit routes, at Grand Bay Range or Avon Park Range, and in the airspace at these respective ranges, would not impact underlying land uses.

For the MQ-9 Wing beddown at Tyndall AFB, there would be an additional demand for an estimated 2,309 off-base housing units. Assuming densities of four to eight dwelling units per acre, this would translate into development of between 285 and 571 acres for residential use by 2025. Impacts of this demand for housing, new residential development, and recreational opportunities are comparable to those described for the three-squadron F-35A Wing in Section 4.1.10.1.3.

New military and civilian personnel and dependents who reside off base may use recreational amenities in surrounding communities (such as gyms, running tracks, and swimming facilities), to some degree. Availability of recreational facilities on base for new personnel would somewhat minimize use of off-base amenities. Outdoor activities that take place in natural settings, such as parks, lakes, bayous, and the open water, would likely absorb additional use resulting from the participation of the new MQ-9 mission personnel and dependents.

4.2.1.20 Land Use, MQ-9 No Action Alternative at Tyndall

In the absence of beddown of the MQ-9 Wing mission at Tyndall AFB, the base would not have a new flying mission. Impacts on land use for this No Action Alternative are the same as those described for the No Action Alternative for the F-35A Wing beddown at Tyndall AFB in Section 4.1.10.3.

4.2.1.21 Infrastructure, MQ-9 at Tyndall (Preferred)

The proposed beddown of 7the MQ-9 mission at Tyndall AFB would result in an increase in the overall number of personnel and dependents as compared to levels previously experienced. The impacts of this alternative would be very similar to the impacts documented in Section 4.1.11.1, and there would be no significant impact to infrastructure.

4.2.1.22 Infrastructure, MQ-9 No Action Alternative at Tyndall

Under the No Action Alternative, the beddown of MQ-9 aircraft at Tyndall AFB would not occur. The use of utilities and power and waste generation at Tyndall AFB would remain at the levels described for the affected environment in Section 3.1.11. No MQ-9–related impacts to the Tyndall AFB reconstructed infrastructure system would result from implementation of the No Action Alternative.

4.2.1.23 Transportation, MQ-9 at Tyndall (Preferred)

4.2.1.23.1 Base Facilities Construction and Personnel Increase

Traffic

The proposed MQ-9 Wing beddown at Tyndall AFB includes the addition of 1,900 personnel to support operational activities (Maintenance Complex Option 1). Approximately 1,000 of the personnel would operate during separate shifts that cover 24 hours per day. The analysis includes the assumption that the action adds 300 additional peak hour trips inbound as well as outbound during the morning and afternoon peak hours. The assumptions are as follows: a shift begins during the morning peak hour; a shift ends during the morning peak hour; a shift ends during the afternoon peak hour, and a shift begins during the afternoon peak hour. This action would generate trips accordingly, and the analysis includes the 300 trips inbound and outbound based on the same proportions as the original traffic counts (left turns, through movements, and right turns). Table 4.2-13 summarizes the operational conditions during the peak hours for the proposed MQ-9 Wing beddown.

Table 4.2-13. MQ-9 at Tyndall Intersection and Road Segment LOS and Performance Metrics

Intersection or Road Segment	Time Period	Analysis Year 2025			
		LOS	V/C Ratio	Control Delay	Highest Contributing Lane Group
US-98 and Tyndall Drive and Airey Avenue	a.m. p.m.	F F	2.1 1.1	290 sec/veh 85.5 sec/veh	US-98 right turns onto Airey Ave. Airey Avenue left turns onto US-98
US-98 Near Tyndall Drive	a.m. p.m.	D C	0.80 0.46	NA	NA

Key: LOS = Level of Service; NA = not applicable; sec/veh = seconds per vehicle; US-98 = U.S. Highway 98; V/C = volume-to-capacity

For this action, the outbound base trips from Airey Avenue turning left onto US-98 during the morning peak hour would be the most significant factor in degradation of the overall intersection LOS. This is different from the other actions due to trips against the typical commute pattern during the morning peak hour. For the current operation of the intersection, the shared through and left turn movement at the intersection uses a split phase timing to avoid blocking left turn movements by through vehicles. This operation limits the signal's ability to provide protected left turn phases exclusive of the through movements. The impacts to traffic from MQ-9 operations for Option 1 would be significant.

Maintenance Complex Option 2 would add a new gate on US-98 that could divert all or a portion of the 1,000 daily trips (assumed 300 peak period trips) associated with the three shifts at the

Maintenance Complex. This action would lessen demand on the main gate as compared to Option 1; however, similar traffic impacts (to Option 1) would occur on the US-98 road segment due to its function as the primary highway facility serving the base. The 300 peak trips would have moderate impact to traffic operations during the peak hour as compared with the added 900 daily trips for personnel working a standard day.

4.2.1.24 Transportation, MQ-9 No Action Alternative at Tyndall

Under the No Action Alternative, no MQ-9 facility construction or MQ-9 increase in base personnel would occur. No MQ-9–related impacts to the transportation network would result from implementation of the No Action Alternative. Analysis of the projected conditions for the year 2025 (see Section 4.1.12) are included for reference and represent conditions for the No Action Alternative, including only ambient traffic growth expected for the area.

4.2.1.25 Socioeconomics, MQ-9 at Tyndall (Preferred)

4.2.1.25.1 Base Facilities Construction and Personnel Increase

New facilities and infrastructure are shown in Table 2.3-3. The total costs of construction associated with the MQ-9 beddown at Tyndall AFB is estimated at $400 million. Construction would begin in 2021 and continue until 2025. Construction activities would generate direct, indirect, and induced employment (jobs) and income to the region. The increase in personnel associated with the MQ-9 beddown at Tyndall AFB would be 1,900 new USAF jobs.

Regional Economy, Employment, and Income

The increased employment and payroll of 1,900 new USAF jobs would be expected to have a positive, long-term economic impact on the regional economy. Table 4.2-14 indicates the number and type of incoming personnel by pay grade. The average annual salary for incoming personnel was estimated and is displayed in Table 4.2-15.

Personnel and dependents associated with the MQ-9 Wing would arrive over 4 years beginning in 2022. The direct employment of 1,900 USAF personnel would result in indirect and induced employment (see Table 4.2-16).

The increase in personnel at Tyndall AFB would generate tax revenues (see Table 4.2-17).

Table 4.2-14. Personnel Changes by Pay Grade, MQ-9 Wing at Tyndall AFB

Type	O1-O2	O3 & Above	E1-E4	E5 & Above	Total
Officers	57	243	0	0	300
Enlisted	0	0	510	690	1,200
Total Active Duty	**57**	**243**	**510**	**690**	**1,500**
Department of Defense Civilian	150	150	0	0	300
Base Operating Support	50	50	0	0	100
System Support	0	0	0	0	0
Total	**257**	**443**	**510**	**690**	**1,900**

Key: O = officer; E = enlisted

Table 4.2-15. Annual Basic Income, MQ-9 Wing at Tyndall AFB

Grade	Average Annual Salary	Total Personnel	Annual Basic Income
O1-O2	$54,000	257	$13,867,456
O3 & Above	$96,000	443	$42,546,746
E1-E4	$25,200	510	$12,852,000
E5 & Above	$50,000	690	$34,500,000

Key: O = officer; E = enlisted (2020 dollars)

Table 4.2-16. Employment (Jobs) Resulting from Personnel Changes in Bay County, MQ-9 Wing at Tyndall AFB

	Employment[1]		
	Direct	Indirect and Induced[3]	Total
Per Year	475	270	745
Total[2]	**1,900**	**1,080**	**2,980**

Notes:
[1] Employment includes direct employment from incoming personnel and indirect and induced employment
[2] Totals may not add due to rounding errors
[3] Based on IMPLAN economic model (IMPLAN, 2018)

Table 4.2-17. Tax Revenues, MQ-9 Wing at Tyndall AFB

Description	Total
State and Local Tax	$10,854,632
Federal Tax	$49,822,576
Total State, Local, and Federal Tax	**$60,677,208**

Approximately $400 million of MQ-9 Wing facility construction expenditures would create direct, indirect, and induced employment and earnings (see Table 4.2-18). The estimated total increase in on-base and off-base jobs would be 985 in 2021, 2,356 in 2022, 3,910 in 2024, peak at 4,655 jobs at the beginning of 2025, and then level off at approximately 2,980 jobs after 2026 (from combining Table 4.2-16 and Table 4.2-18).

Table 4.2-18. Employment (Jobs) Resulting from Construction Expenditures in Bay County, MQ-9 Wing at Tyndall AFB

Year	Construction Costs (millions)	Total Labor Income	Employment (Jobs)			
			Direct	Indirect	Induced	Total
2021	$60	$46,480,718	675	100	210	985
2022	$100	$75,971,696	1,103	164	344	1,611
2023	$100	$74,504,429	1,081	161	337	1,579
2024	$100	$78,993,495	1,147	171	357	1,675
2025	$40	$11,638,021	451	142	52	645
Total	**$400**	**$287,588,359**	**4,457**	**738**	**1,300**	**6,495**

Population

Table 4.2-19 presents the total Tyndall AFB military personnel, including an MQ-9 Wing, by year. There would be 2,584 dependents who would accompany the 1,900 military personnel for a total incoming population of 4,484. Personnel and dependents would be expected to arrive over 4 years or approximately 1,121 people per year beginning in 2022. Table 4.2-20 estimates population growth per year with a potential peak growth rate of 3.3 percent. This is a substantial growth rate for an area that experienced a less than 1-percent growth rate in the years prior to the hurricane.

Table 4.2-19. Personnel Estimates at Tyndall AFB per Year, MQ-9 Wing

Personnel	2022	2023	2024	2025	2026	2027
Total With Base Reconstruction[1]	2,200	2,200	2,200	2,200	2,200	2,200
Total MQ-9 Wing with Reconstruction	2,675	3,150	3,625	4,100	4,100	4,100

Note:
[1] Based on the pre-hurricane estimate minus approximately 1,400 personnel that would be departing with the F-22 Squadron

Table 4.2-20. Population Estimates in Bay County, MQ-9 Wing at Tyndall AFB

Year	Estimated Population without MQ-9 Wing	Year-Over-Year Growth	Incoming Population with MQ-9 Wing	Estimated Population with MQ-9 Wing
2018	182,482	-	-	182,482
2019	167,283	-8.33%	-	167,283
2020	170,963	2.2%	-	170,963
2021	175,237	2.5%	-	175,237
2022	180,494	32.0%	1,121	181,615
2023	186,451	3.3%	1,121	188,693
2024	190,180	2.0%	1,121	193,543
2025	191,891	0.9%	1,121	196,375
2026	192,083	0.1%	-	196,567
2027	192,275	0.1%	-	196,759

Housing

By 2025 there would be 4,100 personnel at Tyndall AFB. In addition to the 1,297 personnel residing on base, there would be a new MQ-9 Wing 168-person dorm and a total of 1,465 personnel residing on base. A total personnel population of 4,100 minus 1,465 on-base personnel would require 2,635 personnel to reside off base. Off-base personnel would be distributed throughout the region as identified in Table 3.1-36. The demand for off-base housing units during reconstruction would increase from 829 units to 2,418 units, an increased demand of 1,589 housing units. The effects on housing and employees per household would be as described for the three-squadron F-35A Wing.

Prior to Hurricane Michael, Bay County had a limited number of affordable properties available for sale or for rent. Hurricane Michael destroyed or severely damaged older, lower-cost residences. The 2010 census had 1.14 employees per household in Bay County (USCB, 2010a). The increased cost of housing and the availability of jobs would be expected to increase that ratio to at least 1.5 employees per household (Florida State average is 1.46). Construction workers and secondary employees would also demand housing (combining Table 4.2-16 and Table 4.2-18). The additional demand by construction and secondary workers would be for up to 1,837 ([1,675+1,080]/1.5) housing units in the community for the years 2022 through 2025. Adding that to the 2025 USAF off-base housing demand for 1,589 units would result in a total demand of 3,426 units by the end of 2024. Housing costs through 2024 could continue rising by 10 to 15 percent or more per year as supply tries to catch up with demand before leveling off as new housing is constructed.

After 2025, mission-related housing demand could decline from the 2024 peak to represent total housing demand for 1,589 by off-base USAF personnel plus 720 units for secondary personnel, for a demand for 2,309 housing units.

Education

Incoming USAF personnel would be accompanied by an estimated 2,584 dependents. Approximately 1,292 of the dependents would be children between the ages of 0 to 18 and, of those, an estimated 950 children would be of school age. Student enrollment would increase with the incoming personnel for an average yearly increase of approximately 238 students per year (see Table 4.2-21. The damage from Hurricane Michael had a major impact on the Bay County District schools. An estimated 950 children at a rate of 9 children per school employee in Bay County would result in an increased demand for 106 additional school employees including administrators, teachers, support, and maintenance. Following initial crowding, the additional students would contribute to obtaining state funding and help restore schools that had been mothballed after the hurricane. The effects on students and schools would be as described for the three-squadron F-35A Wing.

Table 4.2-21. Total Enrollment Estimates in Bay County, MQ-9 Wing at Tyndall AFB

School Year	Estimated Enrollment	Incoming Students (with MQ-9 Wing)	Estimated Enrollment (with MQ-9 Wing)
2018	28,129	-	28,129
2019	23,927	-	23,927
2020	24,933	-	24,933
2021	25,949	-	25,949
2022	26,968	238	27,206
2023	27,508	238	27,682
2024	27,975	238	28,396
2025	28,395	238	29,348
2026	28,821	-	29,773
2027	29,253	-	30,205

Public Services

The addition of MQ-9 Wing and associated 4,484 USAF personnel and dependents would result in increased demand for public services such as police, fire, and medical services (see Table 4.2-22). Approximately 60 percent more public service personnel would be needed for secondary workers and their families and more than twice that number of public service personnel could be needed during construction. Public service personnel would have to compete with all others for housing in Bay County.

Table 4.2-22. Public Services, MQ-9 Wing at Tyndall AFB

Year	Police			Fire			Medical		
	Total Personnel	Total Personnel (with MQ-9 Wing)	Change	Total Personnel	Total Personnel (with MQ-9 Wing)	Change	Total Personnel	Total Personnel (with MQ-9 Wing)	Change
2019	366	366	0	251	251	0	423	423	0
2020	374	374	0	256	256	0	433	433	0
2021	382	382	0	262	262	0	442	442	0

Table 4.2-22. Public Services, MQ-9 Wing at Tyndall AFB

Year	Police			Fire			Medical		
	Total Personnel	Total Personnel (with MQ-9 Wing)	Change	Total Personnel	Total Personnel (with MQ-9 Wing)	Change	Total Personnel	Total Personnel (with MQ-9 Wing)	Change
2022	390	392	2	267	269	2	450	453	3
2023	398	400	2	272	274	2	459	462	3
2024	404	407	2	277	279	2	467	470	3
2025	411	413	2	281	283	2	474	477	3
2026	417	427	10	285	292	7	481	493	11
2027	423	433	10	290	296	7	489	500	11

4.2.1.26 Socioeconomics, MQ-9 No Action Alternative at Tyndall

Under the MQ-9 No Action Alternative at Tyndall AFB, there would be no beddown of an MQ-9 Wing and thus, no MQ-9 facilities construction, personnel changes, or aircraft operations would occur. Under the No Action Alternative, socioeconomic conditions would be as described for the affected environment in Section 3.1.13. However, without the influx of base expenditures and personnel spending, the Bay County area would lack some of the economic foundation needed for a healthy economy and sustainable community development.

4.2.1.27 Environmental Justice, MQ-9 at Tyndall (Preferred)

4.2.1.27.1 Base Airfield Operations and Personnel Increase

There would be no 65 dB DNL off-base noise. There would be no impacts to minority and low-income populations or to children or the elderly. Housing effects would be the same as those described with the three-squadron F-35A Wing.

4.2.1.28 Environmental Justice, MQ-9 No Action Alternative at Tyndall

Under the No Action Alternative at Tyndall AFB, the MQ-9 Wing would not beddown at Tyndall AFB. There are no off-base residential land areas or populations impacted by noise levels of 65 dB DNL associated with affected environment aircraft operations at Tyndall AFB. There would be no disproportionate noise effect to minority or low-income populations as a result of the No Action Alternative. There would be no health or safety effects from aircraft noise levels of 65 dB DNL or greater on children and the elderly residing off base.

4.2.2 Alternative to Beddown the MQ-9 Operational Wing at Vandenberg AFB

4.2.2.1 Airspace Management and Air Traffic Control, MQ-9 at Vandenberg AFB

The relevant factors, discussed in Appendix B, for assessing airspace impacts were considered for the proposed airfield and training operations at Vandenberg AFB under this beddown alternative.

4.2.2.1.1 Base Airfield Operations

As discussed in Section 3.2.1.1, the Vandenberg AFB control tower manages airfield operations within the Class D airspace while the Santa Barbara TRACON controls IFR aircraft operating at this airfield and within this facility's delegated terminal airspace area. The nature of the different missile, rocket, and aircraft operations at this airfield has been scheduled and controlled to be compatible with the other military and civilian aircraft activities within and surrounding this airspace environment.

The proposed beddown of the MQ-9 at Vandenberg AFB would be essentially the same mission types and sortie operations discussed for the Tyndall AFB proposed beddown in Section 4.2.1.1.1. The projected 5,640 MQ-9 airfield operations are discussed in Section 2.3.4.2 and shown in Figure 2.3-5 where pattern work would be conducted within the Class D airspace, the overlying R-2516, and the offshore W-537. No COA would be required for these local operations since they would remain within controlled, restricted airspace. As discussed previously, strict adherence to those RPA coordination and communications requirements would ensure these operations are conducted in a safe manner that would not conflict with or impact other air traffic at this airfield or its surrounding airspace.

4.2.2.1.2 Transit and Training Operations

The 2,820 sortie operations would be conducted by MQ-9s within the different SUA areas as described in Sections 2.3.4.2 and 3.2.1.2 and shown in Figure 2.3-6. These aircraft would transit to and operate at higher altitudes (FL180 and above) within the Hunter MOAs north of Vandenberg AFB, the Warning Areas along the coastal zones, and the San Clemente Range Restricted Areas to the south to fulfill ground launch and control crew training requirements. Any transiting outside of restricted airspace to these different areas would be performed under a required FAA-issued COA.

The collective coordination efforts between the Vandenberg AFB tower, Santa Barbara TRACON, FAA Los Angeles Center, Frontier Control, and other entities that schedule, control, and manage these flights during the course of their inflight operations would ensure these aircraft are appropriately separated from other air traffic in the affected airspace. Given the strict SUA and UAS requirements each of these controlling agencies and operators must follow, this alternative to beddown the MQ-9 Wing at Vandenberg AFB and the operations to be conducted by these aircraft would have minimal effect on other air traffic and airspace uses in this region.

4.2.2.2 Airspace Management and Air Traffic Control, MQ-9 No Action Alternative at Vandenberg AFB

The No Action Alternative would not beddown an MQ-9 Wing at Vandenberg AFB. Airfield and training area operations under the No Action Alternative and the manner in which these operations are managed by ATC would remain the same as typically occurs at Vandenberg AFB under affected environment conditions.

4.2.2.3 Noise, MQ-9 at Vandenberg

The MQ-9 is a propeller-driven aircraft powered by a 950-horsepower turboprop engine. Because measured MQ-9 noise levels are sensitive information, the T-6 aircraft, which is powered by a 1,100-horsepower turboprop engine, was used as a source noise-level surrogate. MQ-9 individual overflight noise levels are substantially lower than noise levels generated by other aircraft types that frequently use Vandenberg AFB (Table 4.2-23).

Table 4.2-23. MQ-9 Individual Overflight Noise Levels Compared Against Aircraft Currently Using Vandenberg AFB

Aircraft (engine type)	Power Setting[1]	Power Unit	L_{max} Values (in dB) at Varying Distances (in feet)				
			500	1,000	2,000	5,000	10,000
Takeoff/Departure Operations							
MQ-9 (T-6 surrogate)	100%	Torque	85	78	71	61	52
C-5B	4.50	EPR	114	106	97	82	68
T-38 (non-afterburner)	99%	RPM	109	101	91	76	63
C-21	90%	NC	89	82	74	62	51
Single-engine, fixed-pitch propeller	100%	RPM	77	70	63	53	45
Landing/Arrival Operations							
MQ-9 (T-6 surrogate)	17%	Torque	82	75	67	57	47
C-5B	2.39	EPR	111	104	95	79	61
T-38	96%	RPM	96	88	79	66	54
C-21	68%	NC	77	70	62	50	40
Single-engine, fixed-pitch propeller	30%	RPM	59	53	46	36	29

Source: Omega10 using standard weather conditions of 59 degrees Fahrenheit and 70 percent relative humidity.
Key: dB = decibel; EPR = engine pressure ratio; L_{max} = Maximum Noise Level; NC = engine core RPM; RPM = revolutions per minute; Torque = engine torque
Note:
[1] Engine power settings are not constant during flight. Power settings shown are typical.

The MQ-9 Wing would conduct an estimated 2,820 sorties annually, and there would be an average of 16 practice approaches per sortie. Operations would be conducted in accordance with current flying procedures and would reflect restrictions intended to minimize impacts to biological resources.

4.2.2.3.1 Annoyance and Land Use Compatibility

As shown in Figure 4.2-2, the area on and near the Vandenberg AFB runway that is currently exposed to noise levels greater than 65 dB CNEL would expand slightly under the Proposed Action.

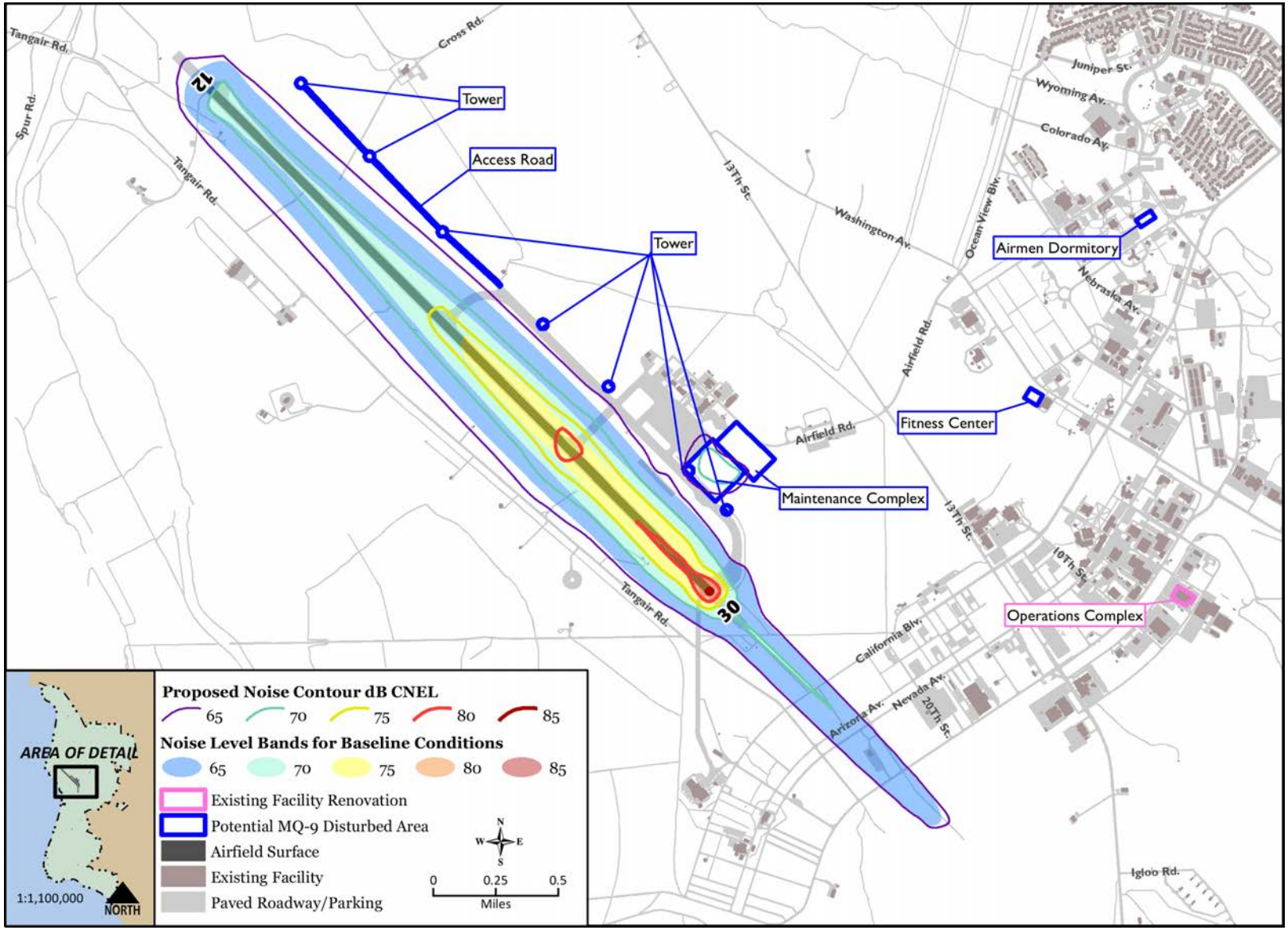

Figure 4.2-2. Proposed Noise Levels at Vandenberg AFB

Noise levels exceeding 65 dB CNEL would continue to remain entirely within the boundaries of the installation. All off-installation land uses would continue to be compatible with DoD noise-land use guidelines, and no off-base residents would be exposed to noise levels greater than 65 dB CNEL. People living outside of the 65 dB CNEL contour also sometimes experience potentially disturbing aircraft overflights and can become annoyed by the noise. A person's reaction to noise is dependent on several non-acoustic factors, including the person's perception of the importance of the activity generating the noise and the activity the person is involved in at the time the noise occurs. Several social surveys have found that people are more likely to become annoyed by aircraft noise at higher DNL(or CNEL) and are less likely to become annoyed at lower DNL(or CNEL) (Schultz, 1978; Finegold, Harris, & Von Gierke, 1994; Miedema & Vos, 1998).

Additional noise calculations were run at several representative noise-sensitive locations, which are depicted in Figure 3.2-2 and Table 4.2-24. The CNEL at the on-base Parade Ground and Lompoc Federal Prison would increase by 1.8 and 0.9 dB, respectively under the Proposed Action, while aircraft noise levels at the other locations studied would remain below ambient. Aircraft noise would remain similar to presumed ambient noise levels (45 dB) at the Parade Ground and Federal Prison, and annoyance due to aircraft noise would continue to be minimal.

Table 4.2-24. Proposed Noise Levels at and Near Vandenberg AFB

Location Description	No Action	Proposed Action	Change[1]
Lompoc (residential area)	<45	<45	0
Crestview Elementary School	<45	<45	0
Maple High School	<45	<45	0
Parade Ground (on base)	<45	46.8	1.8
Lompoc Federal Prison	<45	45.9	0.9

Key: < = less than; AFB = Air Force Base
Note:
[1] Change is relative to No Action.

4.2.2.3.2 Speech Interference

Overflight events that exceed 50 dB, even momentarily, have some potential to interfere with speech. MQ-9 overflights would increase the number of outdoor noise events with potential to momentarily interfere with speech by up to three events per hour at the locations studied (Table 4.2-25). Speech-interference events are brief, lasting only for the duration of the overflight.

Table 4.2-25. Number of Outdoor Noise Events per Average Daytime Hour with Potential to Interfere with Speech (above 50 dB L_{max}) Under the Proposed Action

Location Description	No Action	Proposed Action	Change[1]
Lompoc (residential area)	0	1	1
Crestview Elementary School	0	2	2
Maple High School	0	1	1
Parade Ground (on base)	1	2	1
Lompoc Federal Prison	0	3	3

Key: dB = decibels; L_{max} = maximum noise level
Note:
[1] Change is relative to No Action.

4.2.2.3.3 Classroom Noise

Outdoor noise levels at Crestview Elementary School and Maple High School would remain below 60 dB $L_{eq\text{-}8hr}$ under the Proposed Action. Classroom noise levels would remain below recommended maximum background levels, as described in the DoD Noise Working group guidelines (DoD Noise Working Group, 2009).

4.2.2.3.4 Sleep Disturbance

An estimated 5 percent of MQ-9 initial approach, 3 percent of MQ-9 practice approach operations, and 0 percent of departure operations are expected to be conducted during the late-night time period (10:00 p.m. to 7:00 a.m.), when most people are trying to sleep. Although late-night operations would occur occasionally, MQ-9 noise levels are not sufficiently high to awaken people on a regular basis, when sleeping indoors. The probability of sleep disturbance at the representative noise-sensitive locations would continue to round to zero under the Proposed Action. Probabilities were calculated with windows open, assuming 15 dB noise-level reduction is provided by the structure.

4.2.2.3.5 Noise-Induced Hearing Impairment

Noise levels would not exceed 80 dB CNEL (or DNL) off base under the Proposed Action, and potential hearing-loss risk would continue to be minimal in accordance with DoD policy.

4.2.2.3.6 Workplace Noise

Noise exposure for people working on Vandenberg AFB would continue to be managed in accordance with applicable policies minimizing the risk of hearing damage.

Nonauditory Health

Nonauditory health effects of long-term noise exposure (e.g., cardiovascular health risks) have not been documented at levels below those at which noise-induced hearing loss is a substantial risk.

4.2.2.4 Noise, MQ-9 No Action Alternative at Vandenberg

Under the No Action Alternative, aircraft operations and noise levels would not increase due to an MQ-9 Wing beddown. There would be no additional noise impacts to the affected environment from implementation of the No Action Alternative.

Training Airspace

While operating at mission altitudes (above 18,000 feet MSL), the MQ-9 generates approximately 40 dB L_{max} on the ground, which is inaudible in a typical rural, ambient acoustic environment. No noise impacts are generated by the MQ-9 while operating in training airspace.

4.2.2.5 Health and Safety, MQ-9 at Vandenberg

4.2.2.5.1 Base Facilities Construction

Potential impacts associated with base facility construction would generally be the same as under the MQ-9 at Tyndall AFB Alternative, as described in Section 4.2.1.5.1. At Vandenberg AFB, proposed MQ-9 facilities would be constructed in areas subject to seasonal fires which are dependent on fuels, weather, and topography as described in the Preliminary Vandenberg AFB Installation-specific Climate Change Summaries for Incorporation into the Vandenberg INRMP (Vandenberg AFB, 2020d). The risk of fires can be increased with winter precipitation suggested by Vandenberg's climate scenarios which extend the fire season. MQ-9 potential facilities would be planned and constructed with adequate setbacks and clearing to protect the facilities from wildfires. The area identified as potentially disturbed by construction would be revegetated in accordance with the Vandenberg AFB INRMP, which recognizes the need for wildfire protection.

4.2.2.5.2 Base Airfield Operations (BASH)

An increase in flight operations would result in an associated increase in the potential for aircraft mishaps or BASH incidents by two per year. Other potential impacts associated with airfield operations with the Main Runway Option would be the same as under the MQ-9 at Tyndall AFB Alternative, as described in Section 4.2.1.5.2. Additionally, the Vandenberg AFB airfield is surrounded by a significant amount of deer habitat (see Section 3.2.3.1). Although an electrobraid fence surrounds the airfield, the fence is not adequate to prevent deer incursions.

4.2.2.5.3 Airspace and Range Operations

Other potential impacts associated with Airspace and Range Operations would be the same as under the MQ-9 at Tyndall AFB Alternative, as described in Section 4.2.1.5.1.

4.2.2.6 Health and Safety, MQ-9 No Action Alternative at Vandenberg

Under the No Action Alternative, flight activity at Vandenberg AFB would be as described for the affected environment (Section 3.2.1). No MQ-9–related personnel changes or construction would occur. All aspects of ground safety and safety in the airspace would continue as described in Section 3.2.3.

4.2.2.7 Air Quality, MQ-9 at Vandenberg AFB

The air quality analysis estimated the magnitude of emissions that would result from construction and operation of the alternative to beddown the MQ-9 Wing at Vandenberg AFB. Appendix C presents the calculations used to estimate air pollutant emissions from proposed construction and operational sources for the alternative.

The immediate area surrounding Vandenberg AFB within Santa Barbara County is currently in attainment of all NAAQS. Therefore, the analysis used the USEPA PSD permitting threshold of

250 tons per year for criteria pollutants as indicators of the significance of projected air quality impacts within the Vandenberg AFB project region. The analysis uses this criterion as the PSD permitting process applies to areas that attain a NAAQS. If projected emissions exceed an indicator threshold, further analysis was conducted to determine whether impacts were significant. In such cases, if emissions do not contribute to an exceedance of an ambient air quality standard, then impacts would not be significant.

4.2.2.7.1 Base Facilities Construction

The MQ-9 at Vandenberg AFB Alternative would require construction of operational, maintenance, and base support facilities. Air quality impacts associated with proposed construction activities would result from (1) combustive emissions generated by fossil fuel-powered equipment and (2) fugitive dust emissions ($PM_{10}/PM_{2.5}$) from operation of equipment on exposed soil. The analysis assumed that the air quality BMPs identified in Table 2.7-1 would reduce fugitive dust resulting from the use of construction equipment on exposed soil by 50 percent from uncontrolled levels.

Construction activity data developed for the alternative were used as inputs for ACAM. The air quality analysis assumed that the alternative would begin construction activities in 2021 and would complete all activities by 2025.

Table 4.2-26 presents estimates of annual emissions that would occur from the infrastructure improvements for the MQ-9 at Vandenberg AFB Alternative. These data show that even if all construction activities occurred in 1 year, the total construction emissions would be well below the annual indicator thresholds. Therefore, construction emissions associated with the MQ-9 Alternative would not result in significant air quality impacts.

Table 4.2-26. Annual Construction Emissions for the MQ-9 at Vandenberg AFB Alternative

Construction Year	Air Pollutant Emissions (tons)						
	VOCs	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	CO_2e (mt)
2021	0.69	2.25	2.30	0.01	0.27	0.10	518
2022	1.32	2.59	2.86	0.01	4.94	0.11	702
2023	0.42	1.97	1.77	0.01	2.75	0.07	450
2024	0.42	1.77	1.40	0.01	1.63	0.05	400
Annual Indicator Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**NA**

Key: CO = carbon monoxide; CO_2e (mt) = carbon dioxide equivalent in metric tons; NA = not applicable; 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_x = sulfur oxides; VOCs = volatile organic compounds

4.2.2.7.2 Base Airfield Operations

The MQ-9 at Vandenberg AFB Alternative would generate air emissions from (1) MQ-9 aircraft operations, (2) MQ-9 engine maintenance and testing, and (3) space and water heaters, (4) solvent usages, and (5) personnel commuting activities. The analysis employed the ACAM to estimate emissions from these activities. The air quality analysis assumed that the alternative would reach full operations and resulting emissions in 2025, after the completion of all required infrastructure

improvements. Calculations showing the MQ-9 TIM metrics derived for the air quality analyses and the ACAM output reports are presented in Appendix C.

Table 4.2-27 summarizes the annual operations emissions that would result from implementation of the MQ-9 at Vandenberg AFB Alternative. These data show that emission increases for the alternative would remain below all annual indicator thresholds and would equate to very small portions of the Santa Barbara County 2017 emissions. Therefore, operations from the MQ-9 at Vandenberg AFB Alternative would not result in significant impacts to air quality. MQ-9 aircraft operations would be the primary contributors to emissions of NO_x, SO_x, PM_{10}, and $PM_{2.5}$. Personnel commuting activities would be the main source of VOCs and CO emissions.

Table 4.2-27. Annual Operations Emissions for the MQ-9 Alternative at Vandenberg AFB – Year 2025

Afterburner Scenario/Activity Type	Air Pollutant Emissions (tons per year)[1]						
	VOCs	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	CO_2e (mt)
Flight Operations/Engine Trim Tests –- MQ-9	3.03	3.16	4.33	0.44	0.80	0.72	1,203
Aircraft Engine Test Cells – MQ-9	0.03	0.03	0.04	0.00	0.01	0.01	10
Space and Water Heating	0.17	2.56	3.05	0.02	0.23	0.23	3,338
Solvent Usage	0.65	--	--	--	--	--	--
Personnel Commuting Activities	3.35	21.74	1.82	0.04	0.53	0.23	3,491
Total MQ-9 Mission Emissions[1]	**7.23**	**27.49**	**9.24**	**0.50**	**1.56**	**1.18**	**8,042**
Annual Indicator Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**NA**
Santa Barbara County 2017 Emissions	**8,619**	**20,245**	**5,287**	**200**	**4,656**	**1,155**	**2,230,774**
Total MQ-9 Mission Emissions % of Bay County 2017 Emissions	**0.08%**	**0.14%**	**0.17%**	**0.25%**	**0.03 %**	**0.10 %**	**0.36%**

Key: CO = carbon monoxide; CO_2e (mt) = carbon dioxide equivalent in metric tons; NA = not applicable; 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_x = sulfur oxides; VOCs = volatile organic compounds

Note:

[1] Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.

4.2.2.7.3 Airspace and Range Training Operations

Under the MQ-9 at Vandenberg AFB Alternative, MQ-9 operations within airspaces and training areas would occur above 3,000 feet AGL at all times, and therefore these operations would not appreciably affect ground-level air quality. As a result, the alternative would not result in significant air quality impacts within any airspace or training area.

4.2.2.8 Air Quality, MQ-9 No Action Alternative at Vandenberg AFB

The No Action Alternative would not include any of the facility, personnel, or operational changes proposed by the MQ-9 Wing beddown alternatives for Vandenberg AFB. Air quality impacts from the No Action Alternative would be the same as those described for the affected environment within the Vandenberg AFB project region (Section 3.2.4). No MQ-9–related changes that could affect air quality would occur at Vandenberg AFB or in the associated airspace.

4.2.2.9 Hazardous Materials and Waste, MQ-9 at Vandenberg

4.2.2.9.1 Base Facilities Construction and Base Aircraft Operations

Hazardous Materials Management

New buildings and renovations would be constructed utilizing normal construction methods, which would limit, to the extent possible, the use of hazardous materials. There would be a short–term increase in the quantity of hazardous materials and petroleum substances stored at the installation to support construction activities since various fuels (e.g., diesel, gasoline) would be required to run earth-moving equipment and power tools, and to provide electricity and lighting as conditions warrant. In addition, paints and solvents would be used during construction and renovation activities. These materials would be stored in proper containers, employing secondary containment as necessary to prevent and limit accidental spills. All spills and accidental discharges from these generators or from spills of other petroleum products or hazardous materials would be reported and mitigated. The installation has emergency response procedures and site-specific contingency plans for all hazardous materials locations.

The beddown of the MQ-9 is not anticipated to significantly change the quantities of hazardous materials and petroleum substances used at Vandenberg. Any insignificant increase in fuel consumption and hazardous materials use is supportable by the current infrastructure at the installation.

With implementation of the measures described above, there would be no significant negative impacts to hazardous materials from implementing the proposed MQ-9 Wing beddown at Vandenberg AFB.

Hazardous Waste Management

Hazardous waste would be generated in small quantities during construction/renovation activities and would include spent solvents, waste paint, fluorescent bulbs, used oil, spill cleanup materials, and lead-acid batteries from construction equipment. These wastes would be stored in appropriate containers in accordance with applicable federal and state of California regulations. Wastes that cannot be recycled would be disposed of by the contractor at licensed facilities in a manner approved by the USEPA; consequently, no significant impacts would be expected.

Management of hazardous waste or petroleum wastes would continue as they do currently. The status of Vandenberg AFB as a large quantity generator pursuant to the Resource Conservation and Recovery Act would not change. Where needed, new satellite accumulation areas would be established. These sites would be managed according to established procedures that include the use of properly labeled, approved containers using secondary containment. No change to permits or hazardous waste generator status would be required, and no significant environmental impacts from implementing the MQ-9 Proposed Action would be anticipated.

Toxic Substances

Because it was constructed in 1963, Building 8401 could potentially have ACM, PCBs, and LBP. Prior to renovation, this building would be surveyed for these substances. If ACM, PCBs, or LBP

are identified at Building 8401 during the surveys, BMPs in compliance with federal and state regulations and Vandenberg AFB's environmental management plans for handling and disposing of ACM, PCBs, and LBP (Vandenberg AFB, 2014) would be followed, thus minimizing any impacts from the release of these substances to the environment. No significant environmental impacts from implementing the MQ-9 Proposed Action relative to toxic substances would be anticipated.

Contamination Sites

As Figure 3.2-3 shows, the footprint of the Operations Complex (building 8401) renovation is located over ERP Site AOC-147 (also known as IRP CG 147). This site is currently under investigation and treatment for soil and groundwater contamination. However, this treatment does not preclude repurposing and occupying this building for industrial use (Vandenberg AFB, 2019a). Any renovation or construction work outside the building must be coordinated with AFCEC/Installation Support Team-West (AFCEC/CZOW), Edward Installation Support Section (ISS), and Vandenberg AFB. In addition, the footprint of the proposed Dormitory is located over ERP Sites AOI-567, AOI-568, AOI-569, and AOI-570. However, all four sites have been administratively closed during the preliminary assessment phase by the Central Coast Regional Water Quality Control Board and the Department of Toxic Substances Control. Finally, the footprint of the proposed Fitness Center is adjacent to ERP Site AOI-15. This site has also been administratively closed by the Central Coast Regional Water Quality Control Board and the Department of Toxic Substances Control.

As discussed in Section 3.2.5 and in Section 4.1.5.1.1, in accordance with AFI 32-1021, *Planning and Programming Military Construction (MILCON) Projects*, construction must not adversely impact ongoing cleanup activities or impact migration of contaminants from the site. In addition, site contaminants must be adequately characterized and delineated. If soil contamination is present at the construction site, a permit for remediation may be required by the State. Additional worker precautions as well as a site-specific health and safety plan approved by a Certified Industrial Hygienist would also be required. Additionally, there is the potential for groundwater impacts associated with the historical use of PFOS/PFOA. To minimize the potential for any impacts, all development activities would be coordinated with the Environmental Management Office and the State to ensure that these would comply with all applicable regulatory requirements. As a BMP, to further minimize the potential for any impacts, prior to construction, workers would be educated on how to identify evidence of contamination, such as petroleum odors or soil staining. Should any unusual odor or staining be encountered, construction would cease and the Environmental Management Office would be contacted immediately. No significant impacts related to ERP sites are anticipated with appropriate procedures as described above.

4.2.2.10 Hazardous Materials and Waste, MQ-9 No Action Alternative at Vandenberg

Under the No Action Alternative, the beddown of the MQ-9 Wing would not occur at Vandenberg AFB. The management of hazardous materials and the generation of hazardous waste in the affected environment at Vandenberg AFB would continue as described for the affected environment in Section 3.2.5.

4.2.2.11 Soils and Geologic Resources, MQ-9 at Vandenberg

4.2.2.11.1 Base Facilities Construction

Factors to consider for the potential of a proposed action to have a significant impact in the state of California would include whether the action would result in substantially increased erosion, landslides, soil creep, mudslides, and unstable slopes or alter the complexion of prime farmland soils. Additional factors include whether the project would increase the likelihood of, or result in exposure to, earthquake damage, slope failure, foundation instability, land subsidence, or other severe geologic hazards. Also under consideration would be if the proposed action could have any impact on the extraction or use of geologic resources, such as oil or gas.

Soils

Up to 49 acres could be temporarily disturbed due to construction, renovation, and additions to base facilities for the beddown of the MQ-9 at Vandenberg AFB. Actual acres of disturbance would likely be less, since the facility footprints total approximately 21 acres. Areas immediately surrounding construction zones may also experience temporary disturbance from vehicle and equipment operations during construction. Disturbance in areas greater than 1 acre require a Construction General Permit under the NPDES program (see Section 4.2.1.13).

Table 4.2-28 identifies the area of potential disturbance for construction areas of proposed facilities and provides a total range of potential acreage disturbed and predominant soil types in each proposed area of disturbance. In addition to the potential disturbances in Table 4.2-28 there would be up to approximately 1 acre of surface disturbance for the installation of infrastructure and communication conduit extensions.

Table 4.2-28. Soil Types Associated With Proposed MQ-9 New Facilities and Facility Renovation at Vandenberg AFB

Area	Total Potential Disturbed Area (Acres)	Building	Facility Footprint (Square Feet)	Facility Footprint (Acres)	Soil types in Proposed Area(s)
Operations Complex	NA, primarily renovation of 2.4 acre building	Four satellite communications antennas with a supporting generator	10,000	0.23	Tangair sand, 0 to 2 percent slopes
Maintenance Complex	35.8	Multiple, see Table 2.3-1	723,900	16.6	Tangair sand, 0 to 2 percent slopes
Ground Data Terminal Foundations and Towers/Roads	10	Ground Data Terminal Foundations and Towers/Roads	65,808	1.5	Tangair sand, 0 to 2 percent slopes
Fitness Center	1.7	Fitness Center	38,700	0.9	Narlon loamy sand, 0 to 2 percent slopes and 2 to 9 percent slopes
Airmen Dormitory	1.5	Airmen Dormitory and Parking Lot	107,800	2.5	Narlon loamy sand, 2 to 9 percent slopes
Total	**49**	**NA**	**946,208**	**21.83**	**NA**

Key: AFB = Air Force Base; NA = not applicable

The majority of potential disturbance areas associated with the Proposed Action would occur on Narlon loamy sand and Tangair sand. Characteristics of each soil type and limitations for use are described below, where applicable.

The Operations Complex, Maintenance Complex, GDT Foundations and Towers, and Infrastructure and Communication Conduit Extensions would be located on Tangair sand (0 to 2 percent slopes). Tangair sands are slightly acidic and somewhat poorly drained, with negligible surface water runoff potential. These soils are highly susceptible to wind erosion. In most years, these soils can be saturated within 6 to 24 inches of the surface in winter or early spring; however, Tangair sands are not prone to either ponding or flooding. Soil permeability is rapid or very rapid, but underlying materials have slow or very slow permeability. Depth to the underlying water table is typically 44 to 54 inches from the surface. Limitations for use include instability of excavated walls, a relatively shallow depth to the saturated zone, a moderate potential to corrode concrete (NRCS, 2020c; 2020d).

The Fitness Center and Airmen Dormitory would be located on Narlon loamy sand (0 to 2 percent slopes and 2 to 9 percent slopes). Narlon loamy sands are slightly acidic and moderately well drained (0 to 2 percent slopes) or somewhat poorly drained (2 to 9 percent slopes). These soils have negligible (0 to 2 percent slopes) to very low (2 to 9 percent slopes) surface water runoff potential and are highly susceptible to wind erosion. In most years, these soils can be saturated within 6 to 24 inches of the surface in winter or early spring and temporary shallow ponds can form in swales in wet winters; however, Narlon loamy sands are not typically prone to either ponding or flooding. Soil permeability is moderately rapid. Depth to the underlying water table is typically 14 to 36 inches from the surface. Limitations for use include a relatively shallow depth to the saturated zone, a moderate potential to corrode concrete, and a high risk of corroding untreated steel (NRCS, 2020c; 2020d).

Prime Farmlands

Proposed activities are not planned for any locations where there are soils categorized as prime farmlands or farmlands of state importance. Therefore, no impacts to prime farmland soils would be anticipated for the proposed MQ-9 Wing beddown.

Minimization of soil erosion and the siting of facilities in relation to soil limitations is considered when evaluating impacts to soil resources. If a proposed action were to substantially affect (or be substantially affected by) any of these features, impacts would be considered significant. Generally, impacts associated with soil resources can be avoided or minimized to a level of insignificance if proper construction techniques, erosion control measures, and structural engineering designs are incorporated into project development.

BMPs to lessen potential impacts to soils resulting from the Proposed Action would include those described in Section 4.1.6.

With the employment of such practices, potential impacts to soils on Vandenberg AFB from the siting of facilities associated with the proposed MQ-9 Wing construction, renovation, and additions to base facilities, would be expected to be minimal.

Oil and Gas Leases

While the majority of Vandenberg AFB is considered open to oil and gas leases, there are only a handful of wells classified as active, and these are located in the northern portion of the installation. No known oil or gas wells are located near the proposed facilities construction areas; therefore, no potential impacts to existing oil and gas activities on, or in proximity to, the proposed MQ-9 Wing beddown would be anticipated. Should any previously unidentified oil or gas wells be encountered during ground disturbing activities associated with the proposed MQ-9 Wing beddown, the California Department of Conservation would be notified.

4.2.2.12 Soils and Geologic Resources, MQ-9 No Action Alternative at Vandenberg

Under the No Action Alternative, a beddown of an MQ-9 Wing would not occur at Vandenberg AFB. None of the proposed construction to support the MQ-9 mission would occur, and no MQ-9–related impacts to soils and geologic resources would result from implementation of the No Action Alternative.

4.2.2.13 Water Resources, MQ-9 at Vandenberg

4.2.2.13.1 Base Facilities Construction

Surface Water

For the proposed MQ-9 Wing beddown at Vandenberg, up to 49 acres could be temporarily disturbed due to construction, renovation, and additions to base facilities associated with the beddown of the MQ-9 at Vandenberg AFB. Actual acres of disturbance would likely be less as the facility footprints total approximately 22 acres. However, the overall disturbed area is usually larger than the facility footprints when allowing for landscaping, utility connections, equipment laydown, and staging, etc.) When it rains, stormwater washes over the loose soil on a construction site, along with various materials and products stored outside. As stormwater flows over the site, it can pick up pollutants like sediment, debris, and chemicals and transport them to nearby waters. The airfield construction sites would drain via several drop inlets, ultimately discharging to the Pacific Ocean via unnamed natural drainages. The remaining construction sites would drain to the Santa Ynez River.

Implementation of this alternative would require coverage under the California NPDES Construction General Permit for construction at the airfield as well as for other facilities that would result in ground disturbance of 1 acre or more (e.g., the Airmen Dormitory and the Fitness Center). The construction contractor would be responsible for obtaining, preparing, and implementing the SWPPP and paying the permit application fee. Vandenberg AFB would be responsible for obtaining Construction General Permit coverage from the state and regional Water Boards.

Permit requirements include the preparation and implementation of a site-specific SWPPP to manage stormwater discharges as well as control erosion during and after construction until the area is stabilized. The SWPPP would require regular compliance inspections and specify BMPs that would minimize impacts to water quality. The permit specifies minimum BMPs such as those for erosion and sediment controls, materials management, waste management, and non-stormwater

management. Revegetation of disturbed soil areas remaining after construction is complete would be required. The permit's Notice of Termination conditions include 70 percent final vegetation cover and proper disposal of all construction waste.

Replacement of pre-development (natural) pervious surfaces with impervious surfaces, such as concrete, eliminates any potential for stormwater infiltration and can result in increases to the volume, peak flow, duration, pollutant load, and temperature of stormwater runoff. The vast majority of facilities and improvements would be constructed on pervious surfaces, resulting in an increase of impervious surfaces at Vandenberg AFB of approximately 25 acres.

MQ-9 Proposed Action projects with development or redevelopment footprints greater than 5,000 square feet (see Table 2.3-1) would be subject to Energy Independence and Security Act Section 438. LID practices such as preservation of existing vegetation to the extent feasible, infiltration or underground retention structures, permeable pavements, cisterns/recycling, green roofs or rooftop and impervious area disconnection would be implemented to maintain maximum pre-development site hydrology.

Because an SWPPP and BMPs would be employed during construction of the facilities associated with NPDES permits, significant impacts to surface waters would not be expected from construction activities. Because the pre-development hydrology of the site would be maintained to the maximum extent practicable through LID, significant impacts to surface waters would not be expected to result from the development actions associated with this alternative. It would not be expected that this alternative would affect CWA Section 303(d) impaired waters or cause nonimpaired waters to become impaired.

The California NPDES Municipal (Small MS4) General Permit requires LID measures be applied to projects that create and/or replace 2,500 sf or more impervious surface area within the cantonment area and those projects that create and/or replace 5,000 square feet or more of impervious surface area within the Vandenberg AFB boundary. Per the related Vandenberg AFB Post-Construction Storm Water Standards, a Storm Water Control Plan would be required during design for approval by the Vandenberg AFB storm water section.

The airfield is one of Vandenberg AFB's industrial facilities covered under the California NPDES Industrial General Permit. This alternative would require amended permit coverage including industrial SWPPP revision. Additional storm water sampling may be required.

Groundwater

Due to the variable depths to groundwater in the area, groundwater may be encountered during construction activities. Some dewatering of groundwater may be required; however, the amount of dewatering would not be expected to have a significant effect on groundwater levels, and groundwater levels would return to normal on completion of construction.

Land disturbance during construction can cause direct pollutant discharges to groundwater. These pollutants can include spills and leaks of fuels and other liquids and stormwater runoff from nearby impervious areas. BMPs contained in the SWPPP would be effective in minimizing groundwater impacts from pollutants.

It would not be expected that the increase in personnel at Vandenberg AFB would impact groundwater supplies because the base receives the majority of its potable water from the Central Coast Water Authority via the Coastal Branch of the California Aqueduct. For more information on potable water systems, see Section 4.2.2.21.

Floodplains

Floodplains are not present at any of the areas proposed for development at Vandenberg AFB. Therefore, no impacts to floodplains would result from implementation of the proposed MQ-9 Wing beddown.

Coastal Zone Management

As federal land, Vandenberg AFB is statutorily excluded from California's coastal zone. In addition, this alternative would not be expected to result in "spillover" effects to a California coastal use or resource because the land disturbance areas would be over 2 miles away.

The USAF determined that the Proposed Action would not have an effect on a California coastal use or resource. The USAF submitted a Coastal Consistency Negative Determination to the California Coastal Commission for the proposed MQ-9 Wing beddown at Vandenberg AFB, which the Commission concurred with in a letter dated August 7, 2020. The USAF determined that the Proposed Action would be fully consistent with the enforceable policies of the California Coastal Zone Management Program (see Appendix A).

4.2.2.14 Water Resources, MQ-9 No Action Alternative at Vandenberg AFB

Under the No Action Alternative, the USAF would not implement the proposed MQ-9 Wing beddown at Vandenberg AFB. None of the proposed construction to support the MQ-9 mission would occur and no MQ-9–related impacts to water resources would result from implementation of the No Action Alternative.

4.2.2.15 Biological Resources, MQ-9 at Vandenberg

4.2.2.15.1 Base Facilities Construction

Flora

Vandenberg AFB conducted a biological survey of the proposed project location in the summer of 2019 (Vandenberg AFB, 2019b). Table 4.2-29 summarizes the vegetation types found during the survey.

All acreages in the table are an estimate of the impact area for each project component. For the purposes of the EIS vegetation analysis, it was assumed that all vegetation within the project component footprint would be permanently lost due to the development of site facilities. Should Vandenberg AFB be selected for the proposed MQ-9 Wing beddown, final design could reduce the amount of vegetation habitat impacted by new facility construction. The greatest impacts would be to maritime chaparral and would primarily result from the construction of the

Maintenance Complex. Burton Mesa chaparral is present within the footprint of the GDT Towers Access Road component. Impacts to this regionally important community would be minimized to the extent practical during the design and construction of the Access Road. Construction-related impacts to vegetation are anticipated to be moderate, long-term adverse impacts. Sensitive species and wetland habitat within the project components study area are discussed in the subsections below.

Table 4.2-29. Vegetation Types within Vandenberg AFB MQ-9 Construction Project Components Study Area

Vegetation Type	Project Components (acres)						Total (acres)
	Maintenance Complex	Dormitory	Fitness Center Expansion Area	Operations Complex	GDT Towers	Access Road	
Central coastal scrub – maritime chaparral	-	-	-	-	0.7	-	0.7
Developed	-	-	0.3	2.3	-	-	2.6
Disturbed/cleared	-	-	0.3	-	-	0.2	0.5
Disturbed/cleared maritime chaparral/ herb (managed area around flightline)	4.1	-	-	-	2.9[(1)]	0.2	7.2
Maritime chaparral	25.6	-	-	-	1.4	5.3	32.3
Maritime chaparral/herb	4.5	-	0.8	-	-	0.3	5.6
Non-native grasses and forbs	1.4	1.3[2]	-	-	-	-	2.7
Non-native tree	0.2	0.2	0.3	-	-	-	0.7
Total	**35.8**	**1.5**	**1.7**	**2.3**	**5.0**	**6.0**	**52.3**

Source: (Vandenberg AFB, 2019b)
Notes:
Dashes (-) indicate that there is no habitat present.
[1] A small amount of developed airfield/taxiway is included in this value.
[2] The Dormitory project site has been subjected to mowing or other disturbance in the past, but had not been recently mowed at time of the survey.

Wetlands

A desktop wetland analysis was conducted for the project areas using available GIS data (Vandenberg AFB, 2019b). A preliminary estimate indicated that 10 to 15 acres of emergent wetlands would be impacted by fill activities associated with the Proposed Action (Figure 3.2-5). A project-specific physical wetland survey was conducted in the spring of 2020, and the USACE was consulted to obtain an approved Jurisdictional Determination. A Jurisdictional Determination is an official determination as to whether wetlands or other waters fall under federal jurisdiction. After consultation with the USACE was completed (see Appendix A), it was determined that no jurisdictional waters are present in the project area and no federal wetland permits would be required.

Fauna

Construction of the Dormitory and Operations Complex communication features would occur in previously developed or disturbed areas of Vandenberg AFB. Portions of the Maintenance

Complex, Dormitory, Fitness Center, GDT Towers, and Access Road are within disturbed/non-native habit. Impacts to wildlife would be minimal because habitat in these areas is limited to non-native grasses and forbs or disturbed vegetation.

Construction of the Maintenance Complex would result in the loss of approximately 30 acres of maritime chaparral habitat. Construction of the Fitness Center Expansion, GDT Towers, and the Access Road would result in the loss of additional maritime chaparral habitat (approximately 8 acres). Construction of the GDT Towers would result in the loss of less than 1 acre of central coastal scrub-maritime chaparral. Construction of the Fitness Center Expansion would result in the loss of approximately 0.8 acre of maritime chaparral/herb. Adverse impacts to faunal species would include direct impacts and loss of species that lack mobility to leave the impacted areas. Impacts would also result from the permanent loss of habitat and would be moderate and long-term. Potential impacts to wetlands and protected species are discussed in the wetland and sensitive species subsections. No significant impacts are anticipated to common wildlife species as the result of construction of the MQ-9 facilities. Upgrading the existing ineffective electrobraid fence with a state-of-the-art deer exclusion fence to eliminate the potential for BASH, would not be expected to adversely impact fauna.

Sensitive Species

Adverse impacts to federally listed species are anticipated to result from facility construction related to the proposed MQ-9 Wing beddown. Under the proposed MQ-9 Wing beddown, federally listed species would continue to be managed and monitored in accordance with the INRMP, and annual coordination with the USFWS would continue. Potential impacts to federally listed species from implementation of the proposed MQ-9 Wing beddown would be similar to those impacts described for vegetation and wildlife. The effects determinations for federally listed species evaluated in the Biological Assessment (Vandenberg AFB, 2020a) are included in Table 4.2-31 and further described below. This table includes impacts related to the construction of facilities and to aircraft operations.

One federally listed marine mammal (southern sea otter) and five mammals protected under the MMPA (Pacific harbor seal, northern elephant seal, California sea lion, northern fur seal, Pacific harbor seal) are known to occur at Vandenberg AFB. No coastal or shoreline habitat would be impacted by the Proposed Action. No construction-related impacts to marine mammal species are anticipated.

Other species occurring in dune, coastal, or shoreline habitat include the California least tern, western snowy plover, black abalone, beach layia, Gaviota tarplant, and La Graciosa thistle. No coastal or shoreline habitat would be impacted by the proposed construction.

Several federally listed species at Vandenberg AFB have the potential to occur in areas with permanent perennial streams, marshes, or other large freshwater surface waters or undisturbed habitat around these features. These include least Bell's vireo, southwestern willow flycatcher, Southern steelhead, tidewater goby, unarmored threespine stickleback, Gambel's watercress, and marsh sandwort. No suitable habitat or known records of these species occur within the proposed construction area. Additionally, despite numerous protocol-level surveys, the California tiger salamander has never been observed at Vandenberg AFB.

Other federally listed species that occur on Vandenberg AFB include the Vandenberg monkeyflower. Vandenberg monkeyflower surveys have been conducted on the installation and there are four known populations of the plant at the installation. None of the known locations are in the vicinity of proposed project sites.

Bald eagles are occasionally seen flying over Vandenberg AFB, and the nearest nesting location is Lake Cachuma. No impacts to bald eagles are anticipated as a result of the proposed MQ-9 Wing beddown. Golden eagles are also known to occur at Vandenberg AFB and utilize coastal habitats as well as large trees for roosting. No habitat has been identified within the proposed project areas, and no construction-related impacts to golden eagles are anticipated.

The USAF determined that four species have the potential to occur in the habitat within the proposed project areas. Sensitive species surveys occurred as part of the biological survey of the proposed project location in the summer of 2019 (Vandenberg AFB, 2019b) (see Appendix A). The survey focused on the El Segundo blue butterfly, California red-legged frog, and vernal pool fairy shrimp. Lomboc yerba santa was not expected in the survey area, and the closest known population was approximately 1.8 miles away. During the survey, the Lompoc yerba santa was observed in the proposed Maintenance Complex. Table 4.2-30 lists potential habitat for these species within the project area. The host plant for El Segundo blue butterfly, seacliff buckwheat, was not encountered at any of the survey areas, and the species is not expected to be present.

The biological survey noted that the Maintenance Complex, Fitness Center Expansion, GDT Towers, and Access Road had evidence of depressional features that may support seasonal ponding. No permanent aquatic features were identified at these locations; however, all noted sites are within 1.6 kilometers of known California red-legged frog sites on Vandenberg AFB but are well outside the 210-meter maximum breeding dispersal distance observed in local studies (Christopher, 2018; USFWS, 2018). Given the distance of proposed project activities from permanent aquatic features occupied by California red-legged frog, quality of potentially suitable habitat present within the proposed project sites, and with incorporation of species-specific measures to avoid and/or minimize adverse effects to the species, the potential for adverse effects is low.

Table 4.2-30. Potentially Suitable Habitat Within Proposed MQ-9 Construction Area

Species	Project Component					Total (50 acres)
	Maintenance Complex (35.8 acres)	Dormitory (1.5 acres)	Fitness Center Expansion Area (1.7 acres)	Towers (5 acres)	Access Road (6 acres)	
California red-legged frog (*Rana draytonii*)	5.87[(1)]	-	0.11	0.72	0.14	6.84
Vernal pool fairy shrimp (*Branchinecta lynchi)*	5.87[(1)]	-	-	0.72	0.142	6.73
Lompoc yerba santa (*Eriodictyon capitatum*)	4.52[(2)]	-	-	-	-	4.52

Source: (Vandenberg AFB, 2019b)
Notes: - No acres of habitat present
[1] This is the total acreage of suitable habitat potentially occupied or utilized by California red-legged frog and/or vernal pool fairy shrimp.
[2] This value represents all locations identified within proposed construction sites, including a 100-foot buffer applied (Vandenberg AFB, 2019b; Mantech, 2019; Santa Barbara Botanic Garden, 2019)

Potential implementation of wetland mitigation activities away from proposed construction sites, but within the same watershed, would occur in habitat with similar characteristics as the depressional features that are present within the project sites and similarly could attract California red-legged frog if suitable conditions are present. Specific wetland mitigation activities would be developed in coordination with the USACE as part of the permitting process if Vandenberg AFB is selected as the alternative carried forward. However, activities would likely focus on invasive species removal within the watershed (e.g., jubata grass, veldtgrass, and/or iceplant).

Mitigation activities within the watershed, if occupied by California red-legged frog at the time of the activity, may also cause indirect injury or death of individuals if they are crushed or trapped or forced into adjacent habitat, or temporarily exposed to increased predation or reduced quality of foraging habitat. Disturbances associated with the activity would be temporary and, when completed, higher functioning habitat would be available. As part of the proposed project, Vandenberg AFB will implement a variety of measures intended to avoid and/or minimize adverse effects on the California red-legged frog. These measures are derived from the Biological Opinion on the MQ-9 Beddown Project dated September 21, 2020 (see Appendix A), and include requirements for pre-activity surveys at each project site for all project and mitigation activities that may affect the federally listed species, seasonal avoidance of construction activities to the maximum extent feasible, and species relocation to suitable habitat outside of proposed project sites, if individuals are present.

Given the distance of proposed project activities from permanent aquatic features occupied by California red-legged frog, quality of potentially suitable habitat present within the proposed project sites, and with incorporation of species-specific measures to avoid and/or minimize adverse effects to the species, the potential for adverse effects is low. Regardless, due to the potential for work to occur within the wet season and the potential for relocation of individuals, the USAF has determined that project construction activities may affect, and are likely to adversely affect California red-legged frog.

The depressional features have the potential to support vernal pool fairy shrimp, although the biological survey noted that all the sites have been impacted by invasive weed encroachment. Environmental conditions in the region (prolonged drought and generally more extreme episodic weather events) limit the ability to conduct quality vernal pool fairy shrimp protocol surveys; therefore, for planning purposes, depressional features are presumed to be occupied by vernal pool fairy shrimp. Should Vandenberg AFB be selected for the MQ-9 Wing beddown, and if the USAF cannot feasibly avoid the pools, a mitigation plan will be developed in coordination with the USFWS. Key elements will include enhancement and restoration of existing pools at a 1:1 or 3:1 mitigation ratio at other locations on Vandenberg AFB, with a focus on invasive species management and removal (see Table 2.7-1). Topsoil would also be preserved from impacted pools and retained for seeding other pools. With these measures, USAF determined that the proposed construction activities may affect, and are likely to adversely affect, vernal pool fairy shrimp. Additional measures to protect vernal pool prairie shrimp are included in the USFWS Biological Opinion dated September 21, 2020 (see Appendix A) and incorporated into this EIS in Table 2.7-1. The USFWS concurred with the determination may affect and are likely to adversely affect vernal pool fairy shrimp in the Biological Opinion.

Several localities of Lompoc yerba santa were identified in the chaparral habitat at the location of the proposed Maintenance Complex, with several localities occurring along the southern project border (approximately 4.52 acres of occupied when individual localities were buffered 100 feet [radial]). Adverse effects to Lompoc yerba santa localities would include construction-related removal of all plants and associated habitat, resulting in mortality and overall reduction in the larger distribution of the species on Vandenberg AFB.

To avoid and minimize adverse effects to the species, the USAF will incorporate a series of measures (Table 2.7-1) to avoid where feasible, then incorporate resources from this new location into restoration and enhancement of other existing Lompoc yerba santa locations. An updated current Lompoc Yerba Santa Restoration Plan will be developed and incorporate all current Lompoc yerba santa localities (Table 2.7-1).

For all unavoidable removal of occupied habitat, the USAF would implement a combination of indirect and active restoration practices developed in consultation with the USFWS and Lompoc yerba santa experts at the Santa Barbara Botanic Garden or other institutions. Measures could include, but not be limited to, enhancement of occupied habitat by removing invasive plants species at a 3:1 ratio USFWS) (habitat enhanced: habitat affected). As a result, the USAF has determined that the proposed action may affect and is likely to adversely affect Lompoc yerba santa.

4.2.2.15.2 Base Airfield Operations

Airfield operations would not remove flora or wetlands at Vandenberg AFB. Any increase in operations could increase the potential for bird/wildlife-aircraft strikes. Vandenberg AFB would continue to adhere to the installation's BASH Plan to minimize the risk of strikes. Adherence to the existing BASH program (see Section 3.1.3) would minimize the risk of bird-aircraft strikes to negligible levels. The primary potential for impacts is related to noise. Noise-related impacts to wildlife and sensitive species are anticipated to be minor and short term. As shown in the noise section, an MQ-9 flying at 1,400 feet MSL over Vandenberg AFB has a maximum noise level of 63 dBA. The MQ-9 is considered to be about half as loud as a KC-135R aircraft, a representative transient aircraft at Vandenberg AFB, which has a maximum noise level of 72 dBA (people typically perceive a sound that is 10 dB less than another sound as being "half as loud"). To further put these numbers in perspective, a typical vacuum cleaner at a distance of 10 feet generates approximately 70 dB, and normal conversation at a distance of 3 feet typically generates approximately 65 dB (Los Angeles World Airports, 2020). These common sound sources are qualitatively different from an aircraft overflight, but provide a general idea of relative loudness.

MQ-9 operations would occur over beach and coastal habitats and would introduce a new source of noise to these habitats. While this noise increase is minor and short term and wildlife species tend to adjust to aircraft-related noise (Appendix D of the Draft EIS), the USAF has determined that aircraft operations may affect, but are not likely to adversely affect the southern sea otter, California least tern and western snowy plover (Vandenberg AFB, 2020a). The USFWS agreed to this determination and included additional measures in the Biological Opinion. These measures have been incorporated into this EIS in Table 2.7-1.

The USAF has determined that aircraft operations are unlikely to result in take of marine mammals per MMPA military readiness criteria. MQ-9 operations are not likely to significantly alter or cause marine mammals to abandon natural behavior patterns. Instances of seals or sea lions reacting to

aircraft have not been observed at Vandenberg AFB and the current Vandenberg AFB Letter of Authorization does not impose a limit on the number of annual UAS operations (NOAA, 2019; USAF, 2018d). Per mitigation measures required by the Letter of Authorization, MQ-9s and other Class 4 and 5 UASs would not operate lower than 1,000 feet (except during take-off and landing).

Species not listed in Table 4.2-31 are species that due to a lack of suitable habitat, lack of known occurrences, and/or information demonstrating a species is only known from other areas of Vandenberg AFB are unaffected by proposed activities.

Table 4.2-31. Wildlife and Habitat Effect Determination Summary for Vandenberg AFB

Common Name	Scientific Name	Status	Effect Determination[1]	Potential Occurrence on Vandenberg AFB
Federally Listed Threatened or Endangered Species				
Southern sea otter	*Enhydra lutris nereis*	FT	May Affect, Not Likely to Adversely Affect	O
California least tern	*Sterna antillarum browni*	FE	May Affect, Not Likely to Adversely Affect	O
Western snowy plover	*Charadrius nivosus nivosus*	FT	May Affect, Not Likely to Adversely Affect	O
California red-legged frog	*Rana draytonii*	FT	May Affect, Likely to Adversely Affect	O
Vernal pool fairy shrimp	*Branchinecta lynchi*	FE	May Affect, Likely to Adversely Affect	O
Lompoc yerba santa	*Eriodictyon capitatum*	FE	May Affect, Likely to Adversely Affect	O
Federally Listed Candidate or Other				
Pacific harbor seal	*Phoca vitulina ruchardii*	MMPA	Unlikely to Take	O
Northern elephant seal	*Mirounga angustirostris*	MMPA	Unlikely to Take	O
California sea lion	*Zalophus californianus*	MMPA	Unlikely to Take	O
Northern fur seal	*Callorhinus ursinus*	MMPA	Unlikely to Take	P
Pacific harbor seal	*Phoca vitulina ruchardii*	MMPA	Unlikely to Take	O
Bald eagle	*Haliaeetus leucocephalus*	BGEPA	No Take	O
Golden eagle	*Aquila chrysaetos*	BGEPA	No Take	O

Sources: (Vandenberg AFB, 2011a; USFWS, 2020c; Vandenberg AFB, 2020a)
Key: AFB = Air Force Base; FE = Federally Endangered; FT = Federally Threatened, FC = Federal Candidate, PT = Proposed Threatened, BGEPA = Bald and Golden Eagle Protection Act, MMPA = Marine Mammal Protection Act, O = Observed, P = Potential, U = Unlikely; USFWS = U.S. Fish and Wildlife Service
Note:
[1] Consultation with the USFWS has been completed, and the USFWS has concurred with the effects determinations, provided that the mitigations included in Table 2.7-1 are completed. Effects determination includes potential effects from proposed construction and proposed aircraft operations.

4.2.2.16 Biological Resources, MQ-9 No Action Alternative at Vandenberg

Under the No Action Alternative, no MQ-9 aircraft would be based at Vandenberg AFB. None of the proposed construction to support the MQ-9 mission would occur and biological resources would remain as described in Section 3.2.8. No MQ-9–related impacts to biological resources would result from implementation of the No Action Alternative.

4.2.2.17 Cultural Resources, MQ-9 at Vandenberg

4.2.2.17.1 Base Facilities Construction

Archaeological Resources

As described in Section 3.2.9, the entire APE for direct impacts for the Proposed Action has been surveyed and no archaeological resources were discovered (USAF, 2020d). Although unlikely, the remains of an unrecorded archaeological resource may be uncovered during ground-disturbing activities associated with facility construction. In the event of an inadvertent discovery during ground-disturbing activities, Vandenberg AFB and its contractor would cease work immediately and the USAF would comply with Section 106 of NHPA, as specified in standard operating procedures established in the ICRMP (Vandenberg AFB, 2005). Therefore, facility construction for the beddown of the MQ-9 would have no adverse effect on archaeological resources.

Architectural Resources

As described in Section 3.2.9, there are no NRHP-eligible architectural resources in the APE for direct impacts for the Proposed Action at Vandenberg AFB. Building 8401 would require internal renovations to adapt it for the MQ-9 Wing Operations Complex, but the building was determined to be ineligible for listing on the NRHP both individually and as part of a historic district. Therefore, the proposed facility construction would have no direct effect on NRHP-listed or -eligible buildings or structures.

There are 26 unevaluated pre-1990 buildings within the APE for indirect visual impacts (0.5-mile buffer of the direct APE). For the purposes of analysis, unevaluated properties are treated as though they are eligible for listing on the NRHP. The issue with new construction is whether the new facilities would affect the viewshed of an NRHP-eligible architectural resource, and thus change a character-defining setting. In this case, proposed facilities would be located near other similar facilities. For example, the proposed Airmen Dormitory would be constructed in the base dormitory complex area, and the addition to the Fitness Center would be in an area characterized by recreational facilities. Additionally, the design of new facilities would adhere to applicable Vandenberg AFB facility guidelines. Therefore, the proposed facility construction would have no adverse effect on unevaluated buildings or structures.

Traditional Cultural Properties

The USAF has initiated consultation with the California Office of Historic Preservation (i.e., the California SHPO), federally recognized tribes, and interested parties as described in Section 1.4.1. As described in Section 3.2.9, there are no known traditional cultural properties or sacred sites within the direct or indirect APEs for the MQ-9 Wing beddown. Therefore, the MQ-9 Wing beddown would have no adverse effect on traditional cultural properties or sacred sites.

In accordance with NHPA Section 106, the USAF consulted with the California Office of Historic Preservation, federally recognized tribes, and interested parties regarding the determination of *no historic properties affected*, as described in Section 1.4.1.2. The Santa Ynez Band of Chumash Indians responded with concerns for potentially undiscovered cultural resources in the areas of construction near the Vandenberg AFB airfield. In a letter dated June 3, 2020, the California SHPO

closed the consultation until and unless Vandenberg AFB is selected as the MQ-9 beddown location (see Appendix A).

4.2.2.17.2 Base Airfield Operations

Archaeological Resources

Noise from airfield operations would have no effect on archaeological resources.

Architectural Resources

As discussed in Section 3.2.9, there are no known NRHP-listed or -eligible architectural resources within the APE for indirect noise/vibration impacts associated with airfield operations. However, scientific studies of noise and vibration have shown that subsonic operations (such as that of the MQ-9 aircraft) are unlikely to cause damage to architectural resources (Committee on Hearing and Bio Acoustics, 1977; Sutherland L. R., 1990; Sutherland L. C., 1989). Therefore, noise/vibrations from airfield operations would have no adverse effect on NRHP-listed or -eligible or unevaluated architectural resources.

Traditional Cultural Properties

The USAF has initiated consultation with the California Office of Historic Preservation (i.e., the California SHPO), federally recognized tribes, and interested parties as described in Section 1.4.1. There are no known traditional cultural properties or sacred sites within the APE for indirect noise/vibration impacts associated with airfield operations. Therefore, noise/vibrations from airfield operations would have no adverse effect on traditional cultural properties or sacred sites.

4.2.2.18 Cultural Resources, MQ-9 No Action Alternative at Vandenberg AFB

Under the No Action Alternative, the MQ-9 Wing beddown would not occur and there would be no change to cultural resources affected environment as described in Section 3.2.9. There would be no MQ-9–related impacts to cultural resources from implementation of the No Action Alternative.

4.2.2.19 Land Use, MQ-9 at Vandenberg

Proposed facility construction for the MQ-9 mission at Vandenberg AFB (shown in Figure 4.2-2) is compatible with existing facilities and functions on the base. The new Airmen Dormitory, Fitness Center, and Maintenance Complex occupy vacant areas with access to existing road access and infrastructure. They do not conflict with any restricted safety or security areas. Similarly, the new access road to support new towers along the flightline would not disrupt airfield uses. During construction of these facilities, traffic patterns could experience temporary rerouting in the locale of construction sites, causing minor inconvenience to some personnel. Construction noise and dust may cause temporary annoyance, but would not persist after the construction period and following replanting of exposed soils.

The MQ-9 operations would cause little change in the acoustic environment at Vandenberg AFB and surrounding areas, and consequently negligible effect on land use. As reported in Section 4.2.2.3, the areas exposed to noise levels of 65 dB CNEL would remain on Vandenberg AFB (see Figure 3.2-7). Pattern work for the MQ-9 would occur within 3 miles of the airfield within the Vandenberg AFB boundaries. The City of Lompoc and the Federal Prison currently experience noise levels less than 45 dB CNEL. No perceptible increase would occur in the City of Lompoc or any other residential areas around the base from the MQ-9 operations. The prison facility would experience about a 1 dB CNEL increase. Most persons would not perceive this slight increase, and noise would remain at levels well below the AICUZ threshold of 65 dB CNEL.

An estimated 2,096 new housing units would be needed off-base between 2022 and 2024. Assuming densities of four to eight dwelling units per acre, this would translate into development of about 262 to 524 acres of residential land by 2025. The personnel would be expected to primarily locate in the Santa Maria-Orcutt and the Lompoc-Vandenberg Village areas. There is a continuing shortage of affordable housing in northern Santa Barbara County, although cities have supported new residential construction. Recent real-estate trends in the area show shifts into smaller cities such as Guadalupe, located north of the base, and Buellton, located to the east. Increased demand could affect local land-use patterns, resulting in pressure for expansion of smaller cities. Local jurisdictions regulate and approve any new residential development in compliance with their existing zoning, plans, and building codes. Santa Barbara County would have jurisdiction over new residential development in unincorporated areas. Land-use restrictions, which have resulted from water and sewer availability, wildfires, and droughts in Santa Barbara County, could further impede the process of approval and construction of new residential units. Some personnel may have to opt initially for less suitable housing.

Expansion of residential land use in small communities could also put pressure on other community services and amenities (such as libraries, police, healthcare, childcare and schools. The base would fulfill some of these functions for persons who have access to the base

Recreation on Vandenberg AFB would also experience little change in noise from the MQ-9 operations. No impact on recreation from noise would result. The increase in personnel and dependents would add to the number of persons permitted to use recreational facilities on base; this could affect the capacity to provide particular types of recreation with current amenities. Activities that occur in natural surroundings would tend to absorb the increased use, although some persons may notice the additional numbers of participants. The effect of the added numbers of persons could slightly degrade the quality of recreational activities.

Recreation in surrounding areas would likely absorb the additional base-related population's use of local and regional recreational attractions—both natural and developed. Recreational amenities in nearby communities where some of the new personnel may find housing would likely keep pace with the increase on community recreational resources, considering many of these new residents would use recreational amenities on Vandenberg AFB.

4.2.2.20 Land Use, MQ-9 No Action Alternative at Vandenberg

Under the No Action Alternative, there would be no MQ-9 Wing mission at Vandenberg AFB, which would continue to support the space and missile programs that currently operate at the base. No new

construction or new flying activity would take place. Noise levels and compatibility with land uses on and off the base would be the same as the affected environment described in Section 3.2.10.

4.2.2.21 Infrastructure, MQ-9 at Vandenberg

Potable Water System

Implementation of the proposed MQ-9 Wing beddown would increase base population by 4,484 personnel and dependents and include approximately 511,520 square feet of new construction and renovation of building 8401 as identified in Table 2.3-1 and Table 2.3-4, including a dormitory for 168 Airmen. The long-term potable water requirements on Vandenberg AFB would consist of the daily potable water requirement for the 168 Airmen living on base and the 1,732 personnel supporting the mission. These requirements are estimated to be 0.048 MGD using water use factors based on historical use and potable water intensity measures used by the base.

The potable water requirement for the new personnel and dependents living off base (4,316) would be approximately 0.5 MGD. This amount would be spread across the various nearby municipalities, such as Lompoc, Santa Maria, Orcutt, and Buellton. No significant effects are anticipated.

Sanitary Sewer System

With the implementation of the proposed MQ-9 Wing beddown at Vandenberg AFB, average daily wastewater flows would increase by less than 5 percent from 0.80 MGD to 0.804 MGD. This increase could be processed by the City of Lompoc without any modifications to existing equipment. Wastewater generated by personnel living off base would add less than 0.5 MGD to the cumulative total for the cities of Lompoc, Santa Maria, Orcutt, and Buellton. Thus, no significant effects are anticipated.

Storm Drainage System

The proposed MQ-9 Wing beddown would require renovation of facilities and construction of new facilities near the existing developed flightline and in the cantonment area. The total disturbed area associated with these projects would be approximately 11 acres, and impacts would not be significant. All contractors would be required to comply with applicable statutes, standards, regulations, and procedures regarding stormwater management. During the design phase, LID stormwater controls would be incorporated into construction plans. These would include constructing infiltration or underground retention structural controls. For additional information please refer to Section 4.2.2.13.1.

Solid Waste Management

Under the proposed MQ-9 Wing beddown at Vandenberg AFB, solid waste would continue to be managed in accordance with AFMAN 32-7002 and the ISWMP. The generation of construction and renovation debris could adversely affect waste diversion rates. Wastes generated during construction and renovation would be disposed of off base by the contractor. However, to the greatest extent practicable, the contractor would segregate all waste generated and manage the wastes separately.

In addition, to the extent practicable, recyclable construction and renovation waste would be transported to a recycler. All soils excavated for crane pads, staging areas, and access roads would

be reused onsite. Concrete debris would be transported off base for recycling or proper disposal. All cleared and grubbed material would be disposed of off property and would comply with federal, state, and local regulations. Documentation that material has been disposed of at a certified recycle or landfill would be submitted by the contractor to Vandenberg AFB for all material disposed offsite.

Noncompliance with applicable regulatory requirements or disposal of quantities of solid waste that would cause this action not to meet mandated diversion rates is considered an adverse impact. Debris would be segregated to facilitate subsequent pollution prevention options. Pollution prevention options would be exercised in the following order: reuse of materials, recycling of materials, and regulatory-compliant disposal.

The addition of 4,484 personnel including their associated dependents would generate additional municipal solid waste, but the effect on the municipal solid waste program (collection, disposal, etc.) in Santa Barbara and San Luis Obispo Counties would not be discernable. The overall impacts would not be significant.

Compliance with all applicable federal, state, and local regulations, rules and requirements, and applicable Vandenberg AFB plans would govern all actions associated with implementing the proposed MQ-9 Wing beddown. Therefore, no significant effects to solid waste management are anticipated.

Electrical System

Implementation of the proposed MQ-9 Wing beddown would increase base population by 4,484 personnel and dependents and include approximately 511,520 square feet of new construction and renovation of building 8401. Electric power requirements on base would consist of the demand created with the addition of the new construction, including the demand from the 168-person dormitory. With a peak daily demand of 25 MW being generated by the 5,061,000 square feet of facility space at Vandenberg AFB, the additional new construction would add approximately 2.5 MW to peak demand. With an available capacity of 100 MW, Vandenberg AFB could accommodate this increased demand totaling 27.5 MW.

Off-base electrical demand would increase, spread throughout the nearby communities Lompoc, Santa Maria, Orcutt, and Buellton. However, with their existing service to 5.4 million customers, PG&E would be able to meet this demand without any effect to their system.

Natural Gas System

Natural gas requirements for the proposed ACC MQ-9 mission would be generated by the increase of 4,484 personnel and dependents and the addition of approximately 511,520 square feet of new construction and renovation of building 8401.

With a yearly demand of 235 MCF being generated by the 5,061,000 square feet of facility space at Vandenberg AFB, the additional new construction would add approximately 23.5 MCF to yearly demand. With an available capacity of 632 MCF, Vandenberg AFB could accommodate this increased demand totaling 268.5 MCF.

Off-base natural gas demand would increase, spread throughout the nearby communities Lompoc, Santa Maria, Orcutt, and Buellton. However, with their existing service to 21.6 million customers

in this region, Southern California Gas Company would be able to meet this demand without any effect to their system.

4.2.2.22 Infrastructure, MQ-9 No Action Alternative at Vandenberg

Under the No Action Alternative, the beddown of MQ-9 aircraft at Vandenberg AFB would not occur. The use of utilities and power and waste generation at Vandenberg AFB would remain at the levels described for the affected environment in Section 3.2.11. No MQ-9–related impacts to the Vandenberg AFB infrastructure system would result from implementation of the No Action Alternative.

4.2.2.23 Transportation, MQ-9 at Vandenberg

4.2.2.23.1 Base Facilities Construction and Personnel Increase

The analysis of the proposed MQ-9 Wing beddown at Vandenberg AFB includes similar assumptions to those used at Tyndall AFB in order to analyze potential impacts to the transportation network. Table 4.2-32 summarizes the operating conditions for the three key intersections and six road segments around Vandenberg AFB.

Table 4.2-32 Proposed MQ-9 Wing Beddown Action Intersection and Road Segment LOS and Performance Metrics

Intersection or Road Segment	Time Period	2025 Analysis Year			
		LOS	V/C Ratio	Control Delay (sec/veh)	Highest Contributing Lane Group
CA-1 and Lompoc Casmalia Road	a.m. p.m.	D D	1.17 0.99	39.2 54.3	CA-1 northbound left turns CA-1 northbound left turns
Santa Lucia Canyon Road and Pine Canyon Road	a.m. p.m.	D F	0.52 1.12	25.2 60.1	Left turns from Pine Canyon Road Left turns from Pine Canyon Road
Arguello Boulevard and Ocean Avenue	a.m. p.m.	B A	0.14 0.21	12.5 9.4	Left turns from Solvang Gate Left turns from Solvang Gate
CA-1 east of Santa Maria Gate	a.m. p.m.	B B	0.37 0.49	NA	NA
CA-1 south of Santa Maria Gate	a.m. p.m.	A A	0.28 0.22	NA	NA
Santa Lucia Canyon Road north of Lompoc Gate	a.m. p.m.	D D	0.46 0.58	NA	NA
Santa Lucia Canyon Road south of Lompoc Gate	a.m. p.m.	D D	0.36 0.51	NA	NA
Ocean Avenue east of Solvang Gate	a.m. p.m.	C A	0.36 0.01	NA	NA
Ocean Avenue west of Solvang Gate	a.m. p.m.	A C	0.01 0.23	NA	NA

Key: LOS = Level of Service; NA = not applicable; sec/veh = seconds per vehicle; US-98 = U.S. Highway 98; V/C = volume-to-capacity

Notes:

[1] For signalized intersections, one lane group may cause a significant impact to the overall LOS for the intersection. The table shows this lane group for each analysis period. The V/C ratio is for the highest lane group (worst case).

[2] The analysis for a future year yields acceptable operating conditions and no impacts to the intersection of Utah Street and West Lompoc Casmalia Road. Therefore, the analysis excludes this intersection as no trips are expected to access Vandenberg AFB via Utah Gate.

The primary location for added trips for this action is the intersection of CA-1 and Lompoc Casmalia Road (Santa Maria Gate area) and the intersection of Santa Lucia Canyon Road and Pine Canyon Road (Lompoc Gate area). The afternoon peak hour would experience a degraded LOS at both primary intersections due to the added traffic leaving the base (due to the assumed MQ-9 trips added). In addition, the section of Santa Lucia Canyon Road south of Pine Canyon Road would experience LOS D during both peak hours due to added trips using the two-lane road segment after exiting Vandenberg AFB from Lompoc Gate. Acceptable conditions would exist on Ocean Avenue due to limited traffic added relative to the other two gates. While a short four-lane road segment allows traffic to access the intersection of Ocean Avenue and Arguello Boulevard, Ocean Avenue is primarily a two-lane highway and the analysis is based on the two-lane segment. This action would result in some traffic condition degradation below the Caltrans threshold for acceptable operating conditions during the peak periods. Impacts to two intersections and two road segments would be significant according to the Caltrans LOS guidelines (i.e., LOS D and lower is considered unacceptable).

While the existing Vandenberg AFB ECF study does not include turning movement data for the intersection of Santa Lucia Canyon Road and CA-1, MQ-9 at Vandenberg AFB would likely contribute to additional impacts to left turning traffic onto CA-1. Left turns from Santa Lucia Canyon Road involve crossing two lanes of southbound traffic and accelerating and merging into the northbound left lane. The intersection has separate flared right turns from Santa Lucia Canyon Road with an acceleration lane. CA-1 has a barrier wall separating the north and south directions, with a gap at the intersection for turning traffic. The existing two-way-stop–controlled intersection includes pavement markings delineating an acceleration lane for left turns onto CA-1. Crashes at this intersection could be severe when involving left turns from Santa Lucia Canyon Road. Table 2.7-1 discusses a mitigation strategy for the potential impacts at this intersection.

4.2.2.24 Transportation, MQ-9 No Action Alternative at Vandenberg

Under the No Action Alternative, no MQ-9 facility construction or MQ-9 increase in base personnel would occur. No MQ-9–related impacts to the transportation network would result from implementation of the No Action Alternative. Traffic conditions at the gates would continue to be delayed during certain hours of the day as described in Section 3.2.12.1.

4.2.2.25 Socioeconomics, MQ-9 at Vandenberg

4.2.2.25.1 Base Facilities Construction and Personnel Increase

The total costs of construction associated with the MQ-9 Wing beddown at Vandenberg AFB is estimated at $400 million. Assuming that construction would begin in 2021 and occur over 4 years, the average annual cost of construction would be $100 million per year. The increase in personnel associated with the MQ-9 Wing at Vandenberg AFB would be 1,900 new USAF jobs.

Regional Economy, Employment, and Income

The increased employment and payroll of 1,900 new USAF jobs would be expected to have a positive, long-term economic impact on the regional economy. Table 4.2-33 indicates the number and type of incoming personnel by pay grade. The average annual salary for incoming personnel was estimated and is displayed in Table 4.2-34.

Table 4.2-33. Personnel by Pay Grade, MQ-9 Wing at Vandenberg AFB

Type	O1-O2	O3 & Above	E1-E4	E5 & Above	Total
Officers	57	243	0	0	300
Enlisted	0	0	510	690	1,200
Total Active Duty	**57**	**243**	**510**	**690**	**1,500**
Department of Defense Civilian	150	150	0	0	300
BOS	50	50	0	0	100
System Support	0	0	0	0	0
Total	**257**	**443**	**510**	**690**	**1,900**

Key: O = officer; E = enlisted

Table 4.2-34. Annual Basic Income, MQ-9 Wing at Vandenberg AFB

Grade	Average Annual Salary	Total Personnel	Annual Basic Income
O1-O2	$54,000	257	$13,867,456
O3 & Above	$96,000	443	$42,546,746
E1-E4	$25,200	510	$12,852,000
E5 & Above	$50,000	690	$34,500,000

Key: O = officer; E = enlisted (2020 dollars)

The direct employment of USAF personnel would result in indirect and induced employment. Table 4.2-35 summarizes projected changes in employment in northern Santa Barbara County resulting from 1,900 personnel associated with an MQ-9 Wing at Vandenberg AFB.

Table 4.2-35. Employment (Jobs) Resulting from Personnel Changes in Northern Santa Barbara County, MQ-9 Wing at Vandenberg AFB

	Employment[1]		
	Direct	Indirect and Induced[3]	Total
Per Year	475	190	665
Total[2]	**1,900**	**760**	**2,660**

Notes:
[1] Employment includes direct employment from incoming personnel and indirect and induced employment.
[2] Totals may not add due to rounding.
[3] IMPLAN economic model (IMPLAN, 2018)

The increase in personnel at Vandenberg AFB would generate tax revenues (see Table 4.2-36).

Table 4.2-36. Tax Revenues, MQ-9 Wing at Vandenberg AFB

Description	Total
State and Local Tax	$17,914,480
Federal Tax	$48,466,072
Total State, Local, and Federal Tax	**$66,380,552**

Approximately $400 million of construction expenditures would create direct, indirect, and induced employment and earnings (see Table 4.2-37). The estimated total increase in on-base and off-base jobs would be 915 in 2021, 2,161 in 2022, 3,432 in 2024, and peak at 4,097 jobs at the beginning of 2025, and then level off at approximately 2,660 jobs after 2026 (from combining Table 4.2-35 and Table 4.2-37).

Table 4.2-37. Employment (Jobs) Resulting from Construction Expenditures in Santa Barbara County, MQ-9 Wing at Vandenberg AFB

Year	Construction Costs (millions)	Total Labor Income	Employment (Jobs)			
			Direct	Indirect	Induced	Total
2021	$60	$59,062,820	643	78	194	915
2022	$100	$96,536,861	1,052	127	317	1,496
2023	$100	$94,672,412	1,031	125	310	1,466
2024	$100	$92,843,965	1,011	122	304	1,437
2025	$40	$36,420,336	397	48	119	564
Total	**$400**	**$379,536,394**	**4,134**	**500**	**1,244**	**5,878**

Population

Table 4.2-38 presents the Vandenberg AFB expected personnel by year, including an additional 1,900 personnel associated with the MQ-9 Wing. Arriving wing personnel would be approximately 475 per year.

Table 4.2-38. Personnel Estimates at Vandenberg per Year, MQ-9 Wing

Personnel	2022	2023	2024	2025	2026	2027
No Action	6,857	6,857	6,857	6,857	6,857	6,857
Total MQ-9 Wing	**7,332**	**7,807**	**8,282**	**8,757**	**8,757**	**8,757**

There would be 2,584 dependents who would accompany the military personnel for a total incoming population of 4,484 (see Table 4.2-39). The additional population growth would increase from a projected 0.94 percent per year to 1.33 percent per year in Northern Santa Barbara County. This would be a manageable growth rate.

Table 4.2-39. Population Estimates in Northern Santa Barbara County, MQ-9 Wing at Vandenberg AFB

Year	Estimated Population without MQ-9 Wing	Year-Over-Year Growth	Incoming Population with MQ-9 Wing	Estimated Population with MQ-9 Wing
2019	257,644	-	-	257,644
2020	260,025	0.924%	-	260,025
2021	262,427	0.924%	-	262,427
2022	264,852	0.924%	1,121	265,973
2023	267,299	0.924%	1,121	269,541
2024	269,769	0.924%	1,121	273,132
2025	272,262	0.924%	1,121	276,746
2026	274,777	0.924%	-	279,261

Source: (California Department of Finance, 2020) Adjusted for North County

Housing

There would be an increase in housing demand in Northern Santa Barbara County as a result of this alternative. On-base housing and dorms would continue to accommodate 1,089 military personnel in housing and 468 in dorms rooms, including 168 new dorm rooms constructed as part of the MQ-9 Wing beddown. The net additional off-base number of USAF personnel would be 1,900 less the additional 168 dorm rooms, or 1,732. Off-base personnel would be distributed

throughout the region as described in Section 3.2.13. The 1,732 USAF personnel plus the 760 secondary personnel would increase off-base housing demand by 1,589 units for USAF and 507 units for secondary employees, for a total of 2,096 housing units (9 percent of USAF personnel are married to other USAF personnel (Air Force Personnel Center, 2020), and secondary labor participation rate is 1.5 jobs per household). The increased demand would place additional strain on a housing market which has limited supply of suitable rental housing and has higher cost owner-occupied housing (see Table 3.2-16).

Education

The incoming USAF personnel would be accompanied by 2,584 dependents associated with the MQ-9 Wing. Approximately 1,292 dependents would be children between the ages of 0 to 18 and, of those, an estimated 950 children would be of school age. Student enrollment would increase with the incoming personnel (see Table 4.2-40). The historic ROI annual rate of increase is 0.736 percent. The increase in USAF-related students would result in an increase to 1.2 percent for 4 years. This increased number of students could result in some crowding, but would not be expected to substantially affect the school system as increased enrollment would result in additional state funds for schools.

Table 4.2-40. Total Enrollment Estimates in Northern Santa Barbara County, MQ-9 Wing at Vandenberg AFB

School Year	Estimated Enrollment without MQ-9 Wing	Incoming Students (with MQ-9 Wing)	Estimated Enrollment (with MQ-9 Wing)
2018	47,047	-	47,047
2019	47,393	-	47,393
2020	47,742	-	47,742
2021	48,093	-	48,093
2022	48,447	238	48,685
2023	48,804	238	49,280
2024	49,163	238	49,877
2025	49,525	238	50,477
2026	49,890	-	50842

Source: derived from Santa Barbara Unified School District, 2017

The majority of students would attend schools in Lompoc and the Santa-Maria Orcutt area. An increase in students to the districts would require additional capacity. An estimated average of 10 employees per 100 children in Santa Barbara County would result in an increased demand for 95 additional school employees including administrators, teacher, support, and maintenance. These individuals would also need housing in a tight housing market.

Public Services

There would be an increased demand for public services such as police, fire, and medical services (see Table 4.2-41). Approximately 60 percent more public service personnel would be needed for secondary workers and their families. Public service personnel would have to compete for housing in Santa Barbara County.

Table 4.2-41. Public Services, MQ-9 Wing at Vandenberg AFB

Year	Police			Fire			Medical		
	Total Safety Personnel without MQ-9 Wing	Total Personnel (with MQ-9 Wing)	Change	Total Personnel without MQ-9 Wing	Total Personnel (with MQ-9 Wing)	Change	Total Personnel without MQ-9 Wing	Total Personnel (with MQ-9 Wing)	Change
2019	564	564	0	682	682	0	1,150	1,150	0
2020	569	569	0	685	685	0	1,155	1,155	0
2021	575	575	0	688	688	0	1,160	1,160	0
2022	579	582	3	691	693	2	1,166	1,169	3
2023	585	590	5	696	699	3	1,173	1,179	6
2024	590	598	8	700	705	5	1,181	1,190	9
2025	596	606	10	705	712	7	1,190	1,201	11
2026	602	612	10	710	717	7	1,197	1,209	12

4.2.2.26 Socioeconomics, MQ-9 No Action Alternative at Vandenberg

Under the No Action Alternative, no MQ-9 facility construction or MQ-9 increase in base personnel would occur. No MQ-9–related impacts to the transportation network would result from implementation of the No Action Alternative. Traffic conditions at the gates would continue to be delayed during certain hours of the day as described in Section 3.2.12.1. However, without the influx of base expenditures and personnel spending, the area would lack some of the economic foundation needed for a healthy economy and sustainable community development.

4.2.2.27 Environmental Justice, MQ-9 at Vandenberg

4.2.2.27.1 Base Airfield Operations and Personnel Increase

No off-base populations would be exposed to noise levels of 65 dB CNEL or greater from MQ-9 aircraft at Vandenberg AFB. There are no off-base populations within the APZs. There would be no noise-related impacts to minority and low-income populations and no noise impacts on children or the elderly. Overflight of on-base housing could result in annoyance but would not be expected to exceed 55 dB CNEL and would not have a significant impact on base.

An increase in the number of USAF personnel associated with MQ-9 aircraft at Vandenberg AFB would increase off-base housing demand by approximately 2,096 units in the northern Santa Barbara County ROI (see Section 4.2.2.25.1). The greater demand could lead to higher prices, which could affect low-income residents who typically spend a larger proportion of their income on housing and affect elderly residents on fixed incomes. However, it would be unlikely that USAF personnel would compete for the same housing units as lower-income and elderly residents. The Basic Allowance for Housing (BAH) and Housing Requirements Market Analysis (HRMA) are two programs that reduce the potential demand for low-cost housing units by USAF personnel. The BAH is a monthly allotment designed to ensure that USAF personnel are adequately housed. The 2020 Vandenberg AFB monthly nontaxed allotment for USAF personnel ranges from $1,524 to $2,502, depending on rank and number of dependents (Vandenberg AFB, 2020c). This means

that housing demand by USAF personnel is normally concentrated above low-cost housing and, instead, is more in the low to medium price range.

The HRMA is another program designed to ensure that USAF personnel have suitable housing. The HRMA specifically defines suitable housing and excludes housing such as mobile homes (frequently occupied by the elderly), housing that is not acceptable for health or safety reasons, or housing outside a 60-minute commute. Typically, this means that some lower-income housing is not considered adequate housing for USAF personnel. In summary, there would be an overall effect on housing demand and a potential increase in housing prices but the effect would not be expected to disproportionately affect environmental populations of low-income or minority persons.

Vandenberg AFB has an established Child Development Center, a Family Child Care, and a School Age Care to support military children. Cities such as Lompoc and Santa Maria have similar programs for pre-school and after-school child care. Children would not be expected to be adversely affected by the cumulative Vandenberg AFB actions.

There are no parks, schools, daycares, hospitals, or assisted living facilities exposed to 65 dB CNEL or greater due to aircraft noise. There would be no health or safety effects on children or elderly populations residing off base.

4.2.2.28 Environmental Justice, MQ-9 No Action Alternative at Vandenberg

Under the No Action Alternative, the MQ-9 Wing would not beddown at Vandenberg AFB. There are no off-base residential land areas or populations impacted by noise levels of 65 dB DNL associated with affected environment aircraft operations at Vandenberg AFB. There would be no disproportionate noise effects to minority or low-income populations as a result of the No Action Alternative. There would be no anticipated health or safety effects from aircraft noise levels of 65 dB DNL or greater on children and the elderly.

4.3 COMBINED ACTIONS AT TYNDALL AFB (F-35A WING AND MQ-9 WING BEDDOWNS)

4.3.1 Airspace Management and Air Traffic Control, F-35A and MQ-9 at Tyndall

4.3.1.1 Airspace Management and Air Traffic Control, Three-Squadron F-35A Alternative plus MQ-9 at Tyndall Alternative

4.3.1.1.1 Base Airfield Operations

The collective 33,500 F-35A and 5,700 MQ-9 airfield operations projected for Tyndall AFB along with other based and transient aircraft would be within the upper ranges that have been conducted and accommodated at this high-density airfield. Many of these operations would include practice

landings where aircraft would remain with the Class D airspace closed traffic patterns and not mix with other air traffic outside this area.

The majority of the F-35A operations would occur during the daytime hours with a 1.5-hour mission while the MQ-9 missions would stretch out up to 12 hours with the majority of missions extending into the nighttime hours. Planning and scheduling of different daily aircraft missions would better enable this airfield and use of the main aircraft Runways 14/32 or the Alternate Runway Options for MQ-9 operations to accommodate the combined beddown of both aircraft. This would also allow the ATC system to effectively control and integrate these airfield operations with other aircraft arrivals/departures and air traffic within the Class D and terminal airspace areas. As one of the busiest airfields in the USAF, the Tyndall AFB ATC facilities have the staffing and technology to manage the high-density operations that typically occur at this airfield and within this airspace environment. Therefore, the combined actions of bedding down both the F-35A and MQ-9 Wings at Tyndall AFB would not impact this capability and overall airfield and airspace daily uses.

4.3.1.1.2 Airspace and Ranges

The combined beddown of both the F-35A and MQ-9 Wings at Tyndall AFB would generate approximately 15,120 annual sortie operations (12,300 and 2,820), which would average up to approximately 60 sorties per day (based on 260 flying days per year) in the SUA and range areas described in Sections 3.1.1.1 and 3.1.1.3. Use of the individual and combined training areas is coordinated and scheduled to accommodate the different training missions the F-35A, MQ-9, and other based and transient aircraft would be required to perform in this training airspace. Such scheduling is also required for ATC to effectively manage and separate these flights to/from the SUA areas from other military and civilian air traffic in the RAPCON's terminal area.

Local flight procedures include the direction pilots must adhere to when transiting between the base and each training area; they also provide a means for separating mission aircraft from other nonparticipating air traffic. Again, ground crews and ATC must follow strict controls required to manage RPA flights within the different restricted and unrestricted COA areas throughout the duration of their mission activities. Therefore, given the manner in which both manned and unmanned aircraft operations are scheduled, managed, and controlled for daily flight missions within the different training/range areas in this region, this potential combined beddown of F-35A and MQ-9 Wings at Tyndall AFB could be accommodated with minimal impact on ATC services and airspace uses in this affected environment.

4.3.1.2 Airspace Management and Air Traffic Control, Four-Squadron F-35A Alternative plus MQ-9 at Tyndall Alternative

4.3.1.2.1 Base Airfield Operations

The fourth F-35A squadron would add approximately 11,147 annual projected airfield operations to the level discussed in Sections 2.2.5.3 and 4.1.1.2.1. Again, as one of the busiest airfields in the USAF, the ATC services and cooperative efforts in planning and scheduling flight activities have enabled this base to accommodate a high level of airfield operations. Given these capabilities for supporting higher density operations, the additional fourth F-35A squadron operations coupled

with the MQ-9 operations could be managed and accommodated with minimal impact on the overall airfield operations and the Class D and adjacent airspace uses.

4.3.1.2.2 Airspace and Ranges

This alternative would increase the sortie operations discussed in Sections 2.2.5.3 and 4.1.1.2.2 within the different training areas described in Sections 2.3.3.2 and 3.1.1.2. This overall total number of sorties would be scheduled, managed, and controlled in the same manner as discussed above for the Three-Squadron F-35A Wing Alternative. Therefore, these operations could be accommodated while both conducting mission activities within SUA training airspace areas and while transiting to and from those areas where they must be separated from other air traffic. As mentioned previously, the different military components conducting various training in the SUA areas throughout the general Florida coastal region have been safely accommodated with the civilian air traffic also operating within this region. Therefore, this alternative could be accomplished with minimal impact on the overall airspace environment.

4.3.2 Noise, F-35A and MQ-9 at Tyndall

4.3.2.1 Noise, Three-Squadron F-35A Alternative plus MQ-9 at Tyndall Alternative

4.3.2.1.1 Base Airfield Operations with MQ-9 Main Runway or Alternate Runway Options

Noise levels generated by individual F-35A and MQ-9 overflights would be identical to those described in Sections 4.1.2.1 and 4.2.1.3.

This section describes noise impacts associated with the 5, 50, and 95 percent afterburner scenarios of the three-squadron F-35A Wing beddown alternative, combined with the MQ-9 Wing beddown Main Runway and Alternate Runway Options.

Annoyance and Land Use Compatibility

Noise levels (DNL) under the Main Runway and Alternate Runway Options for the MQ-9 Wing beddown combined with the 5-percent afterburner F-35A Wing beddown are shown in Figure 4.3-1. Figure 4.3-2 illustrates the calculated 65 dB DNL for each of the afterburner scenarios under the three-squadron F-35A Wing beddown, combined with the MQ-9 Wing Main Runway or Alternate Runway Options. Under all three F-35A Wing beddown afterburner scenarios and both MQ-9 Wing beddown Options, off-base land areas affected at greater than 65 dB DNL are limited to portions of the City of Parker and Saint Andrews State Park (Shell Island). As described in Section 4.1.2.1, a person's reaction to noise is dependent on several non-acoustic factors, including the person's perception of the importance of the activity generating the noise and the activity the person is involved in at the time the noise occurs. Noise levels greater than 65 dB DNL are considered incompatible with noise-sensitive land uses, such as residential, in accordance with DoD guidelines.

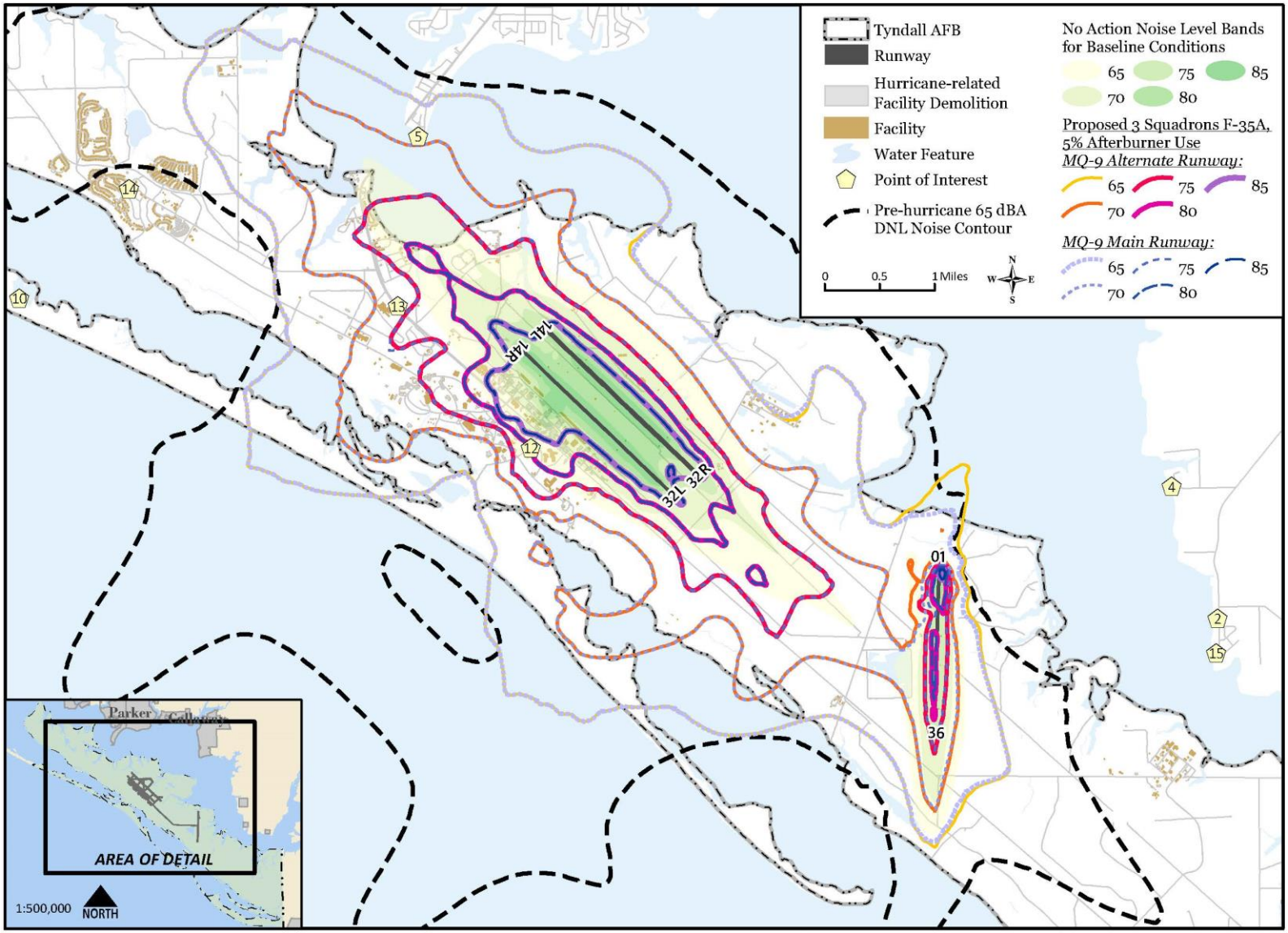

Figure 4.3-1. Noise Contours Under Three-Squadron F-35A Wing Beddown 5% Afterburner Use, Combined With MQ-9 Wing Main Runway or Alternate Runway Options

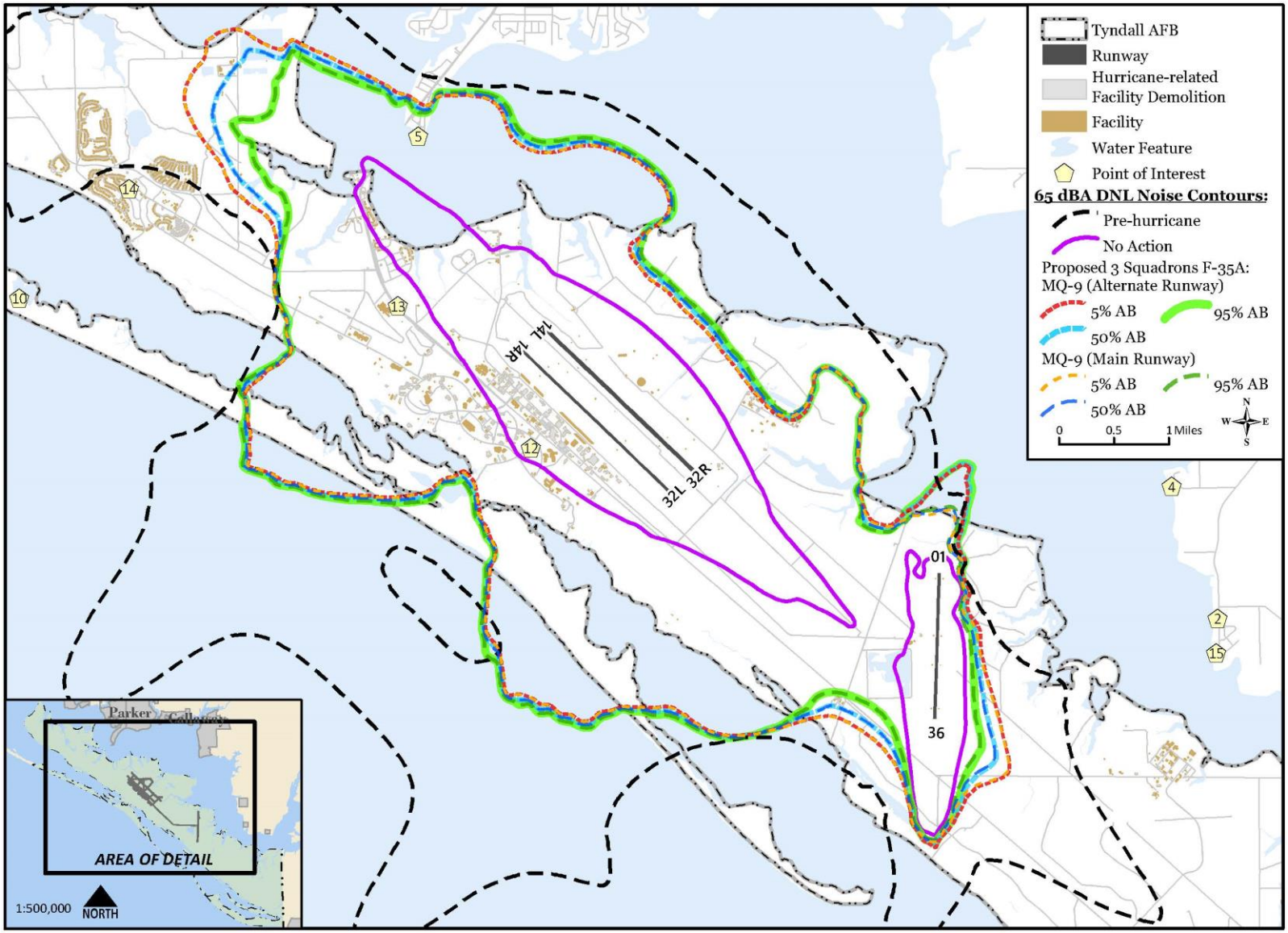

Figure 4.3-2. 65 dB DNL Noise Contours Under Three-Squadron F-35A Wing Beddown, All Afterburner Scenarios Combined With MQ-9 Wing Main Runway or Alternate Runway Options

Under the three-squadron F-35A Wing beddown (all afterburner scenarios) and MQ-9 Wing Main Runway and Alternate Runway Options, the amount of off-base land at greater than 65 dB DNL would be the same as listed for the three-squadron F-35A Wing beddown alone, increasing to as many as 69 acres (Table 4.3-1). The acreage affected is substantially larger than the 2 acres affected under No Action Alternative operations, but is substantially smaller than the 217 acres affected under pre-hurricane conditions.

Table 4.3-1. Off-Base Acres of Land at 65 dB DNL or Greater Under Three-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Main Runway and Alternate Runway Options

DNL (dB)	Pre-Hurricane	No Action	Three-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Main Runway Option					
			5% Afterburner		50% Afterburner		95% Afterburner	
	Acres	Acres	Acres	Change[1]	Acres	Change[1]	Acres	Change[1]
65–69	199	2	62	60	58	56	58	56
70–74	15	0	7	7	6	6	3	3
75–79	3	0	0	0	0	0	0	0
80–84	0	0	0	0	0	0	0	0
≥85	0	0	0	0	0	0	0	0
Total	**217**	**2**	**69**	**67**	**64**	**62**	**61**	**59**
			Three-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Alternate Runway Option					
65–69	199	2	61	59	58	56	58	56
70–74	15	0	7	7	6	6	6	6
75–79	3	0	0	0	0	0	0	0
80–84	0	0	0	0	0	0	0	0
≥85	0	0	0	0	0	0	0	0
Total	**217**	**2**	**68**	**66**	**64**	**62**	**64**	**62**

Key: ≥ = greater than or equal to; dB = decibel; DNL = day-night average sound level
Note:
[1] Change is relative to No Action.

The estimated number of people affected by noise levels greater than 65 dB DNL under the 5, 50, and 95 percent afterburner scenarios, combined with MQ-9 Main Runway and Alternate Runway Options, would be the same as listed for the F-35A Wing beddown alone in Table 4.1-2. The estimated number of residents affected by noise levels greater than 65 dB DNL is substantially higher than the 0 people affected under the No Action Alternative conditions, but much smaller than the estimated 190 people affected under the pre-hurricane conditions.

Additional noise calculations were run at several representative noise-sensitive locations, which are depicted in Figure 3.1-1. Noise levels, which are listed in Table 4.3-2, differ from noise levels under the F-35A Wing beddown scenario (i.e., no MQ-9 Wing beddown) by 0.5 dB or less. Noise levels would exceed 65 dB DNL at Long Point Condominiums, would exceed 70 dB DNL at Tyndall Elementary School, and would exceed 80 dB DNL at the Tyndall AFB Dormitories. These noise levels are considered incompatible with residential and educational land uses. Noise levels would increase by as much as 14 dB DNL relative to No Action Alternative operations, but would be lower than the pre-hurricane levels at all locations except the Tyndall AFB Dormitories, where they would increase by 5 dB relative to pre-hurricane conditions.

Table 4.3-2. Day-Night Average Sound Level at Representative Noise-Sensitive Locations Under Three-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Main Runway and Alternate Runway Options

Location Description	Pre-Hurricane	No Action	Three-Squadron F-35A Wing Beddown Combined With MQ-9 Wing Main Runway Option					
			5% Afterburner		50% Afterburner		95% Afterburner	
	DNL	DNL	DNL	Change[1]	DNL	Change[1]	DNL	Change[1]
First Baptist Church of Parker	58.6	44.8	54.2	9.4	54	9.2	53.9	9.1
Allenton (town)	59.2	46.5	52.4	5.9	52.6	6.1	52.8	6.3
Saint Andrews State Park, Campground	45.4	33.6	38.8	5.2	38.6	5	38.5	4.9
Bayou Point (residences)	58.3	47	51.6	4.6	52	5	52.4	5.4
Long Point Condominiums	70.5	58.7	69	10.3	68.7	10	68.5	9.8
Mexico Beach (community)	58.1	44.9	46.2	1.3	46.1	1.2	46	1.1
Panama City (community)	65.5	50.7	56.3	5.6	56.6	5.9	56.9	6.2
Parker Elementary School	55.1	41.3	50.2	8.9	50.2	8.9	50.2	8.9
Piney Point (residences)	47.1	35.9	41.4	5.5	41.5	5.6	41.7	5.8
Saint Andrews State Park, Shell Island	64	42.1	56.1	14	56.2	14.1	56.3	14.2
Saint Andrews (community)	50.8	46.5	49.5	3	49.3	2.8	49.2	2.7
Tyndall AFB Dormitories	75.5	67.6	80.7	13.1	80.9	13.3	81	13.4
Tyndall Elementary School	75.2	61	73	12	72.8	11.8	72.6	11.6
Tyndall AFB on-base housing	63.6	48	58.4	10.4	57.8	9.8	57	9
Water's Edge (residences)	58.9	47.1	52.9	5.8	53	5.9	53.2	6.1
			Three-Squadron F-35A Wing Beddown Combined With MQ-9 Wing Alternate Runway Option					
First Baptist Church of Parker	58.6	44.8	54.1	9.3	54	9.2	53.9	9.1
Allenton (town)	59.2	46.5	52.4	5.9	52.7	6.2	52.9	6.4
Saint Andrews State Park, Campground	45.4	33.6	39	5.4	38.9	5.3	38.7	5.1
Bayou Point (residences)	58.3	47	52.1	5.1	52.4	5.4	52.7	5.7
Long Point Condominiums	70.5	58.7	69	10.3	68.7	10	68.5	9.8
Mexico Beach (community)	58.1	44.9	46.2	1.3	46.1	1.2	46	1.1
Panama City (community)	65.5	50.7	56.3	5.6	56.6	5.9	56.9	6.2
Parker Elementary School	55.1	41.3	50.2	8.9	50.2	8.9	50.2	8.9
Piney Point (residences)	47.1	35.9	41.7	5.8	41.8	5.9	41.9	6
Saint Andrews State Park, Shell Island	64	42.1	56	13.9	56.2	14.1	56.3	14.2
Saint Andrews (community)	50.8	46.5	49.5	3	49.4	2.9	49.2	2.7
Tyndall AFB Dormitories	75.5	67.6	80.7	13.1	80.9	13.3	81	13.4
Tyndall Elementary School	75.2	61	73	12	72.8	11.8	72.6	11.6
Tyndall AFB on-base housing	63.6	48	58.4	10.4	57.8	9.8	57	9
Water's Edge (residences)	58.9	47.1	53	5.9	53.1	6	53.2	6.1

Note:
[1] Change is relative to No Action.

Speech Interference

Overflight events that exceed 50 dB even momentarily have some potential to interfere with speech. The number of potential outdoor speech-interference events per average daytime hour would increase by as much as 8 to as high as 10 under the three afterburner usage sub-alternatives (Table 4.3-3). Speech-interference events are brief, lasting only for the duration of the overflight. Speech-interference event-counts assume that the people involved in conversation do not raise their voices to talk over the aircraft noise. The number of events per hour would increase substantially relative to No Action Alternative operations. The number of speech-interference events would decrease or remain the same relative to pre-hurricane conditions at all locations except Allentown, Bayou Point, Piney Point, Long Point Condominiums, Panama City, Tyndall AFB Dormitories, Tyndall Elementary School, and Water's Edge where they would increase by up to 2 events per hour.

Table 4.3-3. Number of Outdoor Speech-Interference Events per Average Daytime Hour Under Three-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Main Runway and Alternate Runway Options

Location Description	Pre-Hurricane	No Action	Three-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Main Runway Option					
			5% Afterburner		50% Afterburner		95% Afterburner	
	Events	Events	Events	Change[1]	Events	Change[1]	Events	Change[1]
First Baptist Church of Parker	7	1	7	6	7	6	7	6
Allenton (town)	8	2	7	5	7	5	7	5
Saint Andrews State Park, Campground	5	1	4	3	4	3	4	3
Bayou Point (residences)	7	1	7	6	7	6	7	6
Long Point Condominiums	8	2	9	7	9	7	9	7
Mexico Beach (community)	4	1	3	2	3	2	3	2
Panama City (community)	8	2	9	7	9	7	9	7
Parker Elementary School	7	1	6	5	6	5	6	5
Piney Point (residences)	5	1	5	4	5	4	5	4
Saint Andrews State Park, Shell Island	7	1	7	6	7	6	7	6
Saint Andrews (community)	6	1	5	4	5	4	5	4
Tyndall AFB Dormitories	9	2	10	8	10	8	10	8
Tyndall Elementary School	8	2	9	7	9	7	9	7
Tyndall AFB on-base housing	7	1	7	6	7	6	7	6
Water's Edge (residences)	8	2	7	5	7	5	7	5

Table 4.3-3. Number of Outdoor Speech-Interference Events per Average Daytime Hour Under Three-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Main Runway and Alternate Runway Options

Location Description	Pre-Hurricane	No Action	Three-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Main Runway Option					
			5% Afterburner		50% Afterburner		95% Afterburner	
	Events	Events	Events	Change[1]	Events	Change[1]	Events	Change[1]
			Three-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Alternate Runway Option					
First Baptist Church of Parker	7	1	6	5	6	5	6	5
Allenton (town)	8	2	9	7	9	7	9	7
Saint Andrews State Park, Campground	5	1	4	3	4	3	4	3
Bayou Point (residences)	7	1	9	8	9	8	9	8
Long Point Condominiums	8	2	7	5	7	5	7	5
Mexico Beach (community)	4	1	3	2	3	2	3	2
Panama City (community)	8	2	7	5	7	5	7	5
Parker Elementary School	7	1	6	5	6	5	6	5
Piney Point (residences)	5	1	7	6	7	6	7	6
Saint Andrews State Park, Shell Island	7	1	6	5	6	5	6	5
Saint Andrews (community)	6	1	6	5	6	5	6	5
Tyndall AFB Dormitories	9	2	7	5	7	5	7	5
Tyndall Elementary School	8	2	7	5	7	5	7	5
Tyndall AFB on-base housing	7	1	6	5	6	5	6	5
Water's Edge (residences)	8	2	9	7	9	7	9	7

Key: AFB = Air Force Base
Note:
[1] Change is relative to No Action.

Classroom Noise

As described in Section 4.1.2.1, noise interference with learning in schools is of particular concern because noise can interrupt communication or interfere with concentration. Exterior school-day noise levels would be below the 60 dB $L_{eq\text{-}8hr}$ criteria level at Parker Elementary School, but would exceed 60 dB $L_{eq\text{-}8hr}$ at Tyndall Elementary School (Table 4.3-4) under all three-squadron F-35A Wing afterburner-use scenarios. The number of indoor noise events with potential to interfere with speech (above 50 dB L_{max}) per average daytime hour at Tyndall Elementary School would be as high as six events with windows open or closed. The number of events at Parker Elementary School would be as high as three events with windows open, but would round to zero under all afterburner-use scenarios with windows closed.

Table 4.3-4. Indicators of Classroom Interference Under Three-Squadron F-35A Wing Beddown Alternative Combined With MQ-9 Wing Main Runway and Alternate Runway Options

Location Description	Pre-Hurricane	No Action	Three-Squadron F-35A Wing Beddown Alternative Combined With MQ-9 Wing Main Runway Option					
			5% Afterburner		50% Afterburner		95% Afterburner	
	L_{eq-8hr}	L_{eq-8hr}	L_{eq-8hr}	Change[1]	L_{eq-8hr}	Change[1]	L_{eq-8hr}	Change[1]
Parker Elementary	56.9	<45	52.0	7.0	52.0	7.0	52.0	7.0
Tyndall Elementary	77.0	62.9	74.9	12.0	74.7	11.8	74.6	11.7
	Events (Windows Open)	Events (Windows Open)	Events (Windows Open)	Change[1]	Events (Windows Open)	Change[1]	Events (Windows Open)	Change[1]
Parker Elementary	4	1	2	2	3	2	3	2
Tyndall Elementary	6	1	6	5	6	5	6	5
	Events (Windows Closed)	Events (Windows Closed)	Events (Windows Closed)	Change[1]	Events (Windows Closed)	Change[1]	Events (Windows Closed)	Change[1]
Parker Elementary	1	0	0	0	0	0	0	0
Tyndall Elementary	5	1	6	5	6	5	6	5
			Three-Squadron F-35A Wing Beddown Alternative Combined With MQ-9 Wing Alternate Runway Option					
	L_{eq-8hr}	L_{eq-8hr}	L_{eq-8hr}	Change[1]	L_{eq-8hr}	Change[1]	L_{eq-8hr}	Change[1]
Parker Elementary	56.9	<45	52.0	7.0	52.0	7.0	52.0	7.0
Tyndall Elementary	77.0	62.9	74.9	12.0	74.7	11.8	74.5	11.6
	Events (Windows Open)	Events (Windows Open)	Events (Windows Open)	Change[1]	Events (Windows Open)	Change[1]	Events (Windows Open)	Change[1]
Parker Elementary	4	1	2	1	3	2	3	2
Tyndall Elementary	6	1	5	4	5	4	5	4
	Events (Windows Closed)	Events (Windows Closed)	Events (Windows Closed)	Change[1]	Events (Windows Closed)	Change[1]	Events (Windows Closed)	Change[1]
Parker Elementary	1	0	0	0	0	0	0	0
Tyndall Elementary	5	1	5	4	5	4	5	4

Key: < = less than; L_{eq-8hr} = 8-hour equivalent noise level
Note:
[1] Change is relative to No Action.

Sleep Disturbance

As described in Section 4.1.2.1, nighttime flying, which is required as training for certain missions, has an increased likelihood of causing sleep disturbance. Less than 1 percent of F-35A Wing operations would be expected to occur between 10:00 p.m. and 7:00 a.m., when most people are trying to sleep. An estimated 2 percent or less of people would be awakened at least once per night by aircraft noise at the locations studied under the afterburner-use scenarios (Table 4.3-5).

Table 4.3-5. Percent of People Awakened by Aircraft Noise at Least Once per Night at Representative Locations Under the Three-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Main Runway and Alternate Runway Options

Location Description	Pre-Hurricane	No Action	Three-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Main Runway Option					
			5% Afterburner		50% Afterburner		95% Afterburner	
	% Awakened	% Awakened	% Awakened	Change[1]	% Awakened	Change[1]	% Awakened	Change[1]
First Baptist Church of Parker	1	0	1	1	1	1	1	1
Allenton (town)	1	0	1	1	1	1	1	1
Saint Andrews State Park, Campground	0	0	0	0	0	0	0	0
Bayou Point (residences)	1	0	1	1	1	1	1	1
Long Point Condominiums	2	0	2	2	2	2	2	2
Mexico Beach (community)	1	0	0	0	0	0	0	0
Panama City (community)	1	0	1	1	1	1	1	1
Parker Elementary School	1	0	1	1	1	1	1	1
Piney Point (residences)	0	0	0	0	0	0	0	0
Saint Andrews State Park, Shell Island	1	0	1	1	1	1	1	1
Saint Andrews (community)	1	0	0	0	0	0	0	0
Tyndall AFB Dormitories	2	0	2	2	2	2	2	2
Tyndall Elementary School	2	0	2	2	2	2	2	2
Tyndall AFB on-base housing	1	0	1	1	1	1	1	1
Water's Edge (residences)	1	0	1	1	1	1	1	1
			Three-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Alternate Runway Option					
First Baptist Church of Parker	1	0	1	1	1	1	1	1
Allenton (town)	1	0	1	1	1	1	1	1
Saint Andrews State Park, Campground	0	0	0	0	0	0	0	0
Bayou Point (residences)	1	0	1	1	1	1	1	1
Long Point Condominiums	2	0	1	1	1	1	1	1

Table 4.3-5. Percent of People Awakened by Aircraft Noise at Least Once per Night at Representative Locations Under the Three-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Main Runway and Alternate Runway Options

Location Description	Pre-Hurricane	No Action	Three-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Main Runway Option					
			5% Afterburner		50% Afterburner		95% Afterburner	
	% Awakened	% Awakened	% Awakened	Change[1]	% Awakened	Change[1]	% Awakened	Change[1]
Mexico Beach (community)	1	0	0	0	0	0	0	0
Panama City (community)	1	0	1	1	1	1	1	1
Parker Elementary School	1	0	1	1	1	1	1	1
Piney Point (residences)	0	0	0	0	0	0	0	0
Saint Andrews State Park, Shell Island	1	0	1	1	1	1	1	1
Saint Andrews (community)	1	0	0	0	0	0	0	0
Tyndall AFB Dormitories	2	0	1	1	2	2	2	2
Tyndall Elementary School	2	0	1	1	1	1	1	1
Tyndall AFB on-base housing	1	0	1	1	1	1	1	1
Water's Edge (residences)	1	0	1	1	1	1	1	1

Key: AFB = Air Force Base
Note:
[1] Change is relative to No Action.

Potential Hearing Loss

Under the F-35A Wing beddown alternative, noise levels exceeding 80 dB DNL would not extend to off-base land areas. Therefore, in accordance with DoD policy, the risk of potential hearing loss is minimal (DoD Noise Working Group, 2013).

Workplace Noise

Workplace noise would continue to be managed in accordance with applicable regulations to minimize hearing-loss risk for people working on Tyndall AFB.

Nonauditory Health

Nonauditory health effects of long-term noise exposure (e.g., cardiovascular health risks) have not been documented at levels below those at which noise-induced hearing loss is a substantial risk.

4.3.2.1.2 Airspace and Range Training Operations

While operating at mission altitudes (above 18,000 feet MSL), the MQ-9 generates approximately 40 dB L_{max} on the ground. In typical rural acoustic environment, this noise level is masked by ambient sound sources such as wind and birds, and is therefore inaudible. MQ-9 operations in training airspace would have no measurable effect on overall noise levels alone, or in combination with the proposed operations of Tyndall AFB-based F-35A aircraft. Noise levels in training airspace associated with operations of the three-squadron F-35A Wing can be found in Section 4.1.2.

4.3.2.2 Noise, Four-Squadron F-35A Alternative plus MQ-9 at Tyndall Alternative

4.3.2.2.1 Base Airfield Operations with MQ-9 Main Runway Option or Alternate Runway Option

Noise levels generated by individual F-35A and MQ-9 overflights would be identical to those described in Sections 4.1.2.1 and 4.2.1.3.

This section describes noise impacts associated with the 5, 50, and 95 percent afterburner scenarios of the Four-Squadron F-35A Wing Alternative, combined with the MQ-9 Wing beddown Main Runway and Alternate Runway Options.

Annoyance and Land Use Compatibility

Noise levels (DNL) under the Main Runway and Alternate Runway Options for the MQ-9 Wing beddown, combined with 5-percent afterburner four-squadron F-35A Wing beddown are shown in Figure 4.3-3. Figure 4.3-4 illustrates the calculated 65 dB DNL for each of the afterburner scenarios under the four-squadron F-35A Wing beddown, combined with the MQ-9 Wing Main Runway or Alternate Runway Options. Under all three F-35A Wing beddown sub-alternatives and both MQ-9 Wing beddown Options, off-base land areas affected at greater than 65 dB DNL are limited to portions of the City of Parker and Saint Andrews State Park (Shell Island). As described in Section 4.1.2.1, a person's reaction to noise is dependent on several non-acoustic factors, including the person's perception of the importance of the activity generating the noise and the activity the person is involved in at the time the noise occurs. Noise levels greater than 65 dB DNL are considered incompatible with noise-sensitive land uses, such as residential, in accordance with DoD guidelines.

Under the 5, 50, and 95 percent afterburner scenarios of the four-squadron F-35A Wing beddown alternative, combined with the MQ-9 Wing Main Runway and Alternate Runway Options, the amount of off-base land at greater than 65 dB DNL would be the same as that listed for the four-squadron F-35A Wing beddown alone (Table 4.3-1). The acreage affected is substantially larger than the 2 acres affected under No Action Alternative operations, but is much smaller than the 217 acres affected under pre-hurricane conditions.

The estimated number of people affected by noise levels greater than 65 dB DNL under the 5, 50, and 95 percent afterburner scenarios, combined with the MQ-9 Main Runway and Alternate Runway Options, would be the same as listed for the four-squadron F-35A Wing beddown alone (Table 4.1-10). The estimated numbers of residents affected by noise levels greater than 65 dB DNL is substantially higher than the 0 people affected under the No Action Alternative conditions, but much smaller than the estimated 190 people affected under the pre-hurricane conditions (Table 4.3-6). Estimated populations affected differ from estimates under the four-squadron F-35A Wing beddown alternative (without MQ-9) in that they increase by a single person under the 95 percent afterburner scenario. Population estimates under the other afterburner scenarios are not affected by beddown of the MQ-9 Wing.

Table 4.3-6. Off-Base Population at 65 dB DNL or Greater Under Four-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Main Runway and Alternate Runway Options

DNL (dB)	Pre-Hurricane	No Action	Four-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Main Runway Option					
			5% Afterburner		50% Afterburner		95% Afterburner	
	Residents	Residents	Residents	Change[1]	Residents	Change[1]	Residents	Change[1]
65–69	184	0	129	129	131	131	136	136
70–74	6	0	6	6	0	0	0	0
75–79	0	0	0	0	0	0	0	0
80–84	0	0	0	0	0	0	0	0
≥85	0	0	0	0	0	0	0	0
Total	**190**	**0**	**135**	**135**	**131**	**131**	**136**	**136**
			Four-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Alternate Runway Option					
65–69	184	0	129	129	131	131	136	136
70–74	6	0	6	6	0	0	0	0
75–79	0	0	0	0	0	0	0	0
80–84	0	0	0	0	0	0	0	0
≥85	0	0	0	0	0	0	0	0
Total	**190**	**0**	**135**	**135**	**131**	**131**	**136**	**136**

Key: ≥ = greater than or equal to; dB = decibel; DNL = day-night average sound level
Note:
[1] Change is relative to No Action.

Additional noise calculations were run at several representative noise-sensitive locations, which are depicted in Figure 3.1-1. Noise levels, which are listed in Table 4.3-7, differ from noise levels under the four-squadron F-35A Wing beddown only (i.e., no MQ-9 Wing beddown) by 0.4 dB or less. Noise levels would exceed 65 dB DNL at Long Point Condominiums, 70 dB DNL at Tyndall Elementary School, and 80 dB DNL at the Tyndall AFB Dormitories. These noise levels are considered incompatible with residential and educational land uses. Noise levels would increase by as much as 15 dB DNL relative to No Action Alternative operations, but would be lower than the pre-hurricane levels at all locations except the Tyndall AFB Dormitories, where they would increase by as much as 7 dB relative to pre-hurricane conditions.

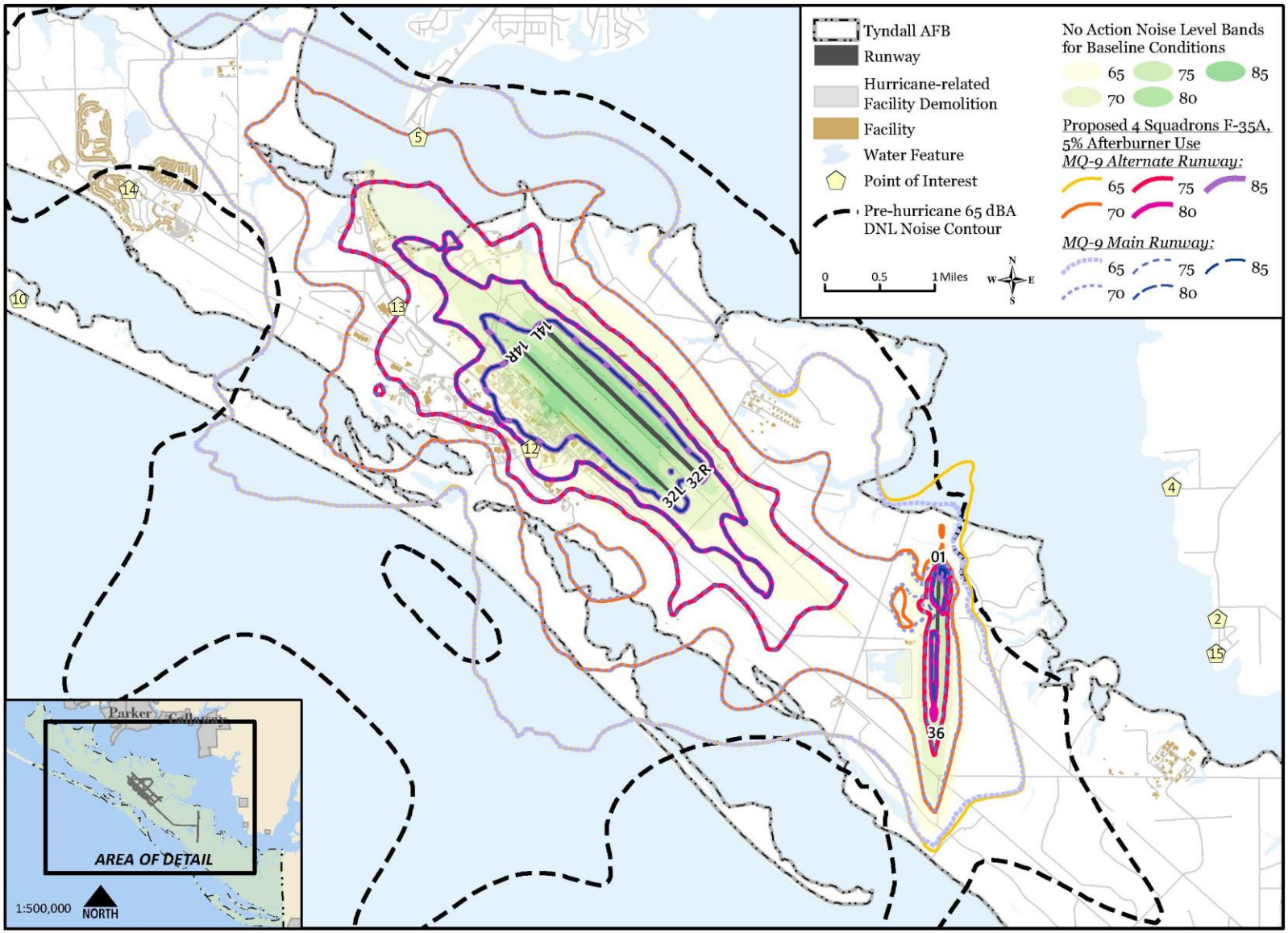

Figure 4.3-3. Noise Contours Under Four-Squadron F-35A Beddown 5% Afterburner Use, Combined With MQ-9 Wing Main Runway or Alternate Runway Options

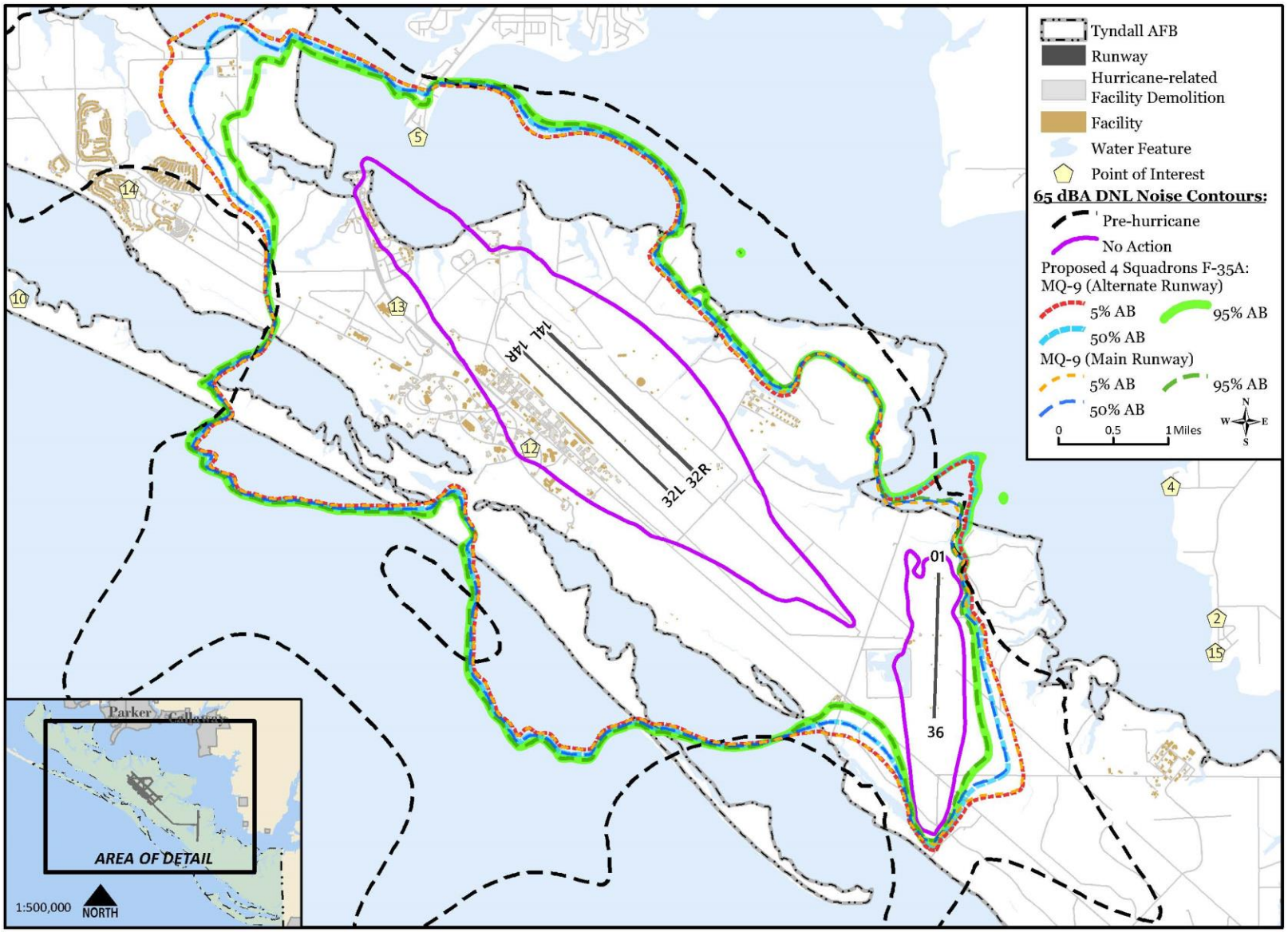

Figure 4.3-4. 65 dB DNL Noise Contours Under Four-Squadron F-35A Wing Beddown, All Afterburner Scenarios, Combined With MQ-9 Wing Main Runway or Alternate Runway Options

Table 4.3-7. Day-Night Average Sound Level at Representative Noise Sensitive Locations Under Four-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Main Runway and Alternate Runway Options

Location Description	Pre-Hurricane	No Action	Four-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Main Runway Option					
			5% Afterburner		50% Afterburner		95% Afterburner	
	DNL	DNL	DNL	Change[1]	DNL	Change[1]	DNL	Change[1]
First Baptist Church of Parker	58.6	44.8	55.3	10.5	55.1	10.3	55	10.2
Allenton (town)	59.2	46.5	53.3	6.8	53.6	7.1	53.8	7.3
Saint Andrews State Park, Campground	45.4	33.6	39.7	6.1	39.5	5.9	39.3	5.7
Bayou Point (residences)	58.3	47	52.5	5.5	52.9	5.9	53.3	6.3
Long Point Condominiums	70.5	58.7	70.1	11.4	69.9	11.2	69.6	10.9
Mexico Beach (community)	58.1	44.9	46.6	1.7	46.5	1.6	46.3	1.4
Panama City (community)	65.5	50.7	57.2	6.5	57.6	6.9	57.9	7.2
Parker Elementary School	55.1	41.3	51.3	10	51.3	10	51.3	10
Piney Point (residences)	47.1	35.9	42.3	6.4	42.5	6.6	42.6	6.7
Saint Andrews State Park, Shell Island	64	42.1	57.3	15.2	57.4	15.3	57.5	15.4
Saint Andrews (community)	50.8	46.5	50.2	3.7	50	3.5	49.8	3.3
Tyndall AFB Dormitories	75.5	67.6	81.9	14.3	82.1	14.5	82.2	14.6
Tyndall Elementary School	75.2	61	74.2	13.2	74	13	73.8	12.8
Tyndall AFB on-base housing	63.6	48	59.6	11.6	58.9	10.9	58.1	10.1
Water's Edge (residences)	58.9	47.1	53.8	6.7	54	6.9	54.1	7
			Four-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Alternate Runway Option					
First Baptist Church of Parker	58.6	44.8	55.3	10.5	55.1	10.3	55	10.2
Allenton (town)	59.2	46.5	53.4	6.9	53.6	7.1	53.9	7.4
Saint Andrews State Park, Campground	45.4	33.6	39.9	6.3	39.7	6.1	39.5	5.9
Bayou Point (residences)	58.3	47	52.8	5.8	53.2	6.2	53.6	6.6
Long Point Condominiums	70.5	58.7	70.1	11.4	69.9	11.2	69.6	10.9
Mexico Beach (community)	58.1	44.9	46.6	1.7	46.5	1.6	46.3	1.4
Panama City (community)	65.5	50.7	57.2	6.5	57.6	6.9	57.9	7.2
Parker Elementary School	55.1	41.3	51.3	10	51.3	10	51.3	10
Piney Point (residences)	47.1	35.9	42.6	6.7	42.7	6.8	42.8	6.9
Saint Andrews State Park, Shell Island	64	42.1	57.3	15.2	57.4	15.3	57.5	15.4

Table 4.3-7. Day-Night Average Sound Level at Representative Noise Sensitive Locations Under Four-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Main Runway and Alternate Runway Options

Location Description	Pre-Hurricane	No Action	Four-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Main Runway Option					
			5% Afterburner		50% Afterburner		95% Afterburner	
	DNL	DNL	DNL	Change[1]	DNL	Change[1]	DNL	Change[1]
Saint Andrews (community)	50.8	46.5	50.2	3.7	50	3.5	49.8	3.3
Tyndall AFB Dormitories	75.5	67.6	81.9	14.3	82.1	14.5	82.2	14.6
Tyndall Elementary School	75.2	61	74.2	13.2	74	13	73.8	12.8
Tyndall AFB on-base housing	63.6	48	59.6	11.6	58.9	10.9	58.1	10.1
Water's Edge (residences)	58.9	47.1	53.9	6.8	54	6.9	54.2	7.1

Key: AFB = Air Force Base; DNL = day-night average sound level
Note:
[1] Change is relative to No Action.

Speech Interference

Overflight events that exceed 50 dB, even momentarily, have some potential to interfere with speech. The number of potential outdoor speech-interference events per average daytime hour would increase by as much as 10 to 12 events under the three afterburner-use sub-alternatives (Table 4.3-8). Speech-interference events are brief, lasting only for the duration of the overflight. Speech-interference event-counts assume that the people involved in conversation do not raise their voices to talk over the aircraft noise. The number of events per hour would increase substantially relative to No Action Alternative operations. The number of speech-interference events would increase by as much as four events per hour at all locations except Mexico Beach and Parker Elementary School.

Table 4.3-8. Number of Outdoor Speech-Interference Events per Average Daytime Hour Under the Four-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Main Runway and Alternate Runway Options

Location Description	Pre-Hurricane	No Action	Four-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Main Runway Option					
			5% Afterburner		50% Afterburner		95% Afterburner	
	Events	Events	Events	Change[1]	Events	Change[1]	Events	Change[1]
First Baptist Church of Parker	7	1	8	7	8	7	8	7
Allenton (town)	8	2	9	7	9	7	9	7
Saint Andrews State Park, Campground	5	1	5	4	5	4	5	4
Bayou Point (residences)	7	1	8	7	8	7	8	7
Long Point Condominiums	8	2	11	9	11	9	11	9
Mexico Beach (community)	4	1	4	3	4	3	4	3
Panama City (community)	8	2	11	9	11	9	11	9

Table 4.3-8. Number of Outdoor Speech-Interference Events per Average Daytime Hour Under the Four-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Main Runway and Alternate Runway Options

Location Description	Pre-Hurricane	No Action	Four-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Main Runway Option					
			5% Afterburner		50% Afterburner		95% Afterburner	
	Events	Events	Events	Change[1]	Events	Change[1]	Events	Change[1]
Parker Elementary School	7	1	7	6	7	6	7	6
Piney Point (residences)	5	1	7	6	7	6	7	6
Saint Andrews State Park, Shell Island	7	1	8	7	8	7	8	7
Saint Andrews (community)	6	1	6	5	6	5	6	5
Tyndall AFB Dormitories	9	2	12	10	12	10	12	10
Tyndall Elementary School	8	2	11	9	11	9	11	9
Tyndall AFB on-base housing	7	1	9	8	9	8	9	8
Water's Edge (residences)	8	2	9	7	9	7	9	7
			Four-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Alternate Runway Option					
First Baptist Church of Parker	7	1	8	7	8	7	8	7
Allenton (town)	8	2	10	8	10	8	10	8
Saint Andrews State Park, Campground	5	1	6	5	6	5	6	5
Bayou Point (residences)	7	1	10	9	10	9	10	9
Long Point Condominiums	8	2	9	7	9	7	9	7
Mexico Beach (community)	4	1	4	3	4	3	4	3
Panama City (community)	8	2	9	7	9	7	9	7
Parker Elementary School	7	1	7	6	7	6	7	6
Piney Point (residences)	5	1	9	8	9	8	9	8
Saint Andrews State Park, Shell Island	7	1	8	7	8	7	8	7
Saint Andrews (community)	6	1	7	6	7	6	7	6
Tyndall AFB Dormitories	9	2	9	7	9	7	9	7
Tyndall Elementary School	8	2	8	6	8	6	8	6
Tyndall AFB on-base housing	7	1	8	7	8	7	8	7
Water's Edge (residences)	8	2	10	8	10	8	10	8

Key: AFB = Air Force Base
Note:
[1] Change is relative to No Action.

Classroom Noise

As described in Section 4.1.2.1, noise interference with learning in schools is of particular concern because noise can interrupt communication or interfere with concentration. Exterior school-day noise levels would be below the 60 dB L_{eq-8hr} criteria level at Parker Elementary School, but would exceed 60 dB L_{eq-8hr} at Tyndall Elementary School (Table 4.3-9) under all F-35A Wing afterburner-use scenarios. The number of indoor noise events with potential to interfere with speech (above 50 dB L_{max}) per average daytime hour at Tyndall Elementary School would be as high as eight events with windows open or seven events with windows closed. The number of events at Parker Elementary School would be as high as three events with windows open, but would be one under all afterburner-use scenarios with windows closed.

Table 4.3-9. Indicators of Classroom Interference Under Four-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Main Runway and Alternate Runway Options

Location Description	Pre-Hurricane	No Action	Four-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Main Runway Option					
			5% Afterburner		50% Afterburner		95% Afterburner	
	L_{eq-8hr}	L_{eq-8hr}	L_{eq-8hr}	Change[1]	L_{eq-8hr}	Change[1]	L_{eq-8hr}	Change[1]
Parker Elementary	56.9	<45	53.1	8.1	53.1	8.1	53.2	8.2
Tyndall Elementary	77.0	62.9	76.1	13.2	75.9	13.0	75.7	12.8
	Events (Windows Open)	Events (Windows Open)	Events (Windows Open)	Change[1]	Events (Windows Open)	Change[1]	Events (Windows Open)	Change[1]
Parker Elementary	4	1	3	2	3	2	3	2
Tyndall Elementary	6	1	8	7	8	7	8	7
	Events (Windows Closed)	Events (Windows Closed)	Events (Windows Closed)	Change[1]	Events (Windows Closed)	Change[1]	Events (Windows Closed)	Change[1]
Parker Elementary	1	0	1	1	1	1	1	1
Tyndall Elementary	5	1	7	6	7	6	7	6
			Four-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Alternate Runway Option					
	L_{eq-8hr}	L_{eq-8hr}	L_{eq-8hr}	Change[1]	L_{eq-8hr}	Change[1]	L_{eq-8hr}	Change[1]
Parker Elementary	56.9	<45	53.1	8.1	53.1	8.1	53.1	8.1
Tyndall Elementary	77.0	62.9	76.1	13.2	75.9	13.0	75.7	12.8
	Events (Windows Open)	Events (Windows Open)	Events (Windows Open)	Change[1]	Events (Windows Open)	Change[1]	Events (Windows Open)	Change[1]
Parker Elementary	4	1	3	2	3	2	3	2
Tyndall Elementary	6	1	6	5	5	4	5	4
	Events (Windows Closed)	Events (Windows Closed)	Events (Windows Closed)	Change[1]	Events (Windows Closed)	Change[1]	Events (Windows Closed)	Change[1]
Parker Elementary	1	0	1	1	1	1	1	1
Tyndall Elementary	5	1	6	5	6	5	6	5

Key: < = less than; L_{eq-8hr} = 8-hour equivalent noise level
Note:
[1] Change is relative to No Action.

Sleep Disturbance

As described in Section 4.1.2.1, nighttime flying, which is required as training for certain missions, has an increased likelihood of causing sleep disturbance. Less than 1 percent of F-35A operations would be expected to occur between 10:00 p.m. and 7:00 a.m., when most people are trying to sleep. An estimated 2 percent or less of people would be awakened at least once per night by aircraft noise at the locations studied under any of the sub-alternatives (Table 4.3-10).

Table 4.3-10. Percent of People Awakened by Aircraft Noise at Least Once per Night at Representative Locations Under the Four-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Main Runway and Alternate Runway Options

Location Description	Pre-Hurricane	No Action	Four-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Main Runway Option					
			5% Afterburner		50% Afterburner		95% Afterburner	
	% Awakened	% Awakened	% Awakened	Change[1]	% Awakened	Change[1]	% Awakened	Change[1]
First Baptist Church of Parker	1	0	1	1	1	1	1	1
Allenton (town)	1	0	1	1	1	1	1	1
Saint Andrews State Park, Campground	0	0	0	0	0	0	0	0
Bayou Point (residences)	1	0	1	1	1	1	1	1
Long Point Condominiums	2	0	2	2	2	2	2	2
Mexico Beach (community)	1	0	0	0	0	0	0	0
Panama City (community)	1	0	1	1	1	1	1	1
Parker Elementary School	1	0	1	1	1	1	1	1
Piney Point (residences)	0	0	0	0	0	0	0	0
Saint Andrews State Park, Shell Island	1	0	1	1	1	1	1	1
Saint Andrews (community)	1	0	0	0	0	0	0	0
Tyndall AFB Dormitories	2	0	2	2	2	2	2	2
Tyndall Elementary School	2	0	2	2	2	2	2	2
Tyndall AFB on-base housing	1	0	1	1	1	1	1	1
Water's Edge (residences)	1	0	1	1	1	1	1	1
			Four-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Alternate Runway Option					
First Baptist Church of Parker	1	0	1	1	1	1	1	1
Allenton (town)	1	0	1	1	1	1	1	1

Table 4.3-10. Percent of People Awakened by Aircraft Noise at Least Once per Night at Representative Locations Under the Four-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Main Runway and Alternate Runway Options

Location Description	Pre-Hurricane	No Action	Four-Squadron F-35A Wing Alternative Combined With MQ-9 Wing Main Runway Option					
			5% Afterburner		50% Afterburner		95% Afterburner	
	% Awakened	% Awakened	% Awakened	Change[1]	% Awakened	Change[1]	% Awakened	Change[1]
Saint Andrews State Park, Campground	0	0	0	0	0	0	0	0
Bayou Point (residences)	1	0	1	1	1	1	1	1
Long Point Condominiums	2	0	2	2	2	2	2	2
Mexico Beach (community)	1	0	0	0	0	0	0	0
Panama City (community)	1	0	1	1	1	1	1	1
Parker Elementary School	1	0	1	1	1	1	1	1
Piney Point (residences)	0	0	0	0	0	0	0	0
Saint Andrews State Park, Shell Island	1	0	1	1	1	1	1	1
Saint Andrews (community)	1	0	0	0	0	0	0	0
Tyndall AFB Dormitories	2	0	2	2	2	2	2	2
Tyndall Elementary School	2	0	2	2	2	2	2	2
Tyndall AFB on-base housing	1	0	1	1	1	1	1	1
Water's Edge (residences)	1	0	1	1	1	1	1	1

Key: AFB = Air Force Base
Note:
[1] Change is relative to No Action.

Potential Hearing Loss

Under the F-35A Wing beddown alternative, noise levels exceeding 80 dB DNL would not extend to off-base land areas. Therefore, in accordance with DoD policy, the risk of potential hearing loss is minimal (DoD Noise Working Group, 2013).

Workplace Noise

Workplace noise would continue to be managed in accordance with applicable regulations to minimize hearing-loss risk for people working on Tyndall AFB.

Nonauditory Health

Nonauditory health effects of long-term noise exposure (e.g., cardiovascular health risks) have not been documented at levels below those at which noise-induced hearing loss is a substantial risk.

4.3.2.2.2 Airspace and Range Training Operations

While operating at mission altitudes (above 18,000 feet MSL), the MQ-9 generates approximately 40 dB L_{max} on the ground. In typical rural acoustic environment, this noise level is masked by ambient sound sources such as wind and birds, and is therefore inaudible. MQ-9 operations in training airspace would have no measurable effect on overall noise levels alone or in combination with the proposed operations of Tyndall AFB-based F-35A aircraft. Noise levels in training airspace associated with operations of the four-squadron F-35A Wing can be found in Section 4.1.2.

4.3.3 Health and Safety, F-35A and MQ-9 at Tyndall

4.3.3.1 Health and Safety, Three-Squadron F-35A Alternative plus MQ-9 at Tyndall Alternative

4.3.3.1.1 Base Facilities Construction

Potential impacts associated with base facility construction would be the same as under the three-squadron F-35A Wing beddown alternative, as described in Section 4.1.3.1.

4.3.3.1.2 Base Airfield Operations with MQ-9 Main Runway Option (BASH)

The environmental consequences associated with safety under the three squadron-35A alternative and the MQ-9 Wing beddown, main runway option, based on the 20 BASH incidents with the 60,660 airfield operations in 2018, would be an estimated 19 BASH incidents annually. This would include F-35A, MQ-9, and transient operations at Tyndall AFB.

4.3.3.1.3 Base Airfield Operations with MQ-9 Alternate Runway Option (BASH)

The environmental consequences associated with safety under this option are the same as those described for the three-squadron F-35A Wing beddown alternative, Base Airfield Operations with Main Runway Option (see Section 4.2.1.5.3).

4.3.3.1.4 Airspace and Range Training Operations (*including flare use*)

An increase in flight operations would result in an associated statistical increase in the potential for aircraft mishaps or BASH incidents. Other potential impacts, including those associated with the use of flares, would be the same as under the three-squadron F-35A Wing beddown alternative, as described in Section 4.1.3.1, and the Base Airfield Operations with Main Runway Option (see Section 4.2.1.5.3).

4.3.3.2 Health and Safety, Four-Squadron F-35A Alternative plus MQ-9 at Tyndall Alternative

4.3.3.2.1 Base Facilities Construction

Potential impacts associated with base facility construction would be the same as under the three-squadron F-35A Wing beddown alternative, as described in Section 4.1.3.1.

4.3.3.2.2 Base Airfield Operations with MQ-9 Main Runway Option (BASH)

The environmental consequences associated with safety under the four-squadron F-35A Wing beddown alternative and the MQ-9 Wing beddown, Main Runway Option, based on the 20 BASH incidents with the 60,660 airfield operations in 2018, would be an estimated 23 BASH incidents annually. This would include F-35A, MQ-9, and transient operations at Tyndall AFB.

4.3.3.2.3 Base Airfield Operations with MQ-9 Alternate Runway Option (BASH)

The environmental consequences associated with safety under this alternative are the same as those described for the Base Airfield Operations with Main Runway Option (see Section 4.2.1.5.3).

4.3.3.2.4 Airspace and Range Training Operations (*including flare use*)

An increase in flight operations would result in an associated statistical increase in the potential for aircraft mishaps or BASH incidents. Other potential impacts, including those associated with the use of flares, would be the same as under the three-squadron F-35A Wing beddown alternative, as described in Section 4.1.3.1, and the Base Airfield Operations with Main Runway Option (see Section 4.2.1.5.3).

4.3.4 Air Quality, F-35A and MQ-9 at Tyndall

4.3.4.1 Air Quality, Three-Squadron F-35A Alternative plus MQ-9 at Tyndall Alternative

4.3.4.1.1 Base Facilities Construction

The potential combined actions to beddown the three-squadron F-35A Wing plus MQ-9 Wing at Tyndall AFB would require construction of airfield, operational, maintenance, and base support facilities. Construction of the MQ-9 Operations Complex Option 2 would result in slightly more construction effort and air emissions compared to Operations Complex Option 1. Air quality impacts associated with proposed construction activities would result from (1) combustive emissions generated by fossil fuel-powered equipment and (2) fugitive dust emissions (PM_{10}/$PM_{2.5}$) from operation of equipment on exposed soil.

Construction activity data developed for the combined actions were used as inputs for ACAM. The air quality analysis assumed that the combined actions would begin construction activities in 2021 and would complete all activities by 2025. The analysis assumed that the air quality BMPs identified in Table 2.7-1 would reduce fugitive dust resulting from the use of construction equipment on exposed soil by 50 percent from uncontrolled levels.

Table 4.3-11 presents estimates of annual emissions that would occur from the infrastructure improvements for the combined three-squadron F-35A Wing plus MQ-9 Wing beddowns at Tyndall AFB. These data show that even if all construction activities occurred in 1 year under either Option 1 or Option 2, the total construction emissions would be well below the annual indicator thresholds. Therefore, construction emissions associated with the combined three-squadron F-35A Wing plus MQ-9 Wing beddowns would not result in significant air quality impacts.

Table 4.3-11. Annual Construction Emissions for the Three-Squadron F-35A plus MQ-9 at Tyndall AFB

Construction Year	Air Pollutant Emissions (tons)						
	VOCs	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	CO_2e (mt)
Option 1							
2021	2.67	8.34	7.60	0.02	3.20	0.33	1,748
2022	3.97	15.27	13.49	0.04	22.95	0.59	3,423
2023	1.59	7.73	5.88	0.02	1.22	0.22	1,566
2024	0.80	2.28	1.70	0.01	0.51	0.06	467
Option 2							
2021	2.67	8.34	7.60	0.02	3.20	0.33	1,748
2022	4.07	15.94	13.99	0.04	23.29	0.57	3,568
2023	1.59	7.73	5.88	0.02	1.22	0.22	1,566
2024	0.80	2.28	1.70	0.01	0.51	0.06	467
Annual Indicator Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**NA**

Key: CO = carbon monoxide; CO_2e (mt) = carbon dioxide equivalent in metric tons; NA = not applicable; 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_x = sulfur oxides; VOCs = volatile organic compounds

4.3.4.1.2 Airfield Operations

The combined three-squadron F-35A Wing plus MQ-9 Wing beddowns would generate air emissions from (1) F-35A and MQ-9 aircraft operations, (2) F-35A and MQ-9 engine maintenance and testing, (3) AGE, (4) space and water heaters, (5) solvent usages, and (6) personnel commuting activities. The analysis employed the ACAM to estimate emissions from these activities. The air quality analysis assumed that the combined F-35A and MQ-9 beddowns would reach full operations and resulting emissions in 2027, after the completion of all required infrastructure improvements. Calculations showing the F-35A and MQ-9 TIM metrics derived for the air quality analyses and the ACAM output reports are presented in Appendix C.

Table 4.3-12 summarizes the annual operations emissions that would result from implementation of the combined three-squadron F-35A plus MQ-9 beddowns at Tyndall AFB. These data show that emission increases for the combined F-35A and MQ-9 beddowns from the 50 percent afterburner scenario would remain below all annual indicator thresholds except for CO. F-35A aircraft operations would be the primary contributors to these emission increases. Emissions of VOCs and CO would slightly increase and all other pollutants would slightly decrease with increasing afterburner usage rates. Conversely, the opposite would occur with decreasing afterburner usage. Since the increase in emissions of VOCs, NO_x, SO_x, PM_{10}, and $PM_{2.5}$ would not exceed any indicator threshold, they would produce less than significant air quality impacts.

Table 4.3-12. Annual Operations Emissions for the Three-Squadron F-35A plus MQ-9 at Tyndall AFB, Year 2027 – 50% Afterburner Scenarios

Afterburner Scenario/Activity Type	Air Pollutant Emissions (tons per year)[1]						
	VOCs	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	CO_2e (mt)
50% Afterburner Scenario							
Aircraft Flight Operations/Engine Trim Tests	3.57	173.63	170.37	18.36	28.41	25.53	51,367
Aircraft Engine Test Cells	0.03	1.26	5.90	0.41	0.52	0.46	1,133
Aerospace Ground Equipment	21.78	38.22	62.67	4.39	6.46	6.27	3,000
Space and Water Heating	0.14	2.18	2.59	0.02	0.19	0.19	2,835
Solvent Usage	1.63	--	--	--	--	--	--
Personnel Commuting Activities	8.65	99.15	6.98	0.06	0.15	0.13	8,089
Total Alternative Emissions	**35.80**	**314.44**	**248.51**	**23.24**	**35.73**	**32.58**	**64,427**
Annual Indicator Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**NA**
Bay County 2017 Emissions	**31,416**	**32,545**	**9,040**	**2,066**	**7,918**	**2,506**	**7,657,264**
Total Alternative Emissions % of Bay County 2017 Emissions	**0.1%**	**1.0%**	**2.7%**	**1.1%**	**0.5%**	**1.3%**	**0.8%**

Key: CO = carbon monoxide; CO_2e (mt) = carbon dioxide equivalent in metric tons; NA = not applicable; 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_x = sulfur oxides; VOCs = volatile organic compounds

Note:

[1] Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.

Emissions of CO resulting from implementation of the combined three-squadron F-35A plus MQ-9 beddowns at Tyndall AFB were compared to the most recent complete Bay County emissions inventory (2017) to determine the relative magnitude of these emissions and their potential to combine with emissions in the affected environment and contribute to an exceedance of an ambient air quality standard. The annual CO emission increases that would result from operations of the alternative would amount to about 1.0 percent of the total CO emissions generated by Bay County in 2017 (see Section 3.1.4.1). These emission increases are lower than the amounts of CO emissions produced by Tyndall AFB in 2017 in comparison to the 2017 Bay County emissions. The majority of CO emissions that would result from the combined F-35A and MQ-9 beddowns would occur from intermittent F-35A and MQ-9 aircraft operations up to an altitude of 3,000 feet AGL and across several square miles that comprise the Tyndall AFB airspace and adjoining aircraft flight patterns. These emissions would disperse through this volume of atmosphere to the point that they would not be expected to result in substantial ground-level impacts in a localized area. In addition, since Bay County attains the NAAQS for CO, these emission increases would not be substantial enough to contribute to an exceedance of the CO NAAQS. Therefore, the combined three-squadron F-35A Wing plus MQ-9 Wing beddowns at Tyndall AFB would not result in significant impacts to air quality.

4.3.4.1.3 Airspace and Range Training Operations

F-35A and MQ-9 aircraft would use airspaces and training areas in proximity to Tyndall AFB under the combined three-squadron F-35A plus MQ-9 beddowns. MQ-9 operations within these areas would occur above 3,000 feet AGL at all times, and therefore these operations would not appreciably affect ground-level air quality. The only airspaces or training areas where proposed F-35A operations would occur below 3,000 feet AGL would be Warning Areas W-151 and W-470.

As a result, the data in Section 4.1.4.1, Table 4.1-19, equate to the annual emissions that would result from implementation of the combined three-squadron F-35A plus MQ-9 beddowns within airspaces and training areas. These data show that the proposed F-35A aircraft operations within these areas would result in air pollutant emissions within 3,000 feet AGL that would not exceed any annual indicator threshold. Therefore, the combined F-35A and MQ-9 beddowns would not result in significant air quality impacts within any airspace or training area.

4.3.4.2 Air Quality, Four-Squadron F-35A Alternative plus MQ-9 at Tyndall AFB Alternative

4.3.4.2.1 Base Facilities Construction

The combined four-squadron F-35A Wing plus MQ-9 Wing beddowns at Tyndall AFB would require construction of airfield, operational, maintenance, and base support facilities. Construction of the MQ-9 Operations Complex Option 2 would result in slightly more construction effort and resulting air emissions compared to Operations Complex Option 1. Air quality impacts associated with proposed construction activities would result from (1) combustive emissions generated by fossil fuel-powered equipment and (2) fugitive dust emissions ($PM_{10}/PM_{2.5}$) from operation of equipment on exposed soil. Construction activity data developed for the combined F-35A and MQ-9 beddowns were used as inputs for ACAM. The air quality analysis assumed that the combined beddowns would begin construction activities in 2021 and would complete all activities by 2025. The analysis assumed that the air quality BMPs identified in Table 2.7-1 would reduce fugitive dust resulting from the use of construction equipment on exposed soil by 50 percent from uncontrolled levels. Table 4.3-13 presents estimates of annual emissions that would occur from the infrastructure improvements for the combined four-squadron F-35A Wing plus MQ-9 Wing beddowns at Tyndall AFB. These data show that even if all construction activities occurred in 1 year under either Option 1 or Option 2, the total construction emissions would be well below the annual indicator thresholds. Therefore, construction emissions associated with the combined F-35A and MQ-9 beddowns would not result in significant air quality impacts.

Table 4.3-13. Annual Construction Emissions for the Four-Squadron F-35A plus MQ-9 at Tyndall AFB

Construction Year	Air Pollutant Emissions (tons)						
	VOCs	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	CO_2e (mt)
Option 1							
2021	2.67	8.34	7.60	0.02	3.20	0.33	1,748
2022	3.97	15.27	13.49	0.04	22.95	0.59	3,423
2023	1.59	7.73	5.88	0.02	1.22	0.22	1,566
2024	1.37	4.74	3.53	0.02	1.39	0.13	977
Option 2							
2021	2.67	8.34	7.60	0.02	3.20	0.33	1,748
2022	4.07	15.94	13.99	0.04	23.29	0.57	3,568
2023	1.59	7.73	5.88	0.02	1.22	0.22	1,566
2024	1.37	4.74	3.53	0.02	1.39	0.13	977
Annual Indicator Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**NA**

Key: CO = carbon monoxide; CO_2e (mt) = carbon dioxide equivalent in metric tons; NA = not applicable; 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_x = sulfur oxides; VOCs = volatile organic compounds

4.3.4.2.2 Airfield Operations

The combined four-squadron F-35A Wing plus MQ-9 Wing beddowns would generate air emissions from (1) F-35A and MQ-9 aircraft operations, (2) F-35A and MQ-9 engine maintenance and testing, (3) AGE, (4) space and water heaters, (5) solvent usages, and (6) personnel commuting activities. The analysis employed the ACAM to estimate emissions from these activities. The air quality analysis assumed that the combined F-35A and MQ-9 beddowns would reach full operations and resulting emissions in 2028, after the completion of all required infrastructure improvements. Calculations showing the F-35A and MQ-9 TIM metrics derived for the air quality analyses and the ACAM output reports are presented in Appendix C.

Table 4.3-14 summarizes the annual operations emissions that would result from implementation of the combined four-squadron F-35A Wing plus MQ-9 Wing beddowns at Tyndall AFB. These data show that emission increases for the three afterburner scenarios would remain below all annual indicator thresholds except for CO and NO_x. F-35A aircraft operations would be the primary contributors to these emission increases. Emissions of VOCs and CO would slightly increase and all other pollutants would slightly decrease with increasing afterburner usage rates. Conversely, the opposite would occur with decreasing afterburner usage. Since the increase in emissions of VOCs, SO_x, PM_{10}, and $PM_{2.5}$ would not exceed any indicator threshold, they would produce less than significant air quality impacts.

Table 4.3-14. Annual Operations Emissions for the Four-Squadron F-35A plus MQ-9 at Tyndall AFB, Year 2028 – 50% Afterburner Scenarios

Afterburner Scenario/Activity Type	Air Pollutant Emissions (tons per year)[1]						
	VOCs	CO	NO_x	SO_x	PM_{10}	$PM_{2.5}$	CO_2e (mt)
50% Afterburner Scenario							
Aircraft Flight Operations/Engine Trim Tests	3.70	230.56	225.92	24.36	37.66	33.84	65,487
Aircraft Engine Test Cells	0.03	1.67	7.85	0.55	0.69	0.62	1,508
Aerospace Ground Equipment	29.04	50.96	83.56	5.85	8.61	8.36	4,000
Space and Water Heating	0.15	2.34	2.78	0.02	0.21	0.21	3,044
Solvent Usage	1.95	--	--	--	--	--	--
Personnel Commuting Activities	10.09	115.62	8.14	0.07	0.18	0.15	9,432
Total Alternative Emissions	**44.96**	**401.15**	**328.25**	**30.85**	**47.35**	**43.18**	**83,471**
Annual Indicator Threshold	**250**	**250**	**250**	**250**	**250**	**250**	**NA**
Bay County 2017 Emissions	**31,416**	**32,545**	**9,040**	**2,066**	**7,918**	**2,506**	**7,657,264**
Total Alternative Emissions % of Bay County 2017 Emissions	**0.1%**	**1.2%**	**3.6%**	**1.5%**	**0.6%**	**1.7%**	**1.1%**

Key: CO = carbon monoxide; CO_2e (mt) = carbon dioxide equivalent in metric tons; NA = not applicable; 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_x = sulfur oxides; VOCs = volatile organic compounds

Note:

[1] Calculated values and totals have been rounded; therefore, sum totals may not match the totals row.

Emissions of CO and NO_x resulting from implementation of the combined four-squadron F-35A Wing plus MQ-9 Wing beddowns at Tyndall AFB were compared to the most recent complete Bay County emissions inventory (2017) to determine the relative magnitude of these emissions and their potential to combine with emissions in the affected environment and contribute to an

exceedance of an ambient air quality standard. The annual CO and NO_x emission increases that would result from operations of the alternative would amount to about 1.2 and 3.6 percent, respectively, of the total CO and NO_x emissions generated by Bay County in 2017 (see Section 3.1.4.1). These emission increases are lower than the amounts of CO and NO_x emissions produced by Tyndall AFB in 2017 in comparison to the 2017 Bay County emissions. The majority of CO and NO_x emissions that would result from the alternative would occur from intermittent F-35A and MQ-9 aircraft operations up to an altitude of 3,000 feet AGL and across several square miles that comprise the Tyndall AFB airspace and adjoining aircraft flight patterns. These emissions would disperse through this volume of atmosphere to the point that they would not be expected to result in substantial ground-level impacts in a localized area. In addition, since Bay County attains the NAAQS for O_3, CO, and NO_2, these emission increases would not be substantial enough to contribute to an exceedance of these NAAQS. Therefore, the combined four-squadron F-35A Wing plus MQ-9 Wing beddowns at Tyndall AFB would not result in significant impacts to air quality.

4.3.4.2.3 Airspace and Range Training Operations

F-35A and MQ-9 aircraft would use airspaces and training areas in proximity to Tyndall AFB with the four-squadron F-35A Wing plus MQ-9 Wing beddowns. MQ-9 operations within these areas would occur above 3,000 feet AGL at all times, and therefore these operations would not appreciably affect ground-level air quality. The only airspaces or training areas where proposed F-35A operations would occur below 3,000 feet AGL would be Warning Areas W-151 and W-470. As a result, the data in Section 4.1.4.2, Table 4.1-22, equate to the annual emissions that would result from implementation of the combined four-squadron F-35A Wing plus MQ-9 Wing beddowns within airspaces and training areas. These data show that the proposed F-35A (and MQ-9) aircraft operations within these areas would result in air pollutant emissions within 3,000 feet AGL that would not exceed any annual indicator threshold. Therefore, the combined four-squadron F-35A plus MQ-9 beddowns would not result in significant air quality impacts within any airspace or training area.

4.3.5 Hazardous Materials and Waste, F-35A and MQ-9 at Tyndall

4.3.5.1 Hazardous Materials and Waste, Three-Squadron F-35A Alternative plus MQ-9 at Tyndall Alternative

4.3.5.1.1 Base Facilities Construction and Base Airfield Operations

Although there are two Maintenance Complex options for the MQ-9 at Tyndall AFB, the impacts to hazardous materials and hazardous waste generation for the two options do not differ so the analysis does not distinguish between the two options.

Hazardous Materials Management and Hazardous Waste Management – Potential impacts to hazardous materials and hazardous waste would be the same as those described separately for the three-squadron F-35A Wing beddown (Section 4.1.5.1) and the MQ-9 Wing beddown (Section 4.2.1.9) at Tyndall AFB. The three-squadron F-35A Wing plus MQ-9 Wing beddown is not anticipated to increase fuel consumption significantly over peak levels already experienced at the

installation and any insignificant increase in fuel consumption would be supportable by the restored infrastructure planned at the installation. Any additional hazardous waste generation or handling areas that are established due to the action would be managed in accordance with the installation's HWMP.

Contamination Sites – Construction activities for, and potential impacts to, contamination sites for the combined actions to beddown a three-squadron F-35A Wing and the MQ-9 Wing would be the same as described separately for the three-squadron F-35A Wing beddown (Section 4.1.5.1) and the MQ-9 Wing beddown at Tyndall (Section 4.2.1.9). There are 14 active ERP sites located under or adjacent to the footprints of the proposed construction sites (Table 4.3-15 and Figure 3.1-2) (325 FW, 2019).

Table 4.3-15. Tyndall AFB ERP Sites in Relation to Proposed Project Facility Sites

ERP Site Name	Project Component	Comments
SS0026 (IRP Site 26), Vehicle Maintenance Area	F-35A Parking Apron/MQ-9 Gym Option 2	Located over ERP site
SS015 (IRP Site 15), POL Area B	F-35A Operations and Maintenance Complex	Located over ERP site
TU204, Bldg 182 UST Site	F-35A Operations and Maintenance Complex	Located over ERP site
OW047, Bldg 188 OWS	F-35A Operations and Maintenance Complex	Located over ERP site
TU205, Former Bldg 239 Engine Test Cell	MQ-9 Maintenance Complex Option 1	Located over ERP site
FT017, Hwy 98 Fire Training Areas	MQ-9 Maintenance Complex Option 1	Located adjacent to ERP site
OW040, Bldg 315 OWS	MQ-9 Maintenance Complex Option 1	Located over ERP site
Bldg 319 WAA	MQ-9 Maintenance Complex Option 1	Located over ERP site
TU207, Bldg 1274 AST	MQ-9 Consolidated Operations Complex	Located over ERP site
SA181, Tower Range	MQ-9 Consolidated Operations Complex	Located adjacent to ERP site
TA534, Bldg 1280 AST	MQ-9 Consolidated Operations Complex	Located over ERP site
OW579, Bldg 7028 OWS	F-35A/MQ-9 Munitions Storage Area	Located over ERP site
OT022, Pesticide Disposal Area	MQ-9 Maintenance Complex Option 2	Located over ERP site
SS219, Wash Rack	MQ-9 Maintenance Complex Option 2	Located over ERP site

Source: (AFCEC, 2016)
AFB = Air Force Base; AST = above ground storage tank; Bldg = building; ERP = Environmental Restoration Program; IRP = Installation Restoration Program; POL = petroleum, oil, and lubricants; OWS = oil/water separator; UST = Underground Storage Tank; WAA = Waste Accumulation Area

As discussed in Section 3.1.5, Remedial Investigations/Feasibility Studies are ongoing or are planned for these ERP sites. As described in Section 4.1.5, construction on a contaminated site must not adversely impact ongoing cleanup activities or impact migration of contaminants from the site. In addition, site contaminants must be adequately characterized and delineated.

Since the three-squadron F-35A Wing plus MQ-9 Wing beddowns would not materially change the amount of hazardous materials used and hazardous waste generated at Tyndall AFB, no significant impacts are anticipated. No significant impacts related to ERP sites are anticipated with appropriate procedures as described above.

4.3.5.2 Hazardous Materials and Waste, Four-Squadron F-35A Alternative plus MQ-9 at Tyndall Alternative

4.3.5.2.1 Base Facilities Construction and Base Airfield Operations

Although there are two Maintenance Complex options for the MQ-9 at Tyndall AFB, the impacts to hazardous materials and hazardous waste generation for the two options do not differ so the analysis does not distinguish between the two options.

Hazardous Materials Management and Hazardous Waste Management

Potential impacts to hazardous materials and hazardous waste would be the same as those described above for the three-squadron F-35A Wing plus MQ-9 Wing beddown. The combined four-squadron F-35A Wing plus MQ-9 Wing beddowns are not anticipated to increase fuel consumption significantly over peak levels already experienced at the installation and any insignificant increase in fuel consumption is supportable by the restored infrastructure planned at the installation. Any additional hazardous waste generation or handling areas that are established due to the action would be managed in accordance with the installation's HWMP.

Contamination Sites

Construction activities for the four-squadron F-35A Wing plus MQ-9 Wing beddowns would be the same as described above for the three-squadron F-35A Wing plus MQ-9 Wing beddowns. Construction on a contaminated site must not adversely impact ongoing cleanup activities or impact migration of contaminants from the site. In addition, site contaminants must be adequately characterized and delineated.

Since the combined four-squadron F-35A Wing plus MQ-9 Wing beddowns would not materially change the amount of hazardous materials used and hazardous waste generated at Tyndall AFB, no significant impacts are anticipated. No significant impacts related to ERP sites are anticipated with appropriate procedures as described above.

4.3.6 Soils and Geologic Resources, F-35A and MQ-9 at Tyndall

4.3.6.1 Soils and Geologic Resources, Three-Squadron F-35A Alternative plus MQ-9 at Tyndall Alternative

4.3.6.1.1 Base Facilities Construction

Under these combined actions, up to 276.1 (MQ-9 Maintenance Complex Option 1) or 834.3 (MQ-9 Maintenance Complex Option 2) acres would be temporarily disturbed due to construction, renovation, and additions to base facilities associated with the beddown of the F-35A Wing and MQ-9 Wing at Tyndall AFB (Figure 3.1-3). Actual acres of disturbance would likely be less as the facility footprints total 37.3 acres with MQ-9 Maintenance Complex Option 1 and 49.5 acres with MQ-9 Maintenance Complex Option 2. Only the MSAs share proposed sites (the proposed MQ-9 MSA is encompassed by the F-35A MSA). Areas immediately surrounding

construction zones may also experience temporary disturbance from vehicle and equipment operations during construction. Disturbance in areas greater than 1 acre require a Construction General Permit under the NPDES program. In addition to the potential disturbances described above there would be up to 0.73 acre of surface disturbance for the installation of infrastructure and communication conduit extensions supporting the MQ-9 Wing beddown.

Impacts would be the same as those described in Sections 4.1.6 and 4.2.1.11. With the use of BMPs described in those sections, the combined actions would not be expected to result in significant impacts to soils and geology.

4.3.6.2 Soils and Geologic Resources, Four-Squadron F-35A Alternative plus MQ-9 at Tyndall Alternative

4.3.6.2.1 Base Facilities Construction

The potential environmental consequences to soil and geologic resources of the combined beddown of a four-squadron F-35A Wing and MQ-9 Wing on Tyndall AFB would be the same as those described in Section 4.3.6.1, with the exception of the construction of any additional facilities and infrastructure within the same construction footprint along the main runway flightline (Figure 2.2-1). The most likely setting for the additional facilities would be Arents or urban soil (or both), which are described in Section 4.1.6.1.1. Impacts would be the same as those described in Sections 4.1.6 and 4.2.1.11. With the use of BMPs described in Table 2.7-1, the combined actions would not be expected to result in significant impacts to soils and geology.

4.3.7 Water Resources, F-35A and MQ-9 at Tyndall

Impacts, BMPs and permitting requirements would be similar to those described for Section 4.1.7.1. The following provides information that is unique to each alternative and/or option.

4.3.7.1 Water Resources, Three-Squadron F-35A Alternative plus MQ-9 at Tyndall AFB Alternative

4.3.7.1.1 Base Facilities Construction

Surface Water, Main Runway Option

There would be no significant impacts to surface waters under this option for the proposed three-squadron F-35A plus MQ-9 beddown at Tyndall. Under these combined actions up to 276.1 acres would be temporarily disturbed due to construction, renovation, and additions to base facilities associated with the beddown of the F-35A and MQ-9 at Tyndall AFB. Actual acres of disturbance would likely be less as the facility footprints total approximately 37 acres. However, the overall disturbed area is usually larger than the facility footprints when allowing for landscaping, utility connections, equipment laydown and staging, etc.

Approximately 35 of 58 acres (60 percent) of the F-35A Operations and Maintenance Facilities Complex/Parking Apron area is currently impervious and 15 of 38 acres (40 percent) of the MQ-9 Maintenance Complex area is currently impervious. All the proposed F-35A and MQ-9 facilities in these areas (50 acres total) could be sited on currently impervious surfaces; however, some new impervious surfaces would likely be created for facilities and improvements located outside of these areas. Other facilities and improvements would be constructed on pervious surfaces. In total, impervious surfaces at Tyndall AFB would increase by 10.5 to 42.5 acres, depending on siting, under this alternative.

Surface Water, MQ-9 Alternate Runway Option

There would be no significant impacts to surface waters under this option. This option would disturb up to 834.3 acres would be temporarily disturbed due to construction, renovation, and additions to base facilities associated with the beddown of the F-35A and MQ-9 at Tyndall AFB. Actual acres of disturbance would likely be less as the facility footprints total approximately 50 acres. This option, which would construct the MQ-9 Maintenance Complex at the drone runway, would result in approximately 27 to 50 acres of new impervious surfaces at Tyndall AFB (compared to 10.5 to 42.5 acres for the Main Runway Option, depending on actual facility siting). The permits and BMPs as described for the Main Runway Option would be the same. No significant impacts would be expected to surface water with the implementation of SWPPPs, BMPs, and LID.

Groundwater, Both MQ-9 Maintenance Complex Options

Impacts would be similar to those described for the three-squadron F-35A Wing beddown alternative. There would be no significant impacts.

Floodplains, MQ-9 Main Runway Option

There would be no significant impacts associated with floodplains. The facilities proposed for the F-35A and MQ-9 MSAs and MQ-9 GDT Towers area could potentially be located in the 100-year floodplain. As a conservative estimate of impacts, it was assumed that all floodplains within the action areas would be impacted. There are 37.6 acres of floodplains in the MSAs and 22.0 acres in the GDT Towers area. This alternative, depending on final siting of facilities and considering the areas presented in Table 2.2-1 and Table 2.3-1, could result in as few as 0.35 to 1.25 acres of development within floodplains.

Floodplains, MQ-9 Alternate Runway Option

There would be no significant impacts associated with floodplains. The facilities proposed for the F-35A and MQ-9 MSAs, MQ-9 Maintenance Complex Option 2 area, and MQ-9 GDT Towers area could potentially be located in the 100-year floodplain. As a conservative estimate of impacts, it was assumed that all floodplains within the action areas would be impacted. There are 207.1 acres of floodplains in the Maintenance Complex Option 2 area, 37.6 acres in the MSAs, and 22.0 acres in the GDT Towers area.

Coastal Zone Management, Both MQ-9 Maintenance Complex Options

There would be no significant impacts associated with coastal zone management.

4.3.7.2 Water Resources, Four-Squadron F-35A Alternative plus MQ-9 at Tyndall Alternative

4.3.7.2.1 Base Facilities Construction

Surface Water

Impacts would be similar to those described for the proposed three-squadron F-35A Wing plus MQ-9 Wing beddown. The construction of any additional facilities and infrastructure in the Operations and Maintenance Facilities complex would result in disturbance of land already developed for the airfield and an increase in impervious surfaces, depending on siting, of 10.5 to 44.5 acres for the MQ-9 Main Runway Option or 27 to 52 acres for the MQ-9 Alternate Runway Option.

Groundwater

Impacts would be similar to those described for the proposed three-squadron F-35A Wing plus MQ-9 Wing beddown.

Floodplains

Impacts would be similar to those described for the proposed three-squadron F-35A Wing plus MQ-9 Wing beddown.

Coastal Zone Management

Impacts would be the same as those described for the proposed three-squadron F-35A Wing plus MQ-9 Wing beddown.

4.3.8 Biological Resources, F-35A and MQ-9 at Tyndall

4.3.8.1 Biological Resources, Three-Squadron F-35A Alternative plus MQ-9 at Tyndall Alternative

4.3.8.1.1 Base Facilities Construction

Flora

Construction-related impacts to vegetation from the proposed three-squadron F-35A Wing beddown at are described in Section 4.1.8.1. Construction-related impacts to vegetation from the proposed MQ-9 Wing beddown at Tyndall AFB are described in Section 4.2.1.15.

Total impacts for this combination of F-35A and MQ-9 Wing beddowns, with the MQ-9 Maintenance Complex Option 1, would include the loss of 33.5 acres of vegetation. Total impacts

with the MQ-9 Maintenance Complex Option 2 would include the loss of 629.5 acres of vegetation. Potential impacts to wetlands and protected species are discussed in the wetlands and sensitive species sections below. No significant impacts to vegetation are anticipated to result from the combination of three-squadron F-35A and MQ-9 Wing beddowns at Tyndall AFB.

Wetlands

Construction-related impacts to wetlands from the proposed three-squadron F-35A Wing beddown at Tyndall AFB are described in Section 4.1.8.1. Construction-related impacts to wetlands from the proposed MQ-9 Wing beddown at Tyndall AFB are described in Section 4.2.1.15.

Approximately 155.5 acres of forested/scrub shrub and 19.6 acres of emergent wetlands would be impacted by construction of the proposed facilities. Impacts would also occur to a freshwater pond and several drainages classified as riverine wetlands (Table 4.3-16). Because no wetlands have been observed at the location of the MQ-9 Maintenance Complex Option 1, selection of this option would reduce wetland impacts by 148 acres of forested/scrub shrub, 19 acres of emergent, and 3 acres of pond/riverine wetland types. Loss of any jurisdictional waters, including wetlands, requires compliance with Section 404 of the CWA. Coordination is in process for a USACE Section 404 permit and for compliance with Florida wetland regulations.

Table 4.3-16. Wetland and Surface Water Features Associated With F-35A and MQ-9 Facilities

Facility	Wetland Type	Acres of Impact
MSA (F-35A)	Freshwater Forested/Scrub Shrub	2.7
	Freshwater Emergent	0.6
	Subtotal Wetlands	**3.3**
GDT Towers (MQ-9)[1]	Freshwater Forested/Scrub Shrub	7.5
	Freshwater Emergent	0.6
	Subtotal Wetlands	**8.1**
Maintenance Complex Option 2 (MQ-9)	Freshwater Forested/Scrub Shrub	258.6
	Freshwater Emergent	36.7
	Subtotal Wetlands	**295.3**
	Total Wetlands	**306.7**

Source: (USAF, 2020e)
Notes:
[1] Wetland acres based on preliminary results of a 2020 field delineation (USAF, 2020e)

As a conservative estimate of impacts, it was assumed that all wetlands within the potential disturbed area would be impacted by fill activities, resulting in the loss of the wetland. Final facility site selection and design would attempt to minimize impacts to Waters of the United States, as feasible, and final impacts could be reduced.

Fauna

Potential impacts to wildlife could include ground disturbance and the associated loss of habitat, and construction noise from the associated facility projects. Construction-related impacts to wildlife from the proposed three-squadron F-35A Wing beddown at Tyndall AFB are described in Section 4.1.8.1. Construction-related impacts to wildlife from the proposed MQ-9 Wing beddown at Tyndall AFB are described in Section 4.2.1.15.

Total impacts from implementation of this combination of F-35A and MQ-9 Wing beddowns would result in 629.5 acres of habitat loss. Potential impacts to protected species are discussed below.

Sensitive Species

Sixteen (16) federally listed species (Table 4.1-25 and Table 3.1-18) have been documented at Tyndall AFB. In addition, seven species have not been documented on the installation but could potentially occur in the various habitats present at the installation. None of the federally listed species or other sensitive species have been documented in the proposed construction area. The effects determinations in Table 4.1-25 would apply to this alternative as well.

Impacts to sensitive species would be the same as those described under the F-35A-only alternatives and are anticipated to result from facility construction associated with the F-35A Wing beddown at Tyndall AFB. Under this combination of three-squadron F-35A and MQ-9 Wing beddowns at Tyndall AFB, sensitive species would continue to be managed and monitored in accordance with the INRMP, FWC recommendations would be implemented, and annual coordination with the USFWS and state agencies would continue.

4.3.8.1.2 Base Airfield Operations

No impacts to vegetation or wetlands would occur due to flight operations. Potential implementation of the combination of three-squadron F-35A and MQ-9 Wing beddowns at Tyndall AFB would increase the land area, and thus the number of wildlife, exposed to increased noise levels. Any increase in operations could increase the potential for bird/wildlife-aircraft strikes. Tyndall AFB would continue to adhere to the installation's BASH Plan to minimize the risk of strikes. Impacts would be similar, regardless of which afterburner scenario is used. Impacts to wildlife (including sensitive species) associated with aircraft noise would be the same as those described for the F-35A only alternatives.

4.3.8.1.3 Airspace and Range Training Operations

Impacts to biological resources under the airspace and ranges proposed for F-35A training operations would be the same as those described in Section 4.1.8.1.3. While MQ-9 training operations could utilize some of the same airspace proposed for F-35A training, any impacts related to noise generated by MQ-9 training operations would be negligible when compared to the noise generated by F-35A training operations. The MQ-9 does not use chaff and flares, and no additional impacts beyond those described for the F-35A beddown would be anticipated.

4.3.8.2 Biological Resources, Four-Squadron F-35A Alternative plus MQ-9 at Tyndall Alternative

4.3.8.2.1 Base Facilities Construction

Facility-related impacts are described in Section 4.3.8.1.1 and were based on the complete use of the facility footprints shown on Figure 2.2-1. Construction of facilities for one additional squadron

would not change the facility footprints used for the basis of impacts; therefore, the impacts for this alternative would be the same as those described in Section 4.1.8.1.1.

4.3.8.2.2 Base Airfield Operations

The addition of a fourth squadron would increase the number of operations, thus increasing the number of biological resources exposed to noise-related impacts. The types of impacts would be the same as those described in Section 4.3.8.1.2.

4.3.8.2.3 Airspace and Range Training Operations (*F-35A*)

The addition of a fourth squadron would increase the number of operations, thus increasing the number of biological resources exposed to noise-related impacts or potential bird/wildlife strikes. The types of impacts would be the same as those described in Section 4.3.8.1.3. The MQ-9 does not use chaff and flares, and no additional impacts beyond those described for the F-35A beddown would be anticipated.

4.3.9 Cultural Resources, F-35A and MQ-9 at Tyndall

4.3.9.1 Cultural Resources, Three-Squadron F-35A Alternative plus MQ-9 at Tyndall Alternative

4.3.9.1.1 Base Facilities Construction and Base Airfield Operations

Potential impacts to cultural resources would be the same as those described separately for the three-squadron F-35A Wing beddown (Section 4.1.9.1) and for both runway options of the MQ-9 Wing beddown (Section 4.2.1.17) at Tyndall AFB. Proposed F-35A and MQ-9 Wing beddowns and associated increase in airfield operations would have no effect on NRHP-listed or -eligible buildings or structures, and would have no adverse effect on archaeological sites, traditional cultural properties, or sacred sites.

4.3.9.1.2 Airspace and Range Training Operations

Potential impacts to cultural resources would be the same as those described separately for the three-squadron F-35A Wing beddown (Section 4.1.9.1) and MQ-9 Wing beddown (Section 4.2.1.17) at Tyndall AFB. No adverse effects on NRHP-listed and NRHP-eligible cultural resources are expected to result from airspace and range training operations.

4.3.9.2 Cultural Resources, Four-Squadron F-35A Alternative plus MQ-9 at Tyndall Alternative

4.3.9.2.1 Base Facilities Construction and Base Airfield Operations

Potential impacts to cultural resources would be the same as those described separately for the four-squadron F-35A Wing beddown alternative (Section 4.1.9.2) and for both runway options of

the MQ-9 Wing beddown (Section 4.2.1.17) at Tyndall AFB. Proposed F-35A and MQ-9 Wing beddowns and associated increase in airfield operations would have no effect on NRHP-listed or -eligible buildings or structures, and would have no adverse effect on archaeological sites, traditional cultural properties, or sacred sites.

4.3.9.2.2 Airspace and Range Training Operations

Potential impacts to cultural resources would be the same as those described separately for the four-squadron F-35A Wing beddown alternative (Section 4.1.9.2) and the MQ-9 Wing beddown (Section 4.2.1.17) at Tyndall AFB. No adverse effects on NRHP-eligible and -listed cultural resources are expected to result from airspace and range training operations.

4.3.10 Land Use and Recreation, F-35A and MQ-9 at Tyndall

4.3.10.1 Land Use and Recreation, Three-Squadron F-35A Alternative plus MQ-9 Wing Beddown at Tyndall AFB Alternative

4.3.10.1.1 Base Facilities Construction

Proposed facility construction for the combination of the F-35A three-squadron mission and the MQ-9 mission, either along the main runway or in a new area along the drone runway, is congruent with recovery plans for base redevelopment following Hurricane Michael. However, both missions would occupy substantial land along the flightline, reducing flexibility for future expansion and mission changes. As mentioned in Section 4.2.1.19, locating the MQ-9 complex of facilities at the drone runway location provides for better traffic circulation on base and retains flexibility for future development along the main runway.

Noise effects from the combined operations would expose the proposed sites for Airmen Dormitories and a Child Development Center (for the MQ-9 mission) to incompatible noise levels for residential use. The Base Civil Engineer would require appropriate noise-attenuating measures for these new projects.

4.3.10.1.2 Base Airfield Operations

Figure 4.1-5 (insets: Proposed 3 and Proposed 4 Squadrons F-35A plus MQ-9, respectively) illustrate the extent of the 65 dB DNL footprint for the combined mission alternatives for the Main Runway or the Alternate Runway Options. The noise footprints for the three-squadron F-35A and MQ-9 combined action beddown are almost identical to the Three-Squadron F-35A Wing Alternative without the MQ-9 mission (Box 1). Impacts are essentially the same as those described in Sections 4.1.2.1.2 and 4.1.10.1.2.

Table 4.3-17, shows that the majority of the area affected by noise levels of 65 dB DNL occurs on base. This combined mission slightly expands the 65 dB DNL footprint compared to the three-squadron mission without the MQ-9 mission by between 50 to 176 acres (about 1 percent). The area off base is between 14 to 97 acres larger (1 to 2 percent) than the three-squadron F-35A-only mission. Most of this off-base affected area is over water. The off-base land area

affected by the combined missions is almost identical in size to the three-squadron F-35A-only mission (61 to 68 acres, compared to 61 to 69 acres). The amount of off-base residential land affected by noise levels of 65 dB DNL or greater is identical to the Three-Squadron F-35A Wing Alternative (9 to 10 acres). Because of these similarities, the noise impacts from aircraft operations of the combined missions are virtually identical to those described in Section 4.1.10.1.2.

Table 4.3-17. Areas Exposed to Noise Levels of 65 dB DNL and Greater – F-35A and MQ-9 at Tyndall AFB (Acres) – All Alternatives

Alternative	Area 65 dB DNL or Greater (Acres)			
	Total Area[1]	Off-Base Area[2]	Off-Base Land Area[3]	Residential[4]
No Action	4,404	247	2	0
Pre-Hurricane 2016 AICUZ[5]	31,641	14,145	217	25
F-35A 3 Squadrons 5% AB	15,938	3,939	68	10
F-35A 3 Squadrons 50% AB	15,663	4,024	64	9
F-35A 3 Squadrons 95% AB	15,304	4,115	61	9
F-35A 3 Squadrons 5% AB + MQ-9 Main	15,989	3,951	69	10
F-35A 3 Squadrons 50% AB + MQ-9 Main	15,712	4,037	64	9
F-35A 3 Squadrons 95% AB + MQ-9 Main	15,353	4,129	61	9
F-35A 3 Squadrons 5% AB + MQ-9 Alternate	16,109	4,024	68	10
F-35A 3 Squadrons 50% AB + MQ-9 Alternate	15,837	4,115	64	9
F-35A 3 Squadrons 5% AB + MQ-9 Alternate	15,480	4,212	61	9

Key: AB = afterburner; AFB = Air Force Base; AICUZ = Air Installations Compatible Use Zone; dB = decibel; DNL = day-night average sound level

Notes:

[1] Includes all areas at or above65 dB DNL (including on-base land, off-base land, and water areas

[2] Includes off-base land and water at or above 65 dB DNL

[3] Includes off-base land area. (Land use categories include commercial, industrial, open/agriculture/low-density, public/quasi-public, residential, transportation, undesignated, and water.)

[4] Residential land within the 65 dB DNL noise contour (Assume area is within the 65 to 70 dB DNL contours, unless noted.)

[5] Residential land includes 1 acre affected by noise levels just over 70 dB DNL.

4.3.10.1.3 Personnel Increase

The combined three-squadron F-35A and MQ-9 mission would result in an estimated demand for 5,103 additional off-base housing units. There will continue to be a housing shortage and increasing rental costs for years, during reconstruction. Assuming densities of four to eight dwelling units per acre, this would translate into development of about 638 to 1,276 acres for additional residential use off base by 2025. The surrounding area has a supply of vacant land categorized for residential use (see Section 4.1.10.1.3). As the prime areas to develop are exhausted, the cost for developing new residential areas would likely increase and take longer, if providing new roads and other infrastructure must precede construction of homes. This would bring issues of meeting a broader range of services and land development to support rapid growth from the new base-related population. This situation could have a moderate impact on local land-use allocation and community resources.

Rapid residential growth in some communities would increase the demand for a range of other community services, amenities and businesses. Local planning departments could find it difficult to allocate resources to meet the needs of rapid expansion and growth. Base support for planning includes publishing the AICUZ and identifying compatible land uses.

The additional military households in the local communities could push the capacity of existing community recreational resources (such as parks, playgrounds, public recreation centers/swimming pools, etc.). Use of facilities on base by these households would somewhat lessen their use of community recreational amenities. Given the losses during the hurricane, jurisdictions may prioritize housing and safety services over recreational redevelopment, and these amenities may remain below optimum for the populations served.

4.3.10.1.4 Airspace and Range Training Operations

The effect of training for the combined actions of the three-squadron F-35A and MQ-9 beddowns are similar to those described in Section 4.1.10.1.4. Minimal effects on land use underlying training airspace would occur. Some additional noise underlying the Compass Lake Work Area (Tyndall C MOA) and Carabelle Work Area would remain compatible with land uses, although some local residents may notice the change given the typically quiet acoustic environment. Some SULMAs under Tyndall C MOA may experience a moderate increase in noise as well, similar to those described in Section 4.1.10.1.4. The combined noise levels for this alternative would remain well below thresholds of concern for compatible land use.

4.3.10.2 Land Use and Recreation, Four-Squadron F-35A Alternative plus MQ-9 Wing Beddown at Tyndall AFB Alternative

4.3.10.2.1 Base Facilities Construction

The effect of new facility construction on base for the combined beddown of four squadrons of F-35A aircraft and the MQ-9 mission are similar to those described in Section 4.1.10.2.1. The additional facilities for the expanded F-35A mission along the flightline would further decrease flexibility for future development along the main runway.

4.3.10.2.2 Base Airfield Operations

Figure 4.1-5 (inset: Proposed 4 Squadrons F-35A:MQ-9 Drone Runway) illustrates the extent of the 65 dB DNL footprint for the combined mission alternatives for the Main Runway or the Alternate Runway Options. The noise footprints for the four-squadron F-35A and MQ-9 combined action beddown are almost identical to the Four-Squadron F-35A Wing Alternative without the MQ-9 mission (inset: Proposed 4 Squadrons F-35A). Impacts are essentially the same as those described in Sections 4.1.2.2.2 and 4.1.10.2.2.

Comparison of the area exposed to noise levels of 65 dB DNL and greater, for the four-squadron F-35A beddown with and without the MQ-9 mission (Table 4.3-18), shows that the MQ-9 mission adds a small amount of land within the 65 dB DNL footprint. This increase in exposure is partially on base and partially over water. The off-base land area exposure is the same for the four-squadron

F-35A beddown with or without the MQ-9 mission; therefore, the impacts of noise on off-base land use are essentially the same as those described in Section 4.1.10.2.2.

The MQ-9 operations on the main runway would contribute a negligible increase to noise levels in the flightline areas of the base.

Table 4.3-18. Areas Exposed to Noise Levels of 65 dB DNL and Greater – Four-Squadron F-35A plus MQ-9 at Tyndall AFB (Acres)

Alternative	Area 65 dB DNL or Greater (Acres)			
	Total Area[1]	Off-Base Area[2]	Off-Base Land Area[3]	Residential[4]
No Action	4,404	247	2	0
Pre-Hurricane 2016 AICUZ[5]	31,641	14,145	217	25
F-35A 4 Squadrons 5% AB[5]	18,157	5,088	93	18
F-35A 4 Squadrons 95% AB	17,477	5,323	84	18
F-35A 4 Squadrons 5% AB + MQ-9 Main[5]	18,198	5.101	93	18
F-35A 4 Squadrons 95% AB + MQ-9 Main	17,515	5,337	84	18
F-35A 4 Squadrons 5% AB + MQ-9 Alternate[5]	18,337	5,196	93	18
F-35A 4 Squadrons 95% AB + MQ-9 Alternate	17,673	5,448	84	18

Key: AB = afterburner; AFB = Air Force Base; AICUZ = Air Installations Compatible Use Zone; dB = decibel; DNL = day-night average sound level

Notes:

[1] Includes all areas at or above 65 dB DNL (including on-base land, off-base land, and water areas).

[2] Includes off-base land and water at or above 65 dB DNL.

[3] Includes off-base land area. (Land use categories include commercial, industrial, open/agriculture/low-density, public/quasi-public, residential, transportation, undesignated, and water.)

[4] Residential land within the 65 dB DNL noise contour (Assume area is within the 65 to 70 dB DNL contours, unless noted.)

[5] Residential land includes 1 acre affected by noise levels just over 70 dB DNL.

[6] Includes 2 acres of transportation land.

4.3.10.2.3 Personnel Increase

This alternative has the highest number of new personnel and the highest anticipated demand for off-base housing. For the combined mission, there would be an increased demand for 6,901 off-base housing units by 2026. Given the situation after the hurricane, the demand for housing by construction workers, and the lack of rental properties, would create a need for new homes in the area. Assuming a density of four to eight dwelling units per acre, this could represent development of about 863 to 1,725 acres for residential use. The surrounding off-base area has some vacant land zoned for residential use to absorb part of this demand (see Sections 4.1.10.1.3 and 4.3.10.1.3). However, competing with other post-hurricane housing needs in the areas, shortages of prime residential land could hamper development and increase the time and cost to develop new housing. This could present a moderate to high impact on local land-use allocation and hamper efforts to provide affordable housing that is close to where people work. The need for this housing between 2022 and 2026 could outpace the current tempo of build-out. This situation could pose a moderate to high impact on local residential-land allocation and community resources.

As mentioned in Section 4.1.10.1.3, preferred areas for new development are on higher elevations, and building codes are starting to require this. Areas such as Lynn Haven, Port St. Joe, and smaller unincorporated communities along primary access routes to the base (along U.S. Route 231) could expand more rapidly than planned. This would burden these communities with the cost of expanding infrastructure and the administrative effort for reviewing and approving new building permit applications. Impacts on land use for this alternative are greater than impacts described for the four-squadron F-35A Wing in Section 4.1.10.2.3.

The addition of more than 4,465 military housing units in the local communities could push the capacity of existing community recreational resources (such as parks, playgrounds, public recreation centers/swimming pools, etc.). Impacts on recreational resources are similar, but increased, compared to the combined mission with Four-Squadron F-35A Wing Alternative (see Section 4.3.10.1.4). Unmet demands may have potentially high impacts on local recreational amenities.

4.3.10.2.4 Airspace and Range Training Operations

The noise generated in training airspace for both the four-squadron F-35A and the MQ-9 Wing beddowns would not exceed levels of concern for underlying land uses. The effects of training would be similar to those described in Section 4.1.10.2.4.

4.3.11 Infrastructure, F-35A and MQ-9 at Tyndall

4.3.11.1 Infrastructure, Three-Squadron F-35A Alternative plus MQ-9 at Tyndall Alternative

4.3.11.1.1 Base Facilities Construction and Personnel Increase

Potable Water System

The proposed beddown of 72 F-35A aircraft and 24 MQ-9 aircraft at Tyndall AFB would result in a substantial increase in the overall number of personnel and dependents as compared to levels previously experienced at Tyndall AFB. The demand for potable water would be spread across various municipal utility systems because base personnel would occupy housing in a number of nearby communities, including Panama City, Lynn Haven, rural areas north of Panama City, and Gulf County. It is anticipated that only a portion of the additional population and demand would affect the base. The average per capita on-base water use is estimated to be about 82 gpd (USAF, 2015). Therefore, the additional demand for potable water could be serviced with modifications to the existing contract with Bay County. Tyndall AFB receives its water supply from Bay County at three locations on base, and the installation currently has onsite potable water storage of approximately 400,000 gallons as well as additional water storage for fire suppression. Water pressure on the base ranges from 60 to 78 psi, well above the DoD requirement of 40 psi and the state recommendation of 20 psi (USAF, 2011a). If direct connections to Bay County's water system are needed, FDEP potable water permitting will be evaluated by the USAF. A determination request would be submitted by emailing a description and drawing(s) to the FDEP

at Epost.nwdwf@FloridaDEP.gov. This system would experience minimal impact from this potential combination of F-35A and MQ-9 beddowns.

Sanitary Sewer System

Tyndall AFB discharges its wastewater to the Bay County AWWTP; the base is allowed by contract to discharge a monthly average of up to 1.26 MGD. The average discharge in FY15 was approximately 0.77 MGD. The existing base sanitary sewer system is adequate to serve the current number of personnel at Tyndall AFB and new construction would reduce inflow and infiltration. The USEPA estimates that the average person generates approximately 70 gpd of wastewater between showering, toilet use, and general water use (USAF, 2011a). As new personnel locate either on base or in one of the nearby communities, additional wastewater would be generated throughout the region. Tyndall AFB would need to modify the contract with Bay County because wastewater flows may exceed 1.26 MGD. The USAF will contact FDEP to determine if permitting is needed for the construction of wastewater collection systems. There would be no significant impact to the sanitary system of Tyndall AFB from this potential combination of F-35A and MQ-9 beddowns.

Stormwater Drainage System

Tyndall AFB has an extensive stormwater piping network, which would be updated as new construction is completed. Stormwater from the industrial areas of the base and the property that surrounds the runway would continue to be channeled to one of the seven outfall locations via the storm drain network (USAF, 2011a). The Tyndall AFB SWPPP would be amended to reflect changes in facility design, construction, operation, or maintenance associated with this potential combination of F-35A and MQ-9 beddowns and no significant impacts are anticipated.

Solid Waste Management

Off-base contractors completing any construction projects at the Tyndall AFB would be responsible for disposing of waste generated from these activities. Contractors would be required to comply with federal, state, and local regulations for the collection and disposal of municipal solid waste from the installation. Much of this material can be recycled, reused, or otherwise diverted from landfills. All nonrecyclable construction waste would be collected in a dumpster until removal. Construction waste contaminated with hazardous waste, ACM, LBP, or other undesirable components would be managed in accordance with AFMAN 32-7002. No significant impacts are anticipated to the solid waste management system at Tyndall AFB with this potential combination of F-35A and MQ-9 beddowns.

Electrical System

The demand for electricity) would increase during activities associated with the beddown of 72 F-35A aircraft and 24 MQ-9 aircraft. Construction of new facilities would result in an increase in electrical consumption. The USAF expects increases in electrical use associated with new facilities to be less than current standard consumption given new requirement to reduce energy levels in federal facilities. This is achieved through using LEED® strategies and "green"

specifications. The supply grid for the Tyndall AFB electrical energy would be adequate and not affected by the increased demand.

Natural Gas System

There would be an increase in natural gas consumption at Tyndall AFB under this alternative. This increase would occur as additional working and administrative spaces are developed and heated and operations change with the beddown of 72 F-35A aircraft and 24 MQ-9 aircraft at the base. The natural gas energy supply grid at Tyndall AFB is currently operating well within its capacity (USAF, 2015) and would be adequate to support the increased demand.

As each component of the Tyndall AFB infrastructure would function below capacity with the implementation of the potential combination of F-35A and MQ-9 beddowns, there would be no significant impact to infrastructure.

4.3.11.2 Infrastructure, Four-Squadron F-35A Alternative plus MQ-9 at Tyndall Alternative

4.3.11.2.1 Base Facilities Construction and Personnel Increase

Potable Water System

The proposed beddown of four F-35A squadrons and 24 MQ-9 aircraft at Tyndall AFB would result in a doubling in the overall number of personnel and dependents as compared to levels previously experienced at Tyndall AFB. The demand for potable water would be spread across various municipal utility systems because base personnel would occupy housing in a number of nearby communities, including Panama City, Lynn Haven, rural areas north of Panama City, and Gulf County. It is anticipated that only a portion of the additional population and demand would affect the base. With an average per capita on-base water use estimation of about 82 gpd (USAF, 2015), the additional demand for potable water may require expansion to the interconnection with Bay County and on-base storage and would require modifications to the existing contract with Bay County. Tyndall AFB receives its water supply from Bay County at three locations on base, and the installation currently has onsite potable water storage of approximately 400,000 gallons as well as additional water storage for fire suppression. Water pressure on the base ranges from 60 to 78 psi, well above the DoD requirement of 40 psi and the state recommendation of 20 psi (USAF, 2011a). The potable water distribution system would undergo a substantial modernization with this level of construction; however, no significant impacts are anticipated from this potential combination of F-35A and MQ-9 beddowns.

Sanitary Sewer System

Tyndall AFB discharges its wastewater to the Bay County AWWTP; the base is allowed by contract to discharge a monthly average of up to 1.26 MGD. The average discharge in FY15 was approximately 0.77 MGD. The existing base sanitary sewer system is adequate to serve the current number of personnel at Tyndall AFB, and new construction would reduce inflow and infiltration. USEPA estimates that the average person generates approximately 70 gpd of wastewater between

showering, toilet use, and general water use (USAF, 2011a). As new personnel locate either on base or in one of the nearby communities, additional wastewater would be generated throughout the region. Tyndall AFB would need to modify the contract with Bay County because wastewater flows would exceed the current contract limits. There would be no significant impact from this potential combination of F-35A and MQ-9 beddowns to the sanitary system at Tyndall AFB.

Stormwater Drainage System

Tyndall AFB has an extensive stormwater piping network, which would be updated as new construction is completed. Stormwater from the industrial areas of the base and the property that surrounds the runway would continue to be channeled to one of the seven outfall locations via the storm drain network (USAF, 2011a). The Tyndall AFB SWPPP would be amended to reflect changes in facility design, construction, operation, or maintenance associated with this potential combination of F-35A and MQ-9 beddowns. No significant impacts are anticipated under this alternative.

Solid Waste Management

Off-base contractors completing any construction projects at Tyndall AFB would be responsible for disposing of waste generated from these activities. Contractors would be required to comply with federal, state, and local regulations for the collection and disposal of municipal solid waste from the installation. Much of this material can be recycled, reused, or otherwise diverted from landfills. All nonrecyclable construction waste would be collected in a dumpster until removal. Construction waste contaminated with hazardous waste, ACM, LBP, or other undesirable components would be managed in accordance with AFMAN 32-7002. No significant impacts are anticipated to the solid waste management system at Tyndall AFB as a result of this potential combination of F-35A and MQ-9 beddowns.

Electrical System

The demand for electricity would increase during activities associated with the beddown of 96 F-35A aircraft and 24 MQ-9 aircraft. Construction of new facilities would result in an increase in electrical consumption. The USAF expects increases in electrical use associated with new facilities to be less than current standard consumption given the new requirement to reduce energy levels in federal facilities. This is achieved through using LEED® strategies and "green" specifications. The supply grid for the Tyndall AFB electrical energy would be adequate and not affected by the increased demand.

Natural Gas System

There would be an increase in natural gas consumption at Tyndall AFB under this alternative. This increase would occur as additional working and administrative spaces are developed and heated and operations change with the beddown of 96 F-35A aircraft and 24 MQ-9 aircraft at the base. The natural gas energy supply grid at Tyndall AFB is currently operating well within its capacity (USAF, 2015) and would be adequate to support the increased demand.

As each component of the Tyndall AFB infrastructure would function below capacity with the implementation of the potential combination of F-35A and MQ-9 beddowns, there would be no significant impact to infrastructure.

4.3.12 Transportation, F-35A and MQ-9 at Tyndall

4.3.12.1 Transportation, Three-Squadron F-35A Alternative plus MQ-9 at Tyndall Alternative

4.3.12.1.1 Base Facilities Construction and Personnel Increase

This section summarizes the results of the analysis for the combined three-squadron F-35A and MQ-9 beddown alternatives at Tyndall AFB. The analysis includes the assumption that the combined actions would add 300 additional maintenance (Maintenance Complex Option 1) personnel trips inbound as well as outbound during the morning and afternoon peak hours in addition to the trips on base from added F-35A operations personnel, including the same assumptions as outlined previously. The analysis also includes 900 additional personnel trips during the normal workday. The 1,200 total trips inbound and outbound are based on the same proportions as the original traffic counts (left turns, through movements, and right turns). Table 4.3-19 summarizes the operational conditions during the peak hours for this action.

For this action, the inbound trips turning right onto Airey Avenue during the morning peak hour and the outbound base trips from Airey Avenue turning left onto US-98 during the afternoon peak hour would be the most significant factor in degradation of the overall intersection LOS. Due to the large demand for peak hour trips and the assumption that all added personnel reside off base to the northwest of the intersection, the intersection LOS would degrade to LOS F during both peak periods. The limited length of the right turn lane from US-98 affects through movements at the intersection. The shared through and left turn movement from Airey Avenue requires a split phase timing to avoid blocking left turn movements by through vehicles (i.e., limits the signal's ability to provide protected left turn phases exclusive of the through movements). The added trips from this action would degrade the LOS to a point at which users would experience nearly 10 minutes of average control delay during the trip.

Table 4.3-19. Three-Squadron F-35A Wing Alternative plus MQ-9 at Tyndall – Intersection and Road Segment LOS and Performance Metrics

Intersection or Road Segment	Time Period	Analysis Year 2025			
		LOS	V/C Ratio	Control Delay	Highest Contributing Lane Group
US-98 and Tyndall Drive and Airey Avenue	a.m. p.m.	F F	2.7 2.4	444 sec/veh 540 sec/veh	US-98 right turns onto Airey Avenue Airey Avenue left turns onto US-98
US-98 Near Tyndall Drive	a.m. p.m.	F F	1.4 1.1	NA	NA

Key: LOS = Level of Service; NA = not applicable; sec/veh = seconds per vehicle; US-98 = U.S. Highway 98; V/C = volume-to-capacity

Under this action, US-98 would experience LOS F during both peak periods due to the capacity of the roadway and the fact that demand would exceed capacity by 40 percent in the morning peak hour and 10 percent in the afternoon peak hour. This segment analysis also represents the traffic levels that users would experience on US-98 near Garfield Avenue at the Cleveland (limited use) gate. If the USAF opened the gate for use, the one-way, stop-controlled intersection would experience a degraded LOS due to the inability of left turning vehicles to find acceptable gaps in traffic. As noted previously in this EIS, the analysis excludes the intersection itself (due to limited use) and focuses on the segment of US-98 at that location. This action would create a significant impact to traffic conditions for the primary intersection and for the primary road segment analyzed.

Maintenance Complex Option 2 would add a new gate on US-98 that could divert all or a portion of the 1,000 daily trips (assumed 300 peak period trips) associated with the three shifts at the Maintenance Complex. This action would lessen demand on the main gate compared with Option 1; however, similar traffic impacts (to Option 1) would occur on the US-98 road segment due to its function as the primary highway facility serving the base. The 300 peak trips would have moderate impact to traffic operations during the peak hour compared with the added 900 daily trips for personnel working a standard day.

4.3.12.2 Transportation, Four-Squadron F-35A Alternative plus MQ-9 at Tyndall Alternative

4.3.12.2.1 Base Facilities Construction and Personnel Increase

The combination of the Four-Squadron F-35A Wing Alternative and MQ-9 Wing beddown actions at Tyndall AFB includes the addition of 2,932 F-35A personnel and 1,900 MQ-9 personnel. The analysis includes the assumption that the action would add 300 additional peak hour trips (Maintenance Complex Option 1) inbound as well as outbound during the morning and afternoon peak hours, including the same assumptions as outlined in the three-squadron F-35A Wing beddown impact analysis. The analysis includes the added trips inbound and outbound based on the same proportions as the original traffic counts (left turns, through movements, and right turns). Table 4.3-20 summarizes the operational conditions during the peak hours for these combined actions.

Table 4.3-20. Four-Squadron F-35A Wing Alternative plus MQ-9 at Tyndall – Intersection and Road Segment LOS and Performance Metrics

Intersection or Road Segment	Time Period	Analysis Year 2025			
		LOS	V/C Ratio	Control Delay	Highest Contributing Lane Group
US-98 and Tyndall Drive and Airey Avenue	a.m. p.m.	F F	3.2 3.1	693 sec/veh 572 sec/veh	Right turns onto Airey Avenue Right turns onto Airey Avenue
US-98 Near Tyndall Drive	a.m. p.m.	F F	1.6 1.2	NA	NA

Key: LOS = Level of Service; NA = not applicable; sec/veh = seconds per vehicle; US-98 = U.S. Highway 98; V/C = volume-to-capacity

For these combined actions, the inbound trips turning right onto Airey Avenue during the morning peak hour and the outbound base trips from Airey Avenue turning left onto US-98 during the

afternoon peak hour would contribute most to the future degradation of the overall intersection LOS. Due to the large demand for peak hour trips and the assumption that all added personnel would reside off base to the northwest of the intersection, the intersection LOS would degrade to LOS F during both peak periods. The limited length of the right turn lane from US-98 affects through movements at the intersection. The shared through and left turn movement from Airey Avenue currently requires a split phase timing to avoid blocking left turn movements by through vehicles (i.e., limits the signal's ability to provide protected left turn phases exclusive of the through movements). The added trips from this alternative would degrade the LOS to a point at which users would experience up to approximately 11 minutes of average control delay during the trip.

As discussed previously, the road segment analysis provides a summary of operating conditions on US-98 based on the density of vehicles on the roadway. The road segment analyzed would experience LOS F during both peak periods due to the capacity of the roadway and the fact that demand would exceed capacity by nearly 60 percent in the morning peak hour and nearly 20 percent in the afternoon peak hour. This segment analysis also represents the traffic levels experienced on US-98 near Garfield Avenue at the limited use gate. If the USAF opened the gate for use, the one-way, stop-controlled intersection would experience a degraded LOS due to the inability of left turning vehicles to find acceptable gaps in traffic. As noted previously in this EIS, the analysis excludes the intersection itself (due to limited use) and focuses on the segment of US-98 at that location. The impacts to traffic from these combined actions would be significant.

Maintenance Complex Option 2 would add a new gate on US-98 that could divert all or a portion of the 1,000 daily trips (assumed 300 peak period trips) associated with the three shifts at the Maintenance Complex. This option would lessen demand on the main gate compared to Option 1; however, similar traffic impacts (to Option 1) would occur on the US-98 road segment due to its function as the primary highway facility serving the base. The 300 peak trips would have moderate impact to traffic operations during the peak hour compared to the added 900 daily trips for personnel working a standard day.

4.3.13 Socioeconomics, F-35A and MQ-9 at Tyndall

4.3.13.1 Socioeconomics, Three-Squadron F-35A Alternative plus MQ-9 at Tyndall Alternative

4.3.13.1.1 Base Facilities Construction and Personnel Increase

The cost of construction associated with the three-squadron F-35A Wing is $320 million, and the MQ-9 wing is $400 million, for a total of $720 million. The increase in personnel associated with the combined three-squadron F-35A Wing plus MQ-9 Wing beddowns at Tyndall AFB would be 4,100 new USAF jobs.

Regional Economy, Employment, and Income

The increased employment and payroll of 4,100 new USAF jobs would have long-term economic effects on the regional economy. Table 4.3-21 indicates the number and type of incoming

personnel by pay grade. The average annual salary for incoming personnel is displayed in Table 4.3-22.

Table 4.3-21. Personnel by Pay Grade, Three-Squadron F-35A plus MQ-9

Type	O1-O2	O3 & Above	E1-E4	E5 & Above	Total
Officers	89	380	0	0	469
Enlisted	0	0	1,331	1,800	3,131
Total Active Duty	**89**	**380**	**1,331**	**1,800**	**3,600**
Department of Defense Civilian	150	163	0	0	313
Base Operating Support	93	94	0	0	187
System Support	0	0	0	0	0
Total	**332**	**637**	**1,331**	**1,800**	**4,100**

Key: O = officer; E = enlisted

Table 4.3-22. Annual Basic Income, Three-Squadron F-35A plus MQ-9

Pay Grade	Average Annual Salary	Total Personnel	Annual Summary Basic Income
O1-O2	$54,000	332	$17,917,456
O3 & Above	$96,000	637	$61,170,746
E1-E4	$25,200	1,331	$33,541,200
E5 & Above	$50,000	1,800	$90,000,000

Key: O = officer; E = enlisted (2020 dollars)

The direct employment of USAF personnel would result in indirect and induced employment (see Table 4.3-23).

Table 4.3-23. Employment (Jobs) Resulting from Personnel Changes in Bay County, Three-Squadron F-35A plus MQ-9

	Employment		
	Direct	Indirect and Induced	Total
Per Year	1,025	571	1,596
Total[2]	**4,100**	**2,284**	**6,384**

Source: IMPLAN economic model (IMPLAN, 2018)

The increase in personnel at Tyndall AFB would generate tax revenues (see Table 4.3-24).

Table 4.3-24. Tax Revenues, Three-Squadron F-35A plus MQ-9

Description	Total
State and Local Tax	$22,993,640
Federal Tax	$105,522,300
Total State, Local, and Federal Tax	**$128,515,940**

The $720 million in construction expenditures would have an impact on the regional economy and create direct, indirect, and induced employment and earnings (see Table 4.3-25). The estimated total increase in on-base and off-base jobs would be 1,642 in 2021, 4,494 in 2022, peak at 9,177 in late 2024, and be 7,599 jobs at the end of 2025. After construction ends by 2026, employment would level off at approximately 6,384 jobs (from combining Table 4.3-23 and Table 4.3-25).

The combined demand for construction labor would exceed the county's capacity and require additional in-migration of personnel. In-migrating construction workers would compete for housing and other services with other Bay County residents.

Table 4.3-25. Employment (Jobs) Resulting from Construction Expenditures in Bay County, Three-Squadron F-35A plus MQ-9

Year	Construction Costs (millions)	Total Labor Income	Employment (Jobs)			
			Direct	Indirect	Induced	Total
2021	$100	$77,467,864	1,125	167	350	1,642
2022	$180	$136,749,053	1,985	295	618	2,898
2023	$180	$134,107,972	1,947	290	606	2,843
2024	$180	$131,517,891	1,909	284	595	2,788
2025	$80	$57,323,485	832	124	259	1,215
Total	**$720**	**$537,166,265**	**7,798**	**1,160**	**2,428**	**11,386**

Population

Table 4.3-26 presents the projected per year Tyndall AFB military personnel, including the F-35A and MQ-9 mission personnel. Mission personnel would be accompanied by 5,576 dependents for a total incoming population of 9,676. Personnel and dependents would be expected to arrive over 4 years or approximately 2,419 people per year beginning in 2022. Table 4.1-50 estimates population growth per year with a potential peak growth rate of 3.3 percent. This would place substantial pressure on community services and impact the ability of the community to provide services in the years of rapid growth.

Table 4.3-26. Personnel Estimates at Tyndall AFB per Year, Three-Squadron F-35A plus MQ-9

Personnel	2022	2023	2024	2025	2026	2027
Total With Base Reconstruction[1]	2,200	2,200	2,200	2,200	2,200	2,200
Total Three-Squadron F-35A plus MQ-9 with Reconstruction	3,225	4,250	5,275	6,300	6,300	6,300

Note:
[1] Based on the pre-hurricane estimate minus approximately 1,400 personnel that would be departing with the F-22 Squadron

Table 4.3-27. Population Estimates in Bay County, Three-Squadron F-35A plus MQ-9

Year	Estimated Population without MQ-9 Wing	Year-Over-Year Growth	Incoming Population with MQ-9 Wing	Estimated Population with MQ-9 Wing
2018	182,482	-	-	182,482
2019	167,283	-8.33%	-	167,283
2020	170,963	2.2%	-	170,963
2021	175,237	2.5%	-	175,237
2022	180,494	32.0%	2,419	182,913
2023	186,451	3.3%	2,419	191,289
2024	190,180	2.0%	2,419	197,437
2025	191,891	0.9%	2,419	201,567
2026	192,083	0.1%	-	201,759
2027	192,275	0.1%	-	201,951

Housing

increase in housing demand in Bay County as a result of the mission personnel. By 2025 there would be 6,300 personnel at Tyndall AFB. In addition to the 1,297 personnel that would reside on base under affected environment conditions, there would be 168 new dorm rooms for a total of 1,465 on-base personnel. This would require 4,835 military personnel to reside off base. Off-base personnel would be distributed throughout the region as identified in Table 3.1-36.

An estimated 9 percent of the military personnel would have a spouse in the military (Air Force Personnel Center, 2020). A total off-base population of 4,835 personnel would require 4,436 residences or 3,607 additional residential units above the affected environment demand for 829 units.

The influx of USAF personnel in combination with construction workers for the three-squadron F-35A Wing and MQ-9 Wing facilities would have a significant impact on the regional housing market. Prior to Hurricane Michael, Bay County had a limited number of affordable properties available for sale or for rent and many of these older units were severely damaged or destroyed by the hurricane. Increased housing costs and available jobs would be expected to increase the jobs per household from 1.14 in the 2010 census to a ratio of 1.5 or more (USCB, 2010a). Construction workers and secondary employees would also demand housing (combining Table 4.3-23 and Table 4.3-25). The additional demand by construction and secondary workers would be for up to 3,382 ([2,788+2,284]/1.5) housing units in the community for the years 2022 through 2025. Adding that to the 3,607 USAF off-base housing demand would result in a total demand of 6,989 units by the beginning of 2025. Housing costs would continue to increase by 10 to 15 percent annually and cause additional pressure on the availability and affordability of rental units in the area. After 2025, housing demand could decline from the 2024–2025 peak to represent total housing demand for 3,607 off-base USAF personnel plus 1,523 units for secondary personnel, for a demand for 5,103 housing units.

One off-base census block group in the City of Parker is affected by noise levels of 65 dB DNL or greater under this alternative. Several studies have attempted to quantify the impact aircraft noise has on property values. Results suggest a discount on property values in the range of 0.51 and 0.67 percent per decibel change associated with aircraft noise above 65 dB DNL (Nelson, 2003).

Education

The combined 4,100 F-35A Wing and MQ-9 Wing personnel would be accompanied by an estimated 5,576 dependents, of whom approximately 2,788 would be children between the ages of 0 to 18 and, of those, an estimated 2,049 children would be of school age. Student enrollment would increase by approximately 512 students per year. Table 4.3-28 shows the estimated total enrollment in the Bay County School District.

Military families would locate in areas as shown in Table 3.1-36, and the majority of students would be expected to attend schools in Panama City proper and Lynn Haven. The damage from Hurricane Michael had a major impact on the Bay County District schools and resulted in over 3,500 fewer students, the need for school closures, extensive reconstruction, portable classrooms, and additional reconfiguring of the district's schools. An increase in students to the district would

result in short-term crowding and permit restoration of some school facilities as state funding increased with the increased enrollment. The increased number of students would result in an additional 228 school employees at the ratio of 10 employees per 90 students that existed prior to the hurricane. The additional school employees would need to find housing in an extremely tight housing market.

Table 4.3-28. Total Enrollment Estimates in Bay County, Three-Squadron F-35A plus MQ-9

School Year	Estimated Enrollment without F-35A or MQ-9	Incoming Students (with 3 F-35A Squadrons + MQ-9)	Estimated Enrollment (with 3 F-35A Squadrons + MQ-9)
2018	28,129	-	28,129
2019	23,927	-	23,927
2020	24,933	-	24,933
2021	25,949	-	25,949
2022	26,968	513	27,481
2023	27,508	512	28,505
2024	27,975	512	30,041
2025	28,395	512	32,089
2026	28,821	-	30,870
2027	29,253	-	31,302

Public Services

The addition of three squadrons of F-35A aircraft plus an MQ-9 Wing and associated 9,676 USAF personnel and dependents would result in increased demand for public services such as police, fire, and medical services (see Table 4.3-29). Approximately 60 percent more public service personnel would be needed for secondary workers and their families, and more than twice that number of public service personnel could be needed during construction. Public service personnel would have to compete with all others for housing in Bay County.

Table 4.3-29. Public Services, Three-Squadron F-35A plus MQ-9

Year	Police			Fire			Medical		
	Total Personnel	Total Personnel (with 3 Squadrons + MQ-9)	Change	Total Personnel	Total Personnel (with 3 Squadrons + MQ-9)	Change	Total Personnel	Total Personnel (with 3 Squadrons + MQ-9)	Change
2019	366	366	0	251	251	0	423	423	0
2020	374	374	0	256	256	0	433	433	0
2021	382	382	0	262	262	0	442	442	0
2022	390	395	5	267	271	4	450	457	7
2023	398	403	5	272	276	4	459	466	7
2024	404	410	6	277	281	4	467	473	6
2025	411	416	5	281	285	4	474	480	6
2026	417	438	21	285	300	15	481	506	25
2027	423	444	21	290	304	14	489	513	24

4.3.13.2 Socioeconomics, Four-Squadron F-35A Alternative plus MQ-9 at Tyndall Alternative

4.3.13.2.1 Base Facilities Construction and Personnel Increase

The cost of construction associated with the four-squadron F-35A Wing would be $400 million and for the MQ-9 Wing would be an additional $400 million for a total of $800 million. The increase in personnel associated with the combined three-squadron F-35A Wing plus MQ-9 Wing beddowns at Tyndall AFB would be 4,832 new USAF jobs.

Regional Economy, Employment, and Income

The increased employment and payroll of 4,832 new USAF jobs would have a substantial long-term economic impact on the regional economy. Table 4.3-30 indicates the number and type of incoming personnel by pay grade. Using the information in Table 4.3-30, the average annual salary for incoming personnel was estimated and displayed in Table 4.3-31.

Table 4.3-30. Personnel by Pay Grade, Four-Squadron F-35A plus MQ-9

Type	O1-O2	O3 & Above	E1-E4	E5 & Above	Total
Officers	99	426	0	0	525
Enlisted	0	0	1,604	2,170	3,774
Total Active Duty	**99**	**426**	**1,604**	**2,170**	**4,299**
Department of Defense Civilian	150	167	0	0	317
Base Operating Support	107	109	0	0	216
System Support	0	0	0	0	0
Total	**357**	**701**	**1,604**	**2,170**	**4,832**

Key: O = officer; E = enlisted

Table 4.3-31. Annual Basic Income, Four-Squadron F-35A plus MQ-9

Pay Grade	Average Annual Salary	Total Personnel	Annual Summary Basic Income
O1-O2	$54,000	357	$19,278,000
O3 & Above	$96,000	701	$67,296,000
E1-E4	$25,200	1,604	$40,420,800
E5 & Above	$50,000	2,170	$108,500,000

Key: O = officer; E = enlisted (2020 dollars)

The direct employment of USAF personnel would result in indirect and induced employment (see Table 4.3-32).

Table 4.3-32. Employment (Jobs) Resulting from Personnel Changes in Bay County, Four-Squadron F-35A plus MQ-9

Per Year	Employment[1]		
	Direct per Year	Indirect and Induced[3]	Cumulative Total
2022	1,062	592	1,654
2023	1,062	592	3308
2024	1,061	592	4,962
2025	1,061	592	6,615
202	586	321	7,522
Total[2]	**4,833**	**2,689**	**7,522**

Notes:
[1] Employment includes direct employment from incoming personnel and indirect and induced employment.
[2] Totals may not add due to rounding errors.
[3] Based on IMPLAN economic model (IMPLAN, 2018)

The increase in personnel at Tyndall AFB would generate tax revenues (see Table 4.3-33).

Table 4.3-33. Tax Revenues, Four-Squadron F-35A plus MQ-9

Description	Total
State and Local Tax	$27,031,113
Federal Tax	$124,048,142
Total State, Local, and Federal Tax	**$151,079,255**

Construction expenditures for facilities to support four F-35A squadrons plus an MQ-9 Wing would total $800 million. Construction would begin in 2021 and end in 2025. Construction expenditures would create direct, indirect, and induced employment and earnings (see Table 4.3-34). The estimated total increase in on-base and off-base jobs would be 2,299 in 2021, 4,553 in 2022, 7,750 in 2024, peak at 8,438 jobs at the end of 2025, and then level off at approximately 7,522 jobs after 2026 (from combining Table 4.3-32 and Table 4.3-34).The combined demand for construction labor would exceed the county's capacity and require additional in-migration of personnel. In-migrating construction workers would compete for housing and other services with other Bay County residents.

Table 4.3-34. Employment (Jobs) Resulting from Construction Expenditures in Bay County, Four-Squadron F-35A plus MQ-9

Year	Construction Costs (millions)	Total Labor Income	Employment (Jobs)			
			Direct	Indirect	Induced	Total
2021	$140	$108,455,009	1,575	234	490	2,299
2022	$180	$136,749,053	1,985	296	618	2,899
2023	$180	$134,107,972	1,947	290	606	2,843
2024	$180	$131,517,891	1,909	284	595	2,788
2025	$120	$85,985,228	1,248	186	389	1,823
Total	**$800**	**$596,815,153**	**8,664**	**1,290**	**2,698**	**12,652**

Population

Table 4.3-35 presents the total military personnel by year associated with four squadrons of F-35A aircraft and an MQ-9 Wing. The 4,832 military personnel would be accompanied by 6,572 dependents. The incoming population of 11,404 would be expected to arrive over 5 years beginning in 2022. The resulting changes in population would be substantial with growth rates up to 3.3 percent in a single year, or an estimated four to five times the historic population growth rates (Table 4.3-36). This would place substantial pressure on community services and impact the ability of the community to provide services in the years of rapid growth.

Table 4.3-35. Personnel Estimates at Tyndall AFB per Year, Four-Squadron F-35A plus MQ-9

Personnel	2022	2023	2024	2025	2026	2027
Total With Base Reconstruction[1]	2,200	2,200	2,200	2,200	2,200	2,200
Total Four-Squadron F-35A plus MQ-9 with Reconstruction	3,263	4,326	5,389	6,452	7,032	7,032

Note:
[1] Based on the pre-hurricane estimate minus approximately 1,400 personnel that would be departing with the F-22 Squadron

Table 4.3-36. Population Estimates in Bay County, Four-Squadron F-35A plus MQ-9

Year	Estimated Population without MQ-9 Wing	Year-Over-Year Growth	Incoming Population with MQ-9 Wing	Estimated Population with MQ-9 Wing
2018	182,482	-	-	182,482
2019	167,283	-8.33%	-	167,283
2020	170,963	2.2%	-	170,963
2021	175,237	2.5%	-	175,237
2022	180,494	32.0%	2,505	182,999
2023	186,451	3.3%	2,505	191,461
2024	190,180	2.0%	2,505	197,695
2025	191,891	0.9%	2,505	201,911
2026	192,083	0.1%	1,384	203,487
2027	192,275	0.1%	-	203,679

Housing

There would be a substantial increase in housing demand in Bay County. By 2026 there would be 7,032 personnel at Tyndall AFB. In addition to the 1,297 personnel that would reside on base under affected environment conditions (see Table 3.1-38), there would be 168 new dorm rooms constructed under this alternative that would house another 168 personnel for a total of 1,435 on-base personnel. A total of 7,032, less 1,435 on-base personnel, would require 5,567 personnel to reside off base. Off-base personnel would be distributed throughout the region as identified in Table 3.1-36. An estimated 9 percent of the military personnel would have a spouse in the military (Air Force Personnel Center, 2020). The total off-base population of 5,567 personnel would require 5,108 housing units or 4,279 housing units more than the affected environment demand for 829 housing units.

The influx of USAF personnel in combination with construction workers for the wing facilities would have a significant impact on the regional housing market. Prior to Hurricane Michael, Bay County had a limited number of affordable properties available for sale or for rent and many of these older units were severely damaged or destroyed by the hurricane. Increased housing costs and available jobs would be expected to increase the jobs per household to a ratio of 1.5 or more. Rental rates would continue to increase by 10 to 15 percent or more per year and cause additional pressure on the availability and affordability of rentals in the area. Housing prices in the next several years would be expected to continue to rapidly rise before leveling off, or even declining in value, as base reconstruction is completed and new housing is built and becomes available.

One census block group in the City of Parker is affected by noise levels of 65 dB DNL or greater under this alternative. One report on multiple studies suggests a discount on property values in the range of 0.51 and 0.67 percent per decibel change associated with aircraft noise above 65 dB DNL (Nelson, 2003).

Education

The incoming 4,832 USAF personnel would have an estimated 6,572 dependents. Approximately 3,286 dependents would be children between the ages of 0 to 18 and, of those, an estimated 2,415 children would be of school age. Student enrollment would increase with the incoming personnel for an average yearly increase of approximately 531 students per year for the first 4 years and 293 students the fifth year (see Table 4.3-37).

Military families would be expected to locate in areas as shown in Table 3.1-36, and the majority of students would attend schools in Panama City proper and Lynn Haven. The damage from Hurricane Michael had a major impact on the Bay County District schools with a reduction of 3,500 students. The hurricane resulted in school closures, extensive reconstruction, construction of additional schools, additional portable classrooms, and additional reconfiguring of the district's schools. An increase in students to the district could result in short-term crowding but in the long-term would result in increased state funding associated with the increased enrollment and a restoration of schools. The increased students would result in an additional 270 school employees at the ratio of 10 employees per 90 students that existed prior to the hurricane. The school employees would need to find housing in an extremely tight housing market.

Table 4.3-37. Total Enrollment Estimates in Bay County, Four-Squadron F-35A plus MQ-9

School Year	Estimated Enrollment without F-35A or MQ-9	Incoming Population with 4 F-35A Squadrons + MQ-9 Wing	Estimated Population with 4 F-35A Squadrons + MQ-9 Wing
2018	28,129	-	28,129
2019	23,927	-	23,927
2020	24,933	-	24,933
2021	25,949	-	25,949
2022	26,968	532	27,500
2023	27,508	531	28,563
2024	27,975	531	29,626
2025	28,395	531	30,689
2026	28,821	293	30,982
2027	29,253	-	31,672

Public Services

The addition of four squadrons of F-35A Wing aircraft plus an MQ-9 Wing and associated 11,404 USAF personnel and dependents would result in increased demand for public services such as police, fire, and medical services (see Table 4.3-38). Approximately 60 percent more public service personnel would be needed for secondary workers, and their families and more than twice that number of public service personnel could be needed during construction. Public service personnel would have to compete with all others for housing in Bay County.

Table 4.3-38. Public Services, Four-Squadron F-35A plus MQ-9

Year	Police			Fire			Medical		
	Total Personnel	Total Personnel (with 4 Squadrons + MQ-9)	Change	Total Personnel	Total Personnel (with 4 Squadrons + MQ-9)	Change	Total Personnel	Total Personnel (with 4 Squadrons + MQ9)	Change
2019	366	366	0	251	251	0	423	423	0
2020	374	374	0	256	256	0	433	433	0
2021	382	382	0	262	262	0	442	442	0
2022	390	395	5	267	271	4	450	457	6
2023	398	409	11	272	280	8	459	472	13
2024	404	421	16	277	288	11	467	486	19
2025	411	432	22	281	296	15	474	500	25
2026	417	442	25	285	303	17	481	510	29
2027	423	448	25	290	307	17	489	517	29

4.3.14 Environmental Justice, F-35A and MQ-9 at Tyndall

4.3.14.1 Environmental Justice, Three-Squadron F-35A Alternative plus MQ-9 at Tyndall Alternative

4.3.14.1.1 Base Airfield Operations and Personnel Increase

Environmental justice noise effects with a three-squadron F-35A Wing plus MQ-9 Wing are as those described for a three-squadron F-35A Wing. The effects of different F-35A afterburner take-off scenarios are the same as for the three-squadron F-35A Wing.

Impacts to housing on environmental justice communities and elderly populations would be similar to those as explained for the three-squadron F-35A Wing; however, impacts would be greater with the larger number of incoming personnel and consequently increased housing demand associated with the MQ-9 beddown as well. In the case of Bay County after the hurricane, all income groups would be impacted by rising housing costs. Although, as a result of USAF housing policies, as off-base personnel would not be expected to compete for low-income housing, the overall price increases from regional growth would impact low-income persons who typically spend a greater portion of their incomes on housing. The elderly on fixed incomes would be affected by the reduced supply of affordable housing and the overall increase in the cost of new or rebuilt housing.

4.3.14.2 Environmental Justice, Four-Squadron F-35A Alternative plus MQ-9 at Tyndall Alternative

4.3.14.2.1 Base Airfield Operations and Personnel Increase

Environmental justice noise effects with a four-squadron F-35A Wing plus MQ-9 Wing are as those described for a four-squadron F-35A Wing. The effects of different F-35A afterburner take-off scenarios are the same as for the four-squadron F-35A Wing.

There are no hospitals, schools, and daycares exposed to 65 dB DNL or greater due to aircraft noise. Children and elderly populations are not expected to be adversely affected by increased noise.

Impacts to housing on environmental justice communities and elderly populations would be similar to those as explained for the four-squadron F-35A Wing; however, impacts would be greatest with a four-squadron F-35A plus a MQ-9 wing beddown because it would result in the largest number of incoming personnel and consequently the greatest housing demand. The increase in the cost of housing and the decrease in available low-cost properties would amplify increased housing costs and adverse impacts on low-income residents. The significant impacts to housing would affect all income levels.

5. CUMULATIVE IMPACTS

CEQ regulations implementing NEPA require that the cumulative impacts of a Proposed Action be assessed (40 CFR Parts 1500–1508). A cumulative impact is defined as "the impact on the environment which results 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. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time." (40 CFR 1508.7).

5.1 TYNDALL AFB

The first step in assessing cumulative effects involves identifying and defining past, present, and reasonably foreseeable future DoD and non-DoD actions and their interrelationship with the F-35A Wing and/or the MQ-9 Wing beddown. The other projects could coincide with the location and timing of the beddown and the duration of potential effects on the environment.

5.1.1 Past, Present, and Reasonably Foreseeable Actions (Tyndall)

Hurricane Michael caused extensive damage to Tyndall AFB and Bay County facilities, infrastructure, and natural resources in 2018. Every facility on Tyndall AFB sustained some damage and more than 50 percent of the facilities were significantly damaged or destroyed (see Section 1.2.1). This means that there are four overarching cumulative actions: cleanup and reconstruction at Tyndall AFB and cleanup and reconstruction throughout Bay County. Most major DoD and non-DoD actions that are underway or that are in the planning phase as of spring 2020 are part of the cleanup and reconstruction. Cleanup and reconstruction actions have a potential to cumulatively interact with the proposals to beddown an F-35A Wing or/and an MQ-9 Wing. There are hundreds of cleanup and reconstruction projects at Tyndall AFB and literally thousands of cleanup and reconstruction projects in Bay County. A separate environmental assessment addressed the cleanup and reconstruction at Tyndall AFB (USAF, 2020a). The multiple planning and permitting actions planned and/or underway throughout Bay County are subject to guidelines of the FDEP.

This EIS does not attempt to list the hundreds of individual projects on Tyndall AFB or the thousands of individual projects in Bay County. This cumulative analysis uses the estimated dollar costs which have been identified for cleanup and reconstruction to estimate the extent and scale of post-hurricane projects and the potential cumulative environmental effects. The non-DoD projects have dollar values that can be converted into equivalent construction dollars for on-base projects. This means off-base projects can be evaluated in the context of the $320 million construction of facilities spread over 4 years to beddown the three-squadron F-35A Wing. The estimated construction cost of facilities to beddown the MQ-9 Wing is estimated at $400 million spread over 4 years. A four-squadron F-35A Wing is estimated to have $400 million in construction costs spread over 5 years. Combinations of F-35A Wing and MQ-9 Wing beddowns would have facility construction costs of $720 million, or up to $180 million per year.

Calculating off-base cumulative activity in the context of USAF facility construction associated with a three-squadron F-35A Wing enables decisionmakers to have the best available information to evaluate the magnitude of environmental consequences of off-base cumulative actions in combination with Tyndall AFB cleanup and reconstruction.

5.1.1.1 Military Actions (Tyndall)

The following projects and reconstruction activity have the potential to cumulatively interact with the F-35A Wing and/or the MQ-9 Wing beddown at Tyndall AFB:

- Emergency actions were enacted in response to Hurricane Michael to relocate the 325th Fighter Wing (FW) F-22 FTU and the T-38 counter air mission assets from Tyndall AFB to Eglin AFB. The reduction in F-22 and T-38 FTU flight operations, facility space, and personnel cumulatively interact with potential F-35A or MQ-9 actions at Tyndall AFB.
- Emergency actions were enacted in response to Hurricane Michael to relocate the operational F-22 squadron from Tyndall AFB. The F-22 and T-38 aircraft were subsequently redistributed to plus-up F-22 squadrons at Joint Base Elmendorf-Richardson, Alaska; Langley AFB, Virginia; Joint Base Pearl Harbor-Hickam, Hawaii; and Nellis AFB, Nevada. The reduction in F-22 flight operations and facilities, and a reduction of 1,400 base personnel cumulatively interact with potential F-35A or MQ-9 actions at Tyndall AFB.
- The 325 FW has initiated demolition of 264 buildings on Tyndall AFB. Cleanup and restoration of Tyndall AFB following the hurricane is anticipated to affect the entire base. Cleanup, beginning with demolition and disposal of debris, is expected to continue from 2019 through 2021. The cleanup is projected to be mostly completed prior to the proposed construction of facilities to support the F-35A or MQ-9 mission beddowns. This means there is an expected sequence of cleanup followed by construction-related activity at Tyndall AFB. The timing of the cleanup is not anticipated to cumulatively interact in a substantial way with the potential F-35A or MQ-9 actions at Tyndall AFB.
- Reconstruction of Tyndall AFB for the base to function as a fighter-capable installation will encompass an expected 5 to 6 years from 2021 to 2026. The reconstruction of Tyndall AFB involves 28 combination projects in six planning areas and two multi-areas. Each combination project includes multiple facilities plus supporting infrastructure, utilities, roadways, pavements, and fencing. This reconstruction is projected to overlap with the same years as construction of F-35A or MQ-9 facilities. Demolition of damaged buildings and infrastructure for 2 to 3 years and reconstruction of Tyndall AFB for an additional 5 years has been estimated to require approximately $3,530 million over a 7-year period. This is the equivalent of an average of constructing 1.5 times the facilities required by a three-squadron F-35A Wing each year for 7 years.
- Reconstruction of Tyndall AFB housing, dorms, and other base capabilities would support a base population consistent with Tyndall AFB future missions. The restoration of community facilities such as the commons, bowling center, restaurant, library, arts and crafts center, and other activities is part of the overall base reconstruction. In the short term, such construction could place increased demand on the construction work force. In

the long term, the availability of base facilities to support USAF and other base employees has a potential cumulative benefit that would support F-35A and/or MQ-9 personnel.

In addition to the relocation of 55 F-22 and 17 T-38 aircraft and the cleanup and reconstruction of Tyndall AFB, there are several missions that have continued or re-established at the base or in the airspace following the hurricane:

- The Eglin AFB-based Marine F-35B and Navy F-35C training squadrons have relocated from Eglin AFB to Marine and Navy bases. A USAF F-35A training squadron would replace the Marine and Navy aircraft. Relocating the F-35B and F-35C squadrons and basing an F-35A training squadron at Eglin AFB would result in some changes to airspace use as F-35A training aircraft use training airspace formerly used by relocated F-35B, F-35C, and F-22 aircraft. There is expected to be a reduction in the use of training airspace by Eglin AFB based aircraft. This would have potential beneficial cumulative effects should F-35A operational squadrons be bedded down at Tyndall AFB.
- An effort is underway to chart as SUAs the existing Aerial Combat Maneuvering Instrumentation (ACMI) East and West Stationary Altitude Reservations (ALTRVs) (USAF, 2019m). The ALTRVs are used primarily for military air operations. Use of the airspaces by civilian or commercial aircraft poses a safety risk due to low public awareness of the extent of military activity in the airspaces. There is no proposed change in the airspace dimensions. Charting and publishing the ALTRVs as SUAs would more accurately represent their use by military aircraft for training for over 40 years. The cumulative effect with any mission beddown at Tyndall AFB would be to chart the airspace as SUA and improve public awareness of military air operations in the airspaces to benefit overall aviation safety in the area.

5.1.1.2 Non-DoD Actions (Tyndall)

Hurricane Michael damaged or destroyed multiple businesses, infrastructure, and an estimated 34,000 homes in Bay County. The damage ranged from roof damage and related property damage, such as downed trees, to total destruction. The magnitude of the damage resulted in a nearly uncountable number of non-DoD actions that have occurred and are projected to occur within the Bay County ROI over the next 5 years. Dollar values ascribed to reconstruction are used in this section in an attempt to convey the magnitude of the reconstruction.

- FEMA grants for damage, as of October 2019, include $98.5 million to homeowners and renters. An estimated one-half of the residents affected have not yet completed all of the assistance registration forms. The FEMA grants to homeowners and renters could amount to $200 million (www.wjtig.com, October 8, 2019).
- FEMA grants to state and local governments and private non-profits amounted to $309.1 million by October 2019 to help with Hurricane Michael expenses.
- Flood insurance claims were filed on 2,129 properties. Claims, totaling approximately $117.2 million, had been paid by October 2019. The final total of payments could be in excess of $150 million.

- The Small Business Administration issued low interest disaster loans in the amount of $474.23 million for 7,772 homeowners and 905 businesses.
- Bay County has received grants of $160 million for removal of storm outfall system debris and other debris.
- Miscellaneous additional grants and funding for roofs, temporary housing, repair of houses of worship, and other non-profit organizations, and other repairs are approximately $50 million.
- Insurance claims for damage in the region are estimated to total $7,250 million with an estimated one-half of that damage and resulting payments to be applied to rebuilding Bay County and cities.
- The Gulf Coast Parkway is a long-term plan to establish an improved roadway north and east of Tyndall AFB and connect the eastern side of Panama City with US-98 near Mexico Beach. Construction would not begin before 2040. The schedule of this long-term project would not cumulatively interact with a beddown of an F-35A Wing or an MQ-9 Wing.
- A Single Point Urban Intersection centered on the intersection of the Tyndall main gate and US-98 is projected to be under construction in 2020. This separation of Tyndall traffic from through traffic on US-98 would substantially improve traffic both on base and off base. This interchange would be expected to have a positive effect on traffic associated with a beddown of an F-35A Wing or an MQ-9 Wing.

Defining the non-DoD projects is difficult in this unique case of hurricane destruction and reconstruction. The total off-base expenditures in Bay County to reconstruct and restore the county will involve tens of thousands of small projects spread over at least 5 years beginning in 2019. The most direct way to estimate the non-DoD projects is to use known and calculated Tyndall AFB expenditures and view off-base projects in terms of base-equivalent construction requirements. This means that the estimated dollar flow into Bay County can be summed and then divided by a known base action to calculate the extent of off-base non-DoD projects.

Summing the estimated Bay County dollars identified for hurricane-related relief projects is accomplished by adding the dollars which are expected to flow into cleanup and reconstruction in the cities and county. These dollar amounts in terms of grants, loans, insurance, etc., are the best estimates available. The total from identified non-DoD projects is $1,343.3 million. This is a low estimate for two reasons. First, the $1,343.3 million represents an estimate of dollars allocated as of October 2019, 1 year after Hurricane Michael. There are additional applications for funding in process, and these numbers do not include all of the county and city dollars spent from normal budgets that were redirected to hurricane-damaged projects. Second, the insurance claims have not been fully resolved and could more than double the total estimate of dollars expended on Bay County and cities to restore infrastructure, commercial, housing, schools, medical, and other facilities. Further, insured losses do not address all losses; one source estimated that uninsured losses from hurricane damage was approximately 125 percent of insured losses.

The net effect of non-DoD projects, with additional insurance settlements, is conservatively estimated to be at least $2,000 million distributed over the years from 2019 through 2024 for an annual Bay County ROI expenditure on hurricane-related cleanup and reconstruction projects of $333 million.

In DoD project terms, the non-DoD annual effect of reconstructing Bay County and cities is estimated to be at least equivalent of the USAF expenditures to beddown the three-squadron F-35A Wing, or $320 million, each year from 2019 through 2024. This is equivalent to all the construction for facilities for the three-squadron F-35A Wing beddown occurring each year in Bay County. This expenditure for non-DoD projects of $333 million per year for 5 years will have cumulative environmental and socioeconomic effects.

The cumulative DoD and non-DoD cleanup and reconstruction expenditures in Bay County are estimated to be between $918 million and $1,018 million each year for 4 to 5 years. This is equivalent to constructing approximately three times the required three-squadron F-35A Wing facilities each year for approximately 5 years. This is a substantial amount of construction dollars to be expended at Tyndall AFB and in Bay County.

5.1.2 Cumulative Effects Analysis (Tyndall)

Cumulative effects are those environmental effects that result from the combination of past, present, and future projects occurring concurrently with the F-35A Wing and/or the MQ-9 Wing beddowns. Each environmental resource is addressed below.

5.1.2.1 Airspace Management and Air Traffic Control (Tyndall)

Beddown of the F-35A and/or MQ-9 mission(s) at Tyndall AFB would generate flight operations that are within the high representative level of flight operations at Tyndall AFB within the last 5 years. The relocation of the two F-22 squadrons with aircraft combined with the introduction of either the three- or four-squadron F-35A Wing or the MQ-9 Wing would not substantially affect air traffic control at the base or in the airspace. The reduced number of F-35B and F-35C training aircraft at Eglin AFB in combination with the introduction of additional F-35A training aircraft at Eglin AFB has the potential to make more training airspace accessible to Tyndall AFB-based F-35A squadrons.

The MQ-9 mission should not substantially affect the management of regional airspace. The MQ-9 would introduce an RPA into the region, and the MQ-9 would fly in restricted airspace or warning areas and in FAA-approved COAs for transit to and training in approved existing airspace. There are no regional federal or private projects that have the potential to cumulatively affect airspace management and air traffic control.

5.1.2.2 Noise (Tyndall)

The acoustic environmental analyses described in Sections 4.1.2 and 4.2.1.3 of this EIS represents a cumulative effects analysis that takes into consideration the relocation of the F-22 squadrons and proposed introduction of the F-35A squadrons and/or the MQ-9 mission. The cumulative acoustic effects of aircraft operations result in reduced off-base noise. Section 4.1.2.2 explains that the estimated acres and number of residents affected by noise levels greater than 65 dB DNL is substantially higher than the 0 people affected under the No Action Alternative conditions with no active flying mission, but is much smaller than the estimated 190 people affected under pre-hurricane conditions with F-22 squadrons at Tyndall AFB. The noise analysis in Section 4.1.2

demonstrates that the F-22 and T38 training and operational squadrons resulted in more extensive noise effects than would three or four squadrons of F-35A operational aircraft using any afterburner option and with or without an MQ-9 Wing.

The acoustic analysis demonstrates that, with the highest potential number of F-35A aircraft, there would be up to 135 persons on residential land subject to off-base noise of 65 dB DNL or greater. Noise levels at Long Point Condominiums, Tyndall Elementary School, and Tyndall AFB dormitories would increase to greater than 70 dB DNL. The amount of land subject to off-base noise of 65 dB DNL or greater would be less than had previously occurred under pre-hurricane conditions (included as a point of reference) before the relocation of the F-22 operational and training missions. There are no additional aircraft operations that could have cumulative off-base effects.

Construction and demolition activities associated with the Tyndall AFB reconstruction and construction of F-35A and/or MQ-9 facilities are expected to result in a 4- to 5-year period with adverse effects on the noise environment at Tyndall AFB. Demolition and reconstruction activities throughout Bay County would result in a similar 4- to 5-year period of noise effects. Construction activities would include, but are not limited to: land clearing, grading, and excavation; pavement construction, demolition, and removal; and building construction, demolition, and removal. These activities would involve the use of vehicles, heavy construction equipment, and machinery and would normally be conducted during the daytime hours of 7:00 a.m. to 5:00 p.m. Construction activities would temporarily increase noise levels in the immediate vicinity of the multiple construction projects during construction hours. Construction projects would be consistent with OSHA noise standards and guidelines. No substantial cumulative long-term noise effects are anticipated.

5.1.2.3 Health and Safety (Tyndall)

Flight, ground, and munitions safety associated with the F-35A and MQ-9 Wing beddowns are not expected to have any cumulative effects in conjunction with other past, present, and reasonably foreseeable actions. A cumulative reduction in flight operations would result in no statistical increase in the potential for aircraft mishaps or BASH incidents. Proposed activities would be similar in nature to existing operations, and the USAF would continue to apply established accident mitigation, BASH, and crash response procedures. The anticipated MQ-9 remotely piloted aircraft is an operational system that does not introduce safety risks different from comparable piloted aircraft. The MQ-9 transition to training airspace and ranges would be conducted under established FAA flight requirements as described in Section 4.2.1.1.2.

Short-term, minor impacts to contractor health and safety could occur from implementation of work performed by demolition and construction contractors. During construction and demolition, all actions would be performed in accordance with AFOSH directives and OSHA regulations. Construction safety and environmental health effects would not be significant because the risks to demolition/construction workers, potentials for offsite dispersion of contaminants, and future exposure to residual onsite contamination would be small and confined to the immediate project site. Regional cumulative demolition and construction, by the county and city permitting process, would be required to adhere to OSHA regulations.

Demolition and construction activities could expose workers to risk from munitions and ordinances. Prior to any trenching or other ground-disturbing work, the project areas should be surveyed for potential UXO. The risk of impacts to worker health and safety would be minimized by coordinating siting and construction plans with the installation safety office and ensuring explosives site plans have been approved before beginning construction as required in AFMAN 91-201, Explosives Safety Standards.

Several proposed reconstruction and construction projects would improve mission safety at Tyndall AFB. Damaged and unstable structures would be removed. Gate improvements and the interchange would enhance mission safety through installation access control. An upgraded Emergency Management facility and other support facilities would improve personnel safety. The long-term traffic safety conditions would improve with the interchange and the completion of most construction projects.

5.1.2.4 Air Quality (Tyndall)

Construction activities from the F-35A squadron and/or the MQ-9 mission would produce minor amounts of (1) combustive emissions due to the use of fossil fuel-powered equipment and haul trucks and (2) fugitive dust emissions ($PM_{10}/PM_{2.5}$) resulting from the operation of equipment on exposed soil. Proposed construction activities would implement the Air Quality BMPs identified in Table 2.7-1 to minimize fugitive dust emissions. The minor levels of emissions from proposed construction activities, in combination with emissions from existing and future cumulative projects, would not exceed a NAAQS. Emissions from construction would occur over a period of 3 to 5 years.

The F-35A squadron and/or the MQ-9 mission would result in new flight operations and increased personnel. The proposed operational activities primarily would generate air emissions from (1) MQ-9 and/or F-35A aircraft operations, (2) AGE, and (3) staff commuting activities. Estimated emissions from aircraft operations would occur across several square miles that comprise the Tyndall AFB airspace and adjoining aircraft flight patterns and up to an altitude of 3,000 feet AGL. These emissions would disperse through this volume of atmosphere to the point that they would not be expected to result in substantial ground-level impacts in a localized area. In addition, emissions from commuting activities would disperse over several miles of roadways that connect to Tyndall AFB. Therefore, emissions from proposed operational activities, in combination with emissions from existing and future cumulative projects, would not exceed a NAAQS.

5.1.2.5 Hazardous Materials and Waste (Tyndall)

Tyndall AFB has established procedures for the handling and treatment of hazardous materials and hazardous waste. Mission-related construction projects, in combination with base reconstruction, would result in increased short-term generation of construction-related hazardous materials and hazardous waste. BMPs would adhere to existing base procedures regarding treatment and disposal of hazardous materials and hazardous waste and would reduce the potential for long-term cumulative impacts.

Demolition, construction, and mission operational activities would increase the use and storage of hazardous materials at Tyndall AFB during the 5-year reconstruction period and subsequent

continuing of mission operations both for the short term and long term. Operations-related hazardous waste generation would continue to be managed in accordance with the installation's HWMP and all applicable federal, state, and local regulations. Restoration-related construction ongoing in Bay County would generate hazardous waste and construction debris for the expected 5 years of Bay County reconstruction. Wastes generated by non-DoD projects would be disposed of in accordance with federal and state requirements.

A variety of ERP sites are within the planned reconstruction and construction sites and have the potential to cause short-term adverse impacts to ongoing remediation activities at these sites. If soil contamination is present at any development site, a permit for soil remediation may be required from the FDEP. Contracts stipulate that contractors comply with all federal and state regulations regarding removal, handling, and disposal of LBP, and other hazardous waste. Worker safety during construction would be required to comply with OSHA safety requirements pertaining to worker exposure, and with all applicable worker safety regulations.

Handling, storage, and disposal of hazardous waste generated during construction activities, including measures to prevent releases, would be required to be conducted in accordance with all applicable environmental compliance regulations and Tyndall AFB environmental management plans. The reconstructed and new facilities would use and manage the same type and similar amounts of hazardous materials/waste as historic facilities.

5.1.2.6 Soils and Geologic Resources (Tyndall)

Cumulative projects at Tyndall AFB and in Bay County, which involve grading, excavations, construction, and demolition, could result in erosion of soils and sedimentation of adjacent drainages and waterbodies. Cumulative on-base and off-base projects would involve site preparation and construction activities that directly disturb native and non-native soils and construction of new impervious surfaces. Soil disturbance that would expose the soils to wind, rain, and stormwater runoff would be handled under a Tyndall AFB NPDES Construction General Stormwater Permit obtained from the FDEP. Each construction contractor would be required to develop an SWPPP that would detail erosion prevention and control measures to be implemented during site preparation and construction activities. No prime or unique farmland soils would be disturbed or removed from any Tyndall AFB project area. Agricultural land in areas damaged by Hurricane Michael would be cleared of debris and could result in exposure of soils to wind and water erosion.

Implementation of BMPs, compliance with established plans and policies, and incorporation of erosion control measures into the project design is expected to result in no significant cumulative erosional impacts to soils and geologic resources.

5.1.2.7 Water Resources (Tyndall)

Surface water resources on Tyndall AFB would be impacted by cumulative mission and reconstruction actions. Demolition, reconstruction, and construction have the potential to create temporary runoff impacts on surface waters as a result of increases in erosion and sedimentation during periods of demolition or construction. Disturbed soils and hazardous substances could directly impact water quality during a major rain event. Soil erosion would have the potential to

increase concentrations of sediments and pollutants discharged from construction sites. The incorporation of BMPs to control erosion and runoff during construction would minimize impacts to water resources resulting from land disturbance. The incorporation of LID in facility design (mandatory for facilities over 5,000 square feet) would maintain pre-development hydrology to the greatest extent practicable. There would be no significant impacts to water resources with the F-35A Wing and/or an MQ-9 Wing beddown and operation. The beddowns would be consistent with the enforceable policies of Florida's Coastal Management Program.

Portions of the facilities to be constructed are located within the 100-year floodplain. Tyndall AFB planning has redefined the potentially impacted areas and increased the foundation height of building to reduce the potential for storm impacts. Most areas disturbed during construction would be revegetated in accordance with Tyndall AFB's landscaping guidelines to reduce the potential for runoff to streams. The construction footprint for facilities would be designed with measures to avoid/reduce impacts to floodplains to the greatest extent practicable.

There would be a cumulative increase in impervious surfaces associated with new facilities and paved surfaces throughout Bay County. Reconstruction of Bay County would result in comparable effects to water resources. Bay County and associated cities are considering additional construction standards to reduce water impacts from future storms.

5.1.2.8 Biological Resources (Tyndall)

Biological resources at Tyndall AFB were impacted by Hurricane Michael and could be affected by cumulative demolition and construction activities on base. The majority of the Tyndall AFB reconstruction and most F-35A and/or MQ-9 facility construction would occur in previously developed areas of Tyndall AFB. Vegetation in the Flightline area, which was impacted by the hurricane and would be affected by construction, would consist primarily of turf grass and landscaped vegetation. Construction related to the F-35A MSA would occur within the existing area and would also include expansion of the disturbed area in one location to the southeast and two locations to the southwest. Vegetation to the southeast of the MSA consists of a pine plantation logged in 2019, mowed right of way, and scrub shrub wetlands. No significant impacts to vegetation are anticipated to result from implementation of the F-35A mission at Tyndall AFB.

Wetlands exist or are immediately proximate to many of the sites identified for reconstruction or construction. The wetlands potentially impacted include forested/scrub shrub, emergent wetlands, freshwater pond, and several drainages classified as riverine wetlands. Similar wetlands would be impacted throughout Bay County as cleanup, reconstruction, and new construction occurred. Loss of any jurisdictional waters, including wetlands, requires compliance with Section 401 of the CWA. Coordination is in process for a USACE Section 404 permit and for compliance with Florida wetland regulations.

The majority of wetlands and other surface waters are highly disturbed and altered due to hurricane damage and timber harvest/salvage operations. Off-base wetlands are typically comparable and were also impacted by the hurricane. Wetlands located within the reconstruction and mission project areas have been surveyed and could be impacted by construction. BMPs and engineering control measures to reduce these impacts during the design and permitting phase will be

implemented. A formal Jurisdictional Determination of the wetlands and other surface waters will be determined during the federal and state permitting process.

Sixteen federally listed species listed under the Endangered Species Act have been documented at Tyndall AFB. In addition, seven species have not been documented on the installation but could potentially occur in the various habitats present at the base. Federally listed species or other sensitive species have not been documented to occur in the proposed construction areas.

No adverse impacts to sensitive species are anticipated (no effects or may affect but not likely to adversely affect). Sensitive species would continue to be managed and monitored under the installation INRMP, and annual coordination with the USFWS and state agencies would continue. F-35A or MQ-9 flight operations would have the potential to increase the number of wildlife exposed to higher noise levels.

Although there would be a cumulative reduction in loud overflights, there could continue to be behavioral responses in individual animals ranging from mild responses, which include head raising, body shifting, or turning to orient toward the aircraft, to moderate responses, which could include nervous behaviors, such as trotting a short distance, or to escape as a severe response. The literature does suggest that common responses include the "startle" (or "fright") response and, ultimately, habituation. The intensities and durations of the startle response decrease with the numbers and frequencies of exposures, suggesting no long-term adverse effects.

Impacts to wildlife (including sensitive species) associated with aircraft noise would be cumulatively reduced and not be expected to result in long-term effects that could affect sensitive populations.

5.1.2.9 Cultural Resources (Tyndall)

Cultural resources surveys have been conducted at sites potentially disturbed during reconstruction or construction of F-35A Wing and/or MQ-9 Wing facilities to determine if there would be any potentially affected NRHP-eligible sites. No NRHP-listed or -eligible archaeological sites or historic buildings were found to be affected by proposed construction or operations of the cumulative Tyndall AFB actions.

NHPA Section 106 consultation for the demolition of the structures is in progress with the Florida SHPO and six Native American Tribes who have expressed an interest in Tyndall AFB. NHPA Section 106 consultation between the USAF, the Florida SHPO, and six Native American Tribes for the F-35A Wing and/or MQ-9 Wing facilities has been initiated, and concurrence that no adverse effect on historic properties would occur as a result of the F-35A Wing and/or MQ-9 Wing beddowns is anticipated.

Ground disturbance during construction could encounter previously unrecorded archaeological resources. If previously undocumented cultural resources are discovered during construction activities, the project would adhere to the Tyndall AFB ICRMP procedures.

Bay County reconstruction of commercial, housing, and other nonfederal projects are on land impacted by the hurricane. Many other structures, which were not constructed to hurricane

standards, were severely damaged or destroyed. The Florida SHPO has responsibility for oversight of off-base historic structures.

5.1.2.10 Land Use (Tyndall)

Following Hurricane Michael, the USAF established multiple task forces to assist the 325 FW in restoring the installation. A task force was created to focus on installation facilities and infrastructure. The plan to repair, reshape, and rebuild Tyndall AFB included supporting the DoD-wide installation planning philosophy to develop a sustainable platform to support the effective execution of assigned missions as efficiently as possible. Construction and implementation of the on-base reconstruction and F-35A and/or MQ-9 facilities would be consistent and compatible with future land uses as determined by Tyndall AFB. The opportunity to reshape Tyndall AFB to achieve operational and land use goals for the future is seen to have long-term beneficial effects to land use.

Construction and operation of the base facilities, including the F-35A or/and MQ-9 facilities, would not result in any significant impact on land use. Each of the individual projects is consistent with current and future land uses as determined by Tyndall AFB and documented in installation planning documents and the long-range facility development plan (USAF, 2015). Construction and operation of facilities within the Tyndall AFB area would be consistent with guidelines for preservation of natural resources within the coastal zone stipulated in the CZMA.

Off-base land use will undergo changes as the results of evaluation of hurricane damage by county and city planning and zoning organizations. Substantial hurricane damage, such as to agricultural tree crops, could place stress on alternative land use. Land use and zoning may be adjusted to reflect lessons learned from the hurricane impacts. Building codes include application of building standards for reconstruction, possible additional setback requirements, floor elevation improvements, and other building design and construction elements. Substantial hurricane damage to agricultural pine plantations could place stress on alternative land uses.

City governments have the potential to be severely stressed as a result of the rapid construction, although no substantial long-term effects on land use would be anticipated as a result of cumulative off-base or on-base actions.

5.1.2.11 Infrastructure (Tyndall)

Post Hurricane Michael reconstruction will substantially update and improve infrastructure on Tyndall AFB as well as in the region. The infrastructure, including power, water, wastewater, roadways, and parking areas will all be undergoing updates and have improved capabilities. The new interchange would substantially improve US-98 and base traffic. On-base improvements in infrastructure associated with the reconstruction are included in a separate environmental analysis (*Hurricane Recovery and Installation Development, Tyndall AFB, Florida*, January 2020) (USAF, 2020a). Reconstructed infrastructure would have the capacity to handle either or both of the F-35A Wing and MQ-9 Wing beddowns. Off-base reconstruction will have similar improvements and modernization of replaced infrastructure.

Construction of the F-35A and/or MQ-9 facilities in combination with demolition and reconstruction would generate nonhazardous, construction-related solid waste such as scrap metal, rubble, asphalt pavement, and other debris. Solid waste would be disposed at an off-base landfill or recycled/reused in locations as appropriate. Solid waste generated during construction and demolition activities would be managed in accordance with the Tyndall AFB ISWMP (USAF, 2019f). Off-base non-DoD projects would generate nonhazardous solid waste, including extensive vegetation waste from downed trees. Moderate to substantial cumulative effects relative to solid wastes generated at Tyndall AFB and in Bay County would occur in conjunction with cleanup and construction in the years after the hurricane.

5.1.2.12 Transportation (Tyndall)

Patterns of traffic circulation would be affected by cumulative cleanup and reconstruction projects. US-98 would experience LOS F during peak periods due to the capacity of the roadway with significant delays ranging from 8 to 10 minutes or more. LOS F represents a level of service that is below the threshold of acceptability. Demand exceeds capacity by nearly 40 percent in the morning peak hour and nearly 20 percent in the afternoon peak hour. The planned interchange improvements should substantially improve traffic conditions by the time there would be a beddown of F-35A squadrons or/and the MQ-9 squadrons. LOS with the interchange would be expected to substantially improve after construction is completed. Before completion of the interchange, additional wait times and degraded traffic flow would have the potential to increase traffic accidents. Cumulative reconstruction of Bay County and cities would increase commuting by construction workers and construction traffic throughout the Bay County ROI. This traffic has the potential to further impact highways and affect base traffic.

5.1.2.13 Socioeconomics (Tyndall)

Personnel changes and facility construction and modification on base and reconstruction off base would cumulatively generate substantial economic activity on Tyndall AFB and throughout Gulf County. In the long term, by 2028 to 2030, base expenditures and personnel spending in the region would help reestablish the economic foundation needed for a healthy economy. The beddown of a mission at Tyndall AFB would help establish a sustainable community following the hurricane damage and reconstruction.

There would be significant cumulative impacts to socioeconomic resources between 2020 and 2028–2030. Economic activity in the region is expected to experience major limitations due to the shortage of labor, housing, and other services. The Tyndall AFB employment of USAF personnel, including DoD civilians, was estimated at 2,200 before any mission beddown. For 4 to 5 years, Tyndall AFB direct, indirect, and induced employment would be from 3,406 jobs with the three-squadron F-35A mission or up to 7,519 jobs with both the four-squadron F-35A and an MQ-9 missions at Tyndall AFB. Education would have an increased demand of 123 to 269 employees, and there could be a substantial need for county service jobs. Construction of mission facilities would result in 1,264 to 2,843 jobs per year for 4 to 5 years.

The demand for employees, housing, education personnel, and other services within the region to support the base cleanup and reconstruction cleanup and reconstruction would be additive to the

mission-related demand. The on-base reconstruction would result in an estimated demand for 8,089 direct, indirect, and induced jobs per year for 5 years. Cumulative Bay County cleanup and construction would be additive to the USAF-induced jobs and add an estimated 5,056 direct, indirect, and induced jobs per year for a 5-year period.

In total, cumulative on-base and off-base direct, indirect, and induced jobs within the ROI from DoD and non-DoD projects over a 5-year period would be an estimated 17,938 jobs per year with a three-squadron F-35A Wing beddown to 23,776 jobs per year with a four-squadron F-35A Wing in combination with an MQ-9 Wing beddown. To evaluate context and intensity, there were an estimated 77,725 jobs in Bay County in 2018, 4,897 of which were construction jobs. Immediately after the hurricane, the number of those jobs dropped to approximately 60,600 (see Section 3.1.13.2). The cumulative projects would represent an increase of from 30 to nearly 40 percent above the Bay County jobs at the beginning of 2019. The rapid increase in demand for construction workers and other employees for the years during construction would exceed anything the regional economy has ever experienced. The boom in employment and the resulting stress on housing and community services would be followed by a substantial decline in employment opportunities following construction completion by 2027–2028. The region will be faced with re-establishing a viable economy that would not be based on large construction projects.

The Bay County ROI labor force would not meet the cumulative demand for new jobs in construction and other industries without substantial in-migration of workers into the area from outside Bay County. The multi-year increase in the workforce during the construction phase would result in a continuing increase in local housing costs and upward pressure on local wages due to demand for construction and support workers contracted for work at Tyndall AFB and/or for work on regional facilities and projects in Bay County.

Population increase in the ROI would be comparable to employment, with an estimated increase from the estimated 167,283 ROI population in 2019 to over 186,500 by 2023. This cumulative employment and population increase would impact housing affordability. The population increase each year from 2020 through 2023 would be approximately three times greater than the average 0.94 percent annual growth that had been experienced in the ROI since 2010. The population increase in the years 2024–2027 would result in a rate of growth that is five to six times more than has been experienced in recent history.

Cumulative employment and population effects would put pressure on all community services and, especially, housing. Construction-related personnel for on- and off-base projects and secondary employment would compete for housing in all price ranges. Some construction workers would park fifth wheels or other trailers wherever possible, while others would share rentals. Still other construction workers who could anticipate 4 to 5 years of steady employment may relocate to Bay County. The result of competition for higher priced housing and the availability of employment opportunities would be expected to increase the number of individuals in a household who would seek employment. The 2010 census had a calculated 1.14 jobs per household (USCB, 2010a). As more residents of a household are employed as a result of higher housing costs in combination with increased employment opportunities, the number of jobs per household would be expected to increase to at least 1.50 jobs per household, which is approximately the average for the State of Florida.

As Bay County reconstruction continues, rental prices, which are substantially above pre-hurricane rents, will continue to rise. Rental prices in Panama City in winter 2019 ranged from $1,300 per month for a two-bedroom/1.5 bath house to $2,200 or more per month for a four-bedroom, two-bath house. Apartment rentals ranged from $700 per month for a one-bedroom, one-bath unit to $1,400 or more per month for a three-bedroom, two-bath unit. Based on newspaper reports, these prices are approximately 50 percent or more higher than pre-hurricane housing costs, which included many older homes that rented at lower rental rates and which were severely damaged by the hurricane.

Housing in Bay County has had an approximate ratio of 50 percent rental and 50 percent owner occupied. The ratio in specific Bay County communities approached 60 to 70 percent rentals. This is a higher ratio of renters than what would be a normal renter- to owner-occupied housing ratio in other communities. The result of more mobile renters is that, with an estimated 34,000 homes sustaining damage, there can be a delay while the owners of the rental units work through insurance applications, claims, and repairs. This results in several years for settlement of insurance claims and reconstruction.

Bay County and Panama City will have a substantial shortage of housing for years as a result of the hurricane recovery effort on base and off base. Given current and projected housing supply, temporary or permanent relocation of construction workers to Bay County during the construction on and off base could result in significant impacts to the local housing supply. Comments on the Draft EIS by the Bay Defense Alliance, supporting the Bay County Board of Commissioners, recognize the potential impacts and identify permitting and other actions to facilitate responsible construction of up to an estimated 15,000 new single-family and 4,330 multi-family housing units from 2019 through approximately 2028. A calculated 6 percent of the planned units had been completed by summer 2020. These market-priced units have the potential to somewhat mitigate the significant impacts to housing in Bay County, which will have potential for a classic boom-bust future. The boom would be from 2020 through 2027 when there will continue to be substantial housing demand, including demand by construction workers and those who support construction. After the construction is completed, workers would no longer demand housing, and there could be an excess of housing. The high prices would no longer increase and could even decline. The people who buy in the early years and then sell before construction ends will reap the benefits of the higher prices. The people who buy toward the end of construction will have higher cost housing, which they thought would continue to rise in value, but instead they will face flat or declining prices with high mortgages. The USAF personnel who are transferred in and buy housing in expectation of growth would be affected by declining prices when they are transferred to another assignment and find that they cannot sell after the construction boom is over. What this has meant in similar situations is that the USAF personnel who bought and are subsequently transferred to another assignment had either to sell at a loss or leave their families to try and sell the houses. The possible forced separations in the 2028–2030 period has the potential for personnel retention difficulties for the USAF.

Bay County schools, health services, security services, as well as other regional socioeconomic services would be affected by cumulative employment and population growth. A calculated 2,992 (three-squadron F-35A) to 6,572 (four-squadron F-35A and MQ-9) total dependents would be associated with the beddowns. This total includes a per-year increase of 275 to 531 students for 4 years to 1,100 to 2,415 students. In fall 2018 there were 28,076 students in Bay County Schools,

and in fall 2019 the number of students had declined by approximately 3,500. Three schools were temporarily closed in 2019 due to the shortage of students.

There would be additional students associated with secondary employment, including construction employment. The USAF-related students as well as the students of secondary employees would permit the reopening of schools and result in the demand for replacement of education jobs lost after the hurricane. The USAF-only demand would include an estimated 123 to 269 education, administrative, and other school system employees in Bay County schools. State funding would increase with the increased attendance. There could be short-term crowding followed by increased state funding, schools reopening, and the addition of education personnel and new school capabilities. Educational and service personnel would add to the demand for scarce housing.

5.1.2.14 Environmental Justice (Tyndall)

Minority populations represent approximately 18 percent of the Bay County ROI. The off-base population affected by noise levels of 65 dB DNL or greater under the greatest potential extent of 65 dB DNL does not have a disproportionate number of minority or low-income persons. There would be no disproportionately adverse impact on minorities or low-income persons. There are no off-base hospitals, schools, or daycare centers exposed to 65 dB DNL or greater noise levels.

Base expenditures would increase direct and secondary employment opportunities for regional workers, including minorities. The area of potential effect on low-income persons would be focused on high and rising housing costs resulting from the on- and off-base cumulative projects. Increased demand for housing associated with reconstruction of Bay County and cumulative USAF projects has the potential to increase the cost of housing and amplify adverse housing cost impacts on all residents, including low-income residents who typically spend a larger portion of their income on housing than higher income residents do. Low-cost housing is often occupied by minorities or the elderly on fixed incomes. In the year since Hurricane Michael struck, multiple comments have appeared in the media about the rapid increase in housing costs, the unavailability of lower-cost housing, and the higher construction costs with new construction standards.

One factor which could potentially reduce demand for low cost housing by USAF personnel is the Basic Allowance for Housing. This monthly allotment is designed to ensure that USAF personnel are adequately housed. An HRMA is performed to determine suitable housing. The HRMA specifically defines suitable housing and excludes housing such as mobile homes (frequently occupied by the elderly), housing that is not acceptable for health or safety reasons, or housing outside a 60-minute commute. Typically, this means that some lower income housing is not considered adequate housing for USAF personnel. USAF-induced demand would be primarily for housing priced above that available to low income levels.

In the case of Tyndall AFB and Bay County reconstruction, the overall cumulative increased housing demand, including an estimated up to 5 years of demand by construction workers, would result in projected increases in housing prices at all levels. Low-income families and the elderly on fixed incomes throughout Bay County would be adversely affected because they would be required to spend a larger portion of their income for housing. Minorities would be included in the affected population, but would not be expected to be disproportionately affected by overall

increases in housing costs resulting from the cumulative projects. There would be an overall increase in demand for housing and increased competition for all housing.

As part of the reconstruction, Tyndall AFB will have newly constructed facilities to support child development, families, and after-school programs that support military children. Panama City and neighboring cities have similar programs for pre-school and after-school child care. Between 2021 and 2016, children could be affected as families and schools are faced with overcrowding and housing shortages. Children would not be expected to be adversely affected by the cumulative Tyndall AFB actions after cleanup and construction are completed.

5.1.3 Cumulative Effects Analysis for No Action Alternatives at Tyndall AFB

A No Action Alternative decision with no F-35A Wing and no MQ-9 Wing at Tyndall AFB would cumulatively result in all cleanup and reconstruction expenditures at Tyndall AFB and in Bay County but not have an active Tyndall AFB flying mission at the end of construction. This would result in most environmental resources being as described for the affected environment in Chapter 3, with fewer buildings and impervious surfaces. The physical and biological effects would be somewhat less than under any action to beddown a mission. The primary exception would be the cumulative No Action Alternative impacts to socioeconomic resources from on- and off-base cleanup and reconstruction. The cleanup and reconstruction would have a peak of 8,655 direct construction and 3,860 related secondary jobs by 2025, for a total of 12,515 construction related jobs with high demand for community services. Then, after construction was completed and construction employees and their expenditures were no longer in Bay County, the number of cleanup and construction jobs would rapidly decline in 2026. Tyndall AFB would have 2,200 USAF employees plus an estimated 1,206 secondary employees, for a total USAF-related employment of 3,406 employees. The No Action Alternative with no F-35A or MQ-9 mission at Tyndall AFB in combination with the hurricane-induced relocation of the F-22 missions would have a significant impact as a result of the severe boom-bust effects from the on- and off-base cleanup and reconstruction followed by no backfill of USAF and related indirect and induced employees. The lack of school children would continue to impact school budgets. The demand effects on housing and services would be intensified for the construction years through 2025 and then abruptly decline thereafter.

5.2 VANDENBERG AFB

The first step in assessing cumulative effects involves identifying and defining other actions and their interrelationship with the MQ-9 Wing beddown at Vandenberg AFB. The other projects could coincide with the location and timing of the beddown and the duration of potential effects on the environment.

5.2.1 Past, Present, and Reasonably Foreseeable Actions (Vandenberg)

An effort has been made to identify major DoD and non-DoD actions that are being considered and that are in the planning phase as of spring 2020. To the extent that details regarding such actions exist and the actions have a potential to interact with the proposal to beddown an MQ-9

Wing, these actions are included in this cumulative analysis. This approach enables decisionmakers to have the most current information available so that they can evaluate the environmental consequences of the proposed MQ-9 Wing beddown Proposed Action.

5.2.1.1 Military Actions (Vandenberg)

- U.S. Space Force mission: The U.S. Space Force is the space operations of the U.S. Armed Forces and is the most recently established of the six branches of the U.S. military. Vandenberg AFB directly supports the U.S. Space Force mission to protect the interests of the United States in space; to deter aggression in, from, and to space; and to conduct space operations. Vandenberg AFB is one of five installations in the United States under consideration to become U.S. Space Force HQ. Space Force HQ would accommodate approximately 1,870 personnel with approximately 1,000,000 square feet of office/administrative space and privately owned vehicle parking. There are two phases to establish the HQ. The first phase would temporarily base the HQ to conduct operations and provide 595,000 square feet of interim facility space and parking. If selected in the first phase, existing, vacant facilities and/or temporary/modular facilities would be used at Vandenberg AFB. An existing parking area would be expanded to the west to provide approximately 0.64 acre of supplemental parking. The second phase would complete a permanent facility (estimated to be in 2025). If selected for the second phase, a permanent HQ facility would be constructed at Vandenberg AFB on approximately 22.3 disturbed acres in the base's intensely developed cantonment area. The interim and permanent facilities would not necessarily be at the same installation. The potential establishment of the Space Force HQ is a major action with the potential for cumulative impacts.
- Ground Based Strategic Deterrent Testing: The Intercontinental Ballistic Missile (i.e., ICBM) test squadron and Ground-Based Midcourse Defense (GMD) missions are combined as the Ground Based Strategic Defense Testing. The 576th Flight Test Squadron performs ICBM test launches. Vandenberg AFB includes GMD test and training functions as well as a fully operational defense system. The GMD system conducts infrequent launches to train personnel and test system components. There is an Environmental Assessment for this project in preparation, anticipated to be completed in 2021. There is no substantial projected change in testing and launching of ICBMs or GMD interceptors and no cumulative impacts with the proposed MQ-9 Wing beddown are anticipated.
- Commercial Space Programs: Vandenberg AFB has supported private space companies, including Space X and United Launch Alliance, through facilities, launch tracking, recovery, safety, and security of commercial systems. Vandenberg AFB's geographical location allows for desirable polar launches from the continental United States without overflying land. There is no projected substantial change in the launching of commercial vehicles from the existing space launch complexes and no cumulative impacts are anticipated in conjunction with MQ-9 Wing or Space Force HQ missions.

In addition to the four major missions, Vandenberg AFB has large and small projects under consideration:

- Arguello Commercial Launch District: There is long-term planning to consider investing $100 million to allow for development of on-base facilities and launch locations for

commercial forums. This potential development would be on South Vandenberg. No details for cumulative environmental analysis are available as of spring 2020. An independent environmental analysis to assess environmental consequences of commercial space development was initiated in late 2019. The Arguello Commercial Launch District potential cumulative effects are qualitatively included in the discussion for specific environmental resources. The development and operation of the Arguello Commercial Launch District is a major action that would be anticipated to result in cumulative impacts.

- Dunes Golf Courses: There is a proposal to replace the closed 250-acre Marshallia Golf Course with the 1,268 acre Dunes Golf Courses. No details for cumulative environmental analysis are available as of spring 2020. A draft description of the golf courses was used to anticipate cumulative effects and include the effects in the qualitative discussion of specific environmental resources. The development and operation of the Dunes Golf Courses is a major action that would be anticipated to result in cumulative impacts.
- Multiple Maintenance and Upgrade Projects: Vandenberg AFB is an active space and missile testing base that experiences continuous and rapidly evolving programs to support space exploration and defense. Vandenberg AFB, like other major military installations, regularly has new construction, facility improvements, and infrastructure upgrades. The Vandenberg AFB Installation Development Plan identified 62 short-, medium-, or long-range projects in January 2019. Examples of such projects include 14 miles of replacement power poles, maintenance projects for facilities, infrastructure upgrades, and other comparable projects. These improvements and upgrades are not considered to be major projects which could result in cumulative effects.

5.2.1.2 Non-DoD Actions (Vandenberg)

Non-DoD actions include major projects in the ROI consisting of northern Santa Barbara and southern San Luis Obispo Counties and associated cities. The ROI has multiple construction projects. Specific major actions within the ROI include the following:

- Closure of the Diablo Canyon Nuclear Power Plant. PG&E proposes to retire Units 1 and 2 of the Diablo Canyon Power Plant (DCPP) by 2024 and 2025 respectively. DCPP, which employs about 1,500 PG&E workers, is the second largest employer in San Luis Obispo County and provides a large economic base to the area. By the end of 2018, an estimated $352.1 million had been authorized for DCPP employee retention programs and $85 million for community impact mitigation programs. Assuming that decommissioning expenditures are distributed evenly across 10 years, there would be an estimated net economic loss of approximately $77 million annually.
- Stauss Wind Energy Project. The wind energy project consists of 30 wind turbine generators up to 492 feet tall located on 2,970 acres southwest of the City of Lompoc and east of South Vandenberg. The project's transmission line corridor would be located on 11 properties, starting at the Wind Site and running east and northeast to the City of Lompoc. The project includes approximately 3 acres of administrative and support buildings, widening of existing roads, and construction of new roads to access the turbines. Wind energy turbines at some locations in the United States have interfered with military aircraft systems, although the MQ-9 is not known to be one of the aircraft types that could

be affected. The Wind Energy project would not directly have a cumulative effect on the MQ-9 Wing beddown or flight operations, although the disturbance of vegetation and habitat could be similar to the effects of the Arguello Launch District.

- Representative new homes. New homes are being constructed within the ROI. Pasadera is a representative project proposed to have 800 new homes southwest of Highway 1 and Main Street in Guadalupe, California. Pasadera is presented as affordable homes in the Santa Maria Valley. The homes range from two bedrooms/two baths to five bedrooms/three baths and have basic prices (without upgrades) in spring 2020 ranging from $370,000 to over $410,000. Comparable homes in the city of Lompoc and in Vandenberg Village are higher priced, are with three bedrooms and four bedrooms from $500,000 to over $670,000. Comparable new homes in the Lompoc Valley hills, in Orcutt, or in the Santa Ynez Valley are typically in the $500,000 or higher range.
- Representative new apartments. Representative new apartments in the ROI include the Hancock Terrace Apartments, a 272-unit apartment community in Santa Maria. The apartment units are studio, one-, two-, and three-bedroom apartments. Monthly rental prices in spring 2020 vary from $1,600 to over $2,550.
- Enos Ranchos Development. The Enos Ranchos is a development of approximately 121 acres at the northwest corner of the U.S Highway 101 and Betteravia Road interchange in Santa Maria. The development includes commercial, office, and residential units, a school, and a park. The development is approximately one-half completed as of spring 2020. The residential Easton Plaza Apartments, in the northwest corner of the Enos Ranchos, is planned to have 318 apartments with a mix of studio, and one-, two-, and three-bedroom units.
- Orcutt Gateway. The Orcutt Gateway project is proposed in Orcutt, south of Clark Avenue and west of Highway 101. This commercial project would have a new shopping center on 6 acres with 42,921 square feet of retail space to include a grocery store, a fast food restaurant, commercial space, and a gas station with a convenience store and a car wash.
- Lompoc Valley Housing. Representative housing projects in the Lompoc Valley include 44 new homes in the $500,000 range located east of Harris Grade Road off Gardengate Lane and the Burton Mesa Ranch project with up to 476 comparably priced new homes in the Lompoc Valley north of Highway 1 and west of Harris Grade Road. The Burton Mesa project is delayed in spring 2020 to determine water and sewer access.

5.2.2 Cumulative Effects Analysis (Vandenberg)

5.2.2.1 Airspace Management and Air Traffic Control (Vandenberg)

Beddown of the MQ-9 mission at Vandenberg AFB will increase Vandenberg AFB tower responsibilities. There are no current aircraft flying missions at Vandenberg AFB. The single MQ-9 mission should not substantially affect the management of regional airspace. The MQ-9 would introduce an RPA into the region, and the MQ-9 would fly in restricted airspace or warning areas and in FAA-approved COAs for transit to and training in approved existing airspace. There are no regional federal or private projects that have the potential to cumulatively affect airspace management and air traffic control. MQ-9 flight operations would be adjusted to not interfere with

missile or rocket launches. No adverse cumulative effects on airspace management or air traffic control are anticipated.

5.2.2.2 Noise (Vandenberg)

Noise conditions addressed for the MQ-9 beddown represent cumulative effects of all Vandenberg AFB flight operations, and the noise analysis for the MQ-9 presented in Section 4.2.2.3 is effectively a cumulative analysis. MQ-9 overflight of on-base residential areas could be seen as an annoyance but would not result in noise levels higher than 55 dB CNEL.

Development throughout Vandenberg AFB results in intermittent, short-term construction effects. Future construction activities would be subject to the standard measures and conditions regulating construction activities to ensure consistency with OSHA noise standards and guidelines. There would be temporary vehicular and construction noise during construction of facilities. This temporary construction noise would be extended with the combined MQ-9 mission and the Space Force HQ construction for interim or permanent facilities. Localized cumulative short-term construction-related noise could be for a longer period. No substantial cumulative long-term noise effects are anticipated.

5.2.2.3 Health and Safety (Vandenberg)

Flight, ground, and munitions safety associated with the MQ-9 Wing beddown are not expected to have any cumulative effects in conjunction with other past, present, and reasonably foreseeable actions. Rocket and missile launches have been occurring at Vandenberg AFB for over 60 years, and established safety procedures are integral to the launches. The anticipated MQ-9 RPA is an operational system that does not introduce safety risks different from comparable piloted aircraft. The MQ-9 transition to training airspace and ranges will be conducted under established FAA flight requirements as described in Section 4.2.2.5. Construction safety and environmental health effects would not be significant because the risks to demolition/construction workers, potentials for offsite dispersion of contaminants, and future exposure to residual on-site contamination would be minimal and confined to the immediate project site.

Increased highway traffic associated with beddown of cumulative projects could affect safety on the base or in base environs. A 55-percent increase in base personnel associated with a combined MQ-9 Wing and the Space Force HQ would substantially increase traffic congestion, especially in gate entrance areas. The increase would be anticipated to increase the number of minor and major vehicular accidents associated with base personnel. Development of the Arguello Commercial Launch District would increase traffic west of Lompoc. Development of the Dunes Golf Courses would increase traffic north of the Main Gate. Additionally, the golf course may result in additional BASH impacts as it could act as an attractant to birds and other wildlife. The current BASH Plan would need to be revised to account for this potential. This may also necessitate the implementation of additional wildlife monitoring and/or control procedures to ensure that BASH hazards are minimized. The extent of the cumulative impacts cannot be quantified. An increase in personal traffic and associated accidents would not be expected to significantly affect overall traffic safety.

Vandenberg AFB is subject to forest fires. The increase in population associated with new missions, the increase of people in fire prone areas (e.g., the golf courses), and the increase in rocket and missile launches at the Arguello Commercial Launch District all increase the likelihood of more frequent fires on Vandenberg AFB.

5.2.2.4 Air Quality (Vandenberg)

Construction activities from the MQ-9 mission would produce minor amounts of (1) combustive emissions due to the use of fossil fuel-powered equipment and haul trucks and (2) fugitive dust emissions ($PM_{10}/PM_{2.5}$) resulting from the operation of equipment on exposed soil. Proposed construction activities would implement the air quality BMPs identified in Table 2.7-1 to minimize fugitive dust emissions. The minor levels of emissions from proposed construction activities, in combination with emissions from existing and future cumulative projects, would not exceed a NAAQS. Emissions from construction would occur over a period of about 4 years.

The MQ-9 mission would result in new flight operations and increased personnel. The proposed operational activities primarily would generate air emissions from (1) MQ-9 aircraft operations and (2) staff commuting activities. Estimated emissions from aircraft operations would occur across several square miles that comprise the Vandenberg AFB airspace and adjoining aircraft flight patterns, up to an altitude of 3,000 feet AGL. These emissions would disperse through this volume of atmosphere to the point that they would not be expected to result in substantial ground-level impacts in a localized area. In addition, emissions from commuting activities would disperse over several miles of roadways that connect to Vandenberg AFB. Therefore, emissions from proposed operational activities, in combination with emissions from existing and future cumulative projects, would not exceed a state ambient air quality standard or NAAQS.

5.2.2.5 Hazardous Materials and Waste (Vandenberg)

Vandenberg AFB has established procedures for the handling and treatment for hazardous materials and hazardous waste. Construction within an ERP site would follow the procedures described in AFI 32-1021. BMPs would adhere to existing base procedures regarding treatment and disposal of hazardous materials and hazardous waste and would reduce the potential for cumulative impacts. The Arguello Commercial Launch District would generate substantial hazardous materials and hazardous waste. No environmental analysis has been performed to quantify impacts. As of spring 2020, no environmental analysis has been completed to address the potential impacts from the Dunes Golf Courses operational application of fertilizers, herbicides, and pesticides.

5.2.2.6 Soils and Geologic Resources (Vandenberg)

Cumulative projects at Vandenberg that involve grading, excavations, construction, and demolition could result in erosion-induced sedimentation of adjacent drainages and waterbodies. Construction of the Dunes Golf Courses has the potential to result in soil erosion and discharge into established wetlands. Construction at MQ-9 and Space Force HQ cumulative project sites involving grading and construction should not result in significant cumulative erosional impacts

due to the localized nature of the activity, implementation of BMPs, compliance with established plans and policies, and incorporation of standard erosion control measures into the project design.

All projects located on Vandenberg AFB are subject to seismically induced ground shaking due to an earthquake on a local or regional fault. Seismic-related impacts at the project site, in combination with probable future projects, should not be cumulatively significant with incorporation of modern construction engineering and safety standards.

5.2.2.7 Water Resources (Vandenberg)

Water resources on Vandenberg AFB would be impacted by cumulative proposed actions and actions under consideration for development. Cumulative construction for MQ-9 Wing and Space Force HQ facilities would result in some ground disturbance with the potential for erosion by wind and water. Construction of the Dunes Golf Courses and the Arguello Commercial sites would disturb substantial acreage. Soil erosion would have the potential to increase concentrations of sediments and pollutants discharged from construction sites. Construction contracts would include requirements for application of BMPs for erosion and sediment control, materials management, waste management, and non-stormwater management in accordance with applicable federal, state, and local regulatory requirements. Adverse short-term impacts to surface water could occur during construction of the golf courses or the Arguello Commercial Launch District site.

Most areas disturbed during construction would be revegetated in accordance with Vandenberg AFB's landscaping guidelines to reduce the potential for runoff to streams. The golf courses would be revegetated with non-native plant species and have the potential for greater water runoff. The golf course would be treated with fertilizer, herbicides, and pesticides, which would be expected to result in runoff into surface waters. The cumulative effect would be expected to impact water courses.

There would be a cumulative increase in impervious surfaces associated with new facilities and paved surfaces. Stormwater discharged from the impervious surfaces would be managed in accordance with Vandenberg AFB's Post-Construction Storm Water Standards. Runoff from the surfaces of the MQ-9 and Space Force HQ mission projects would not contribute to exceedances of water quality standards.

Increased employment at Vandenberg AFB and additional population in the ROI would increase water consumption for domestic use. Cyclical droughts in the ROI affect water consumption. Potable water supplies are expected to be adequate in the ROI although rationing has occurred in severe drought years. The cumulative effect of the golf courses would result in high levels of water consumption.

5.2.2.8 Biological Resources (Vandenberg)

Biological resources at Vandenberg AFB could be affected by cumulative construction activities on base. MQ-9 and Space Force HQ mission-related construction projects would result in short-term increased construction noise and disturbance to soils, vegetation, and wildlife. A threatened plant species and potentially sensitive habitat are in areas identified for construction of

MQ-9 facilities, and there would be impacts to federally listed species (see Section 4.2.2.15). The MQ-9 mission and Space Force HQ project may affect but are not likely to adversely affect the listed species. Projects which have the potential to impact recently undeveloped areas, native vegetation, or wetlands include the golf course which would impact native vegetation and introduce non-native vegetation. The golf course would manage native species such as bobcats, mountain lions, black bears, raccoons, skunks, opossums, ground squirrels, and other animals defined as pest species. The Arguello Commercial Launch District could include roadways and new construction in areas of South Vandenberg AFB which have had minimal disturbance. These cumulative projects have the potential to significantly affect sensitive species, sensitive habitat, and vegetation.

Marine and special status bird populations are intermittently affected by vibration, noise, and visual effects associated with infrequent (a typical average of one per month) rocket or missile launches. The introduction of the MQ-9 turboprop aircraft is expected to overfly sensitive populations at altitudes above 1,300 feet MSL. These overflights could be noticed by sensitive species but would not be expected to result in behavior patterns that could affect sensitive species along Vandenberg AFB intertidal zone.

Removal of a portion of the Burton Mesa chaparral community for MQ-9 facilities and the Space Force HQ parking extension has the potential to affect sensitive species. MQ-9 facilities and access roadways would have an incremental effect on vegetation and habitat. The impact from facility construction for the golf courses, and the Arguello Commercial District would reduce available habitat and could have long-term effects on the biological community.

Wetland areas would be disturbed by construction for the Space Force HQ, the Dunes Golf courses, and Arguello Commercial Launch District projects. Adverse effects on sensitive species, including those associated with the MQ-9 mission, would be subject to the terms and conditions of the Vandenberg AFB Programmatic Biological Opinion (which considers adverse effects of all covered activities), or other individual project consultation. Vandenberg AFB has a long history of identifying and implementing measures to compensate for disturbed wetlands, especially along San Antonio Creek. Such measures are expected to be identified and implemented for construction effects of the MQ-9 Proposed Action.

5.2.2.9 Cultural Resources (Vandenberg)

Cultural resources surveys have been conducted at potentially disturbed MQ-9 Wing and Space Force HQ sites to determine if there would be any potentially affected NRHP-eligible sites. No NRHP-listed or -eligible archaeological sites or historic buildings were found to be affected by proposed construction or operations of these cumulative Vandenberg AFB missions. Ground disturbance during construction could encounter previously unrecorded archaeological resources. If previously undocumented cultural resources are discovered during construction activities, the project would adhere to the Vandenberg AFB ICRMP procedures. Construction of the Dunes Golf courses and the Arguello Commercial Launch District would have the potential to substantially impact multiple cultural resource sites.

Housing, industrial, and other nonfederal projects in most areas of the ROI are on land previously disturbed by agricultural operations. There would be potential for cumulative impacts to cultural

resources in the relatively undisturbed Burton Mesa chaparral associated with the housing proposed near Harris Grade Road. Construction of such projects is subject to environmental review under the California Environmental Quality Act. Cultural resource impacts could result from cumulative on-base construction; however, the proposed MQ-9 Wing beddown would not contribute to cumulative impacts to cultural resources.

5.2.2.10 Land Use (Vandenberg)

The MQ-9 mission and Space Force HQ, including facility construction, are consistent with existing land use plans and would not be expected to substantially affect land use on- or off-base. Additional personnel and dependents associated with Vandenberg AFB cumulative projects would increase demand for recreational resources in the region. That increase would not be expected to negatively impact recreational resources. The golf courses would be an expansion of recreational opportunities. Construction and operation of facilities within the Vandenberg AFB area would be consistent with guidelines for preservation of natural resources within the coastal zone stipulated in the CZMA. Development of reasonably foreseeable projects should not result in any adverse cumulative impacts to land use and coastal zone resources.

5.2.2.11 Infrastructure (Vandenberg)

On-base improvements in infrastructure associated with the MQ-9 mission and the Space Force HQ are included in the environmental analysis for the construction of such facilities. No cumulative effects are anticipated from these identified projects. The golf courses and Arguello Commercial Launch District projects would require substantial infrastructure improvements.

5.2.2.12 Transportation (Vandenberg)

Patterns of traffic circulation could be affected in the ROI near Vandenberg AFB. The effects of one mission with the MQ-9 Wing or the Space Force HQ would increase traffic congestion and result in LOS D. Cumulative effects would be expected to result in LOS F at the main gate. Implementation of the MQ-9 mission in combination with the Space Force HQ mission would increase traffic to and from Vandenberg AFB by an estimated 55 percent. The Vandenberg AFB main gate and the Solvang gate would be expected to have substantial traffic congestion with a LOS F during morning and afternoon rush hours.

Development and operation of the golf courses would increase traffic on expanded roadways along the San Antonio Creek Road, and at the intersection of San Antonio Creek Road and Highway 1. The direct route from the Main Gate to San Antonio Creek Road is now closed and intercepted by the San Antonio Creek wetland. Cumulative effects to traffic would be expected, especially at Vandenberg AFB entrance gates.

5.2.2.13 Socioeconomics (Vandenberg)

Personnel changes and facility construction and modification would generate economic activity in the ROI. Economic activity in the region is not expected to experience any major limitations. The Vandenberg AFB employment of USAF personnel, DoD civilians, and contractors totaled 6,857

in January 2019. Employment would increase by 27 percent with either the MQ-9 mission (1,900 personnel) or Space Force HQ (1,870 personnel). With both missions, the number of USAF base employees would increase by an estimated 55 percent. Implementation of the MQ-9 Wing beddown separately or in conjunction with the beddown of the Space Force HQ or with relevant past, present and reasonably foreseeable future projects within the ROI would increase the demand for employment as well as for housing, schools, and other services within the region. The effects of construction would be temporary, lasting for the duration of the construction period. The cumulative effects of the beddown projects would substantially increase base employment for the foreseeable future. Associated regional employment would be an estimated 3,770 Vandenberg AFB direct jobs added to the 149,000 estimated Northern Santa Barbara County ROI jobs for a 2.6 percent increase in direct employment and a potential for a 3.6 percent increase in total employment, including direct plus indirect and induced employment resulting from the expenditures associated with the missions and personnel.

With both the MQ-9 and Space Force HQ. there would be an additional cumulative demand for over 2,000 construction workers and 850 indirect and induced jobs per year for 4 years. For the 2-year period of construction overlap with incoming mission personnel, there could be a demand for direct and secondary workers of 8,200 jobs. Northern Santa Barbara County had 92,765 jobs in 2018. The cumulative increased demand would represent an 8.84 percent increase in ROI employment. The Santa Barbara construction work force in 2019 was 9,400. The equivalent cumulative demand for approximately 2,000 construction workers would represent 21 percent of the total construction workforce. The non-DoD cumulative projects could be nearing completion at the time there would be a build-up of construction demand for Vandenberg missions, so there could be available construction workers in Santa Barbara County to fill part of the demand.

Population increase in the Northern Santa Barbara County would be an estimated 12,000 persons, or an increase of 5.25 percent to the 2019 population of 228,500. This cumulative employment and population increase could impact housing affordability. Cumulative USAF mission-related demand would be for approximately 3,200 off-base residential units, or 800 additional units per year for 4 years. This would be approximately equivalent to the construction of the Pasadera housing development per year for 4 years. This would impact the county and cities that are not experienced with such a growth in housing. If the population increase were to occur over a 4-year period, each year the population increase would be 1.4 times greater than had been experienced in any single year in the ROI in the last decade. Employment and population effects associated with the Arguello Commercial Launch District activity could result in additional job growth comparable to the Space Force HQ projection.

ROI schools, health services, security services, as well as other regional socioeconomic services would be affected by cumulative employment and population growth. A calculated 4,934 dependents, including 2,467 children, 1,813 of whom would be school aged, would be associated with the MQ-9 mission and Space Force HQ projects. This number of students represents approximately 4 percent of the students in northern Santa Barbara County school districts and would be a substantial increase in students. An estimated additional 180 education system employees, needed for the cumulative missions would add to the regional housing demand.

Non-DoD projects have the potential to reduce the effects of cumulative USAF projects. Reduced expenditures and reduced employment resulting from the closure of the Diablo Canyon Nuclear

Power Plant could result in a reduction in direct and secondary employment in southern San Luis Obispo County and northern Santa Barbara County. Base employment opportunities could serve to backfill this reduction in employment. The on-going and planned investment in apartments and housing in the area cities could address some of the housing demand. The construction in 2020 and 2021 of commercial and industrial development could result in increased numbers of construction workers available for the USAF projects in 2022 and beyond.

Incremental effects of the MQ-9 beddown, in combination with potential impacts associated with other Vandenberg AFB projects, could be expected to create employment and population growth. That growth has the potential to result in cumulative impacts to socioeconomic resources in the ROI. On-base projects would increase demand for socioeconomic resources while off-base projects would have the potential to address some of the increased demand, especially for labor and housing.

5.2.2.14 Environmental Justice (Vandenberg)

Minority populations represent approximately 35 percent of the ROI. The 2010 census reported that 31 percent of Vandenberg AFB residents identified themselves as minority (USCB, 2010a). Base expenditures would increase direct and secondary employment opportunities for regional workers, including minorities. The area of potential effect on low-income persons would be focused on housing costs. The average household in the ROI spends approximately 40 percent of their income on housing. By comparison, a desirable percentage is 30 percent. Increased demand for housing associated with cumulative USAF projects has the potential to increase the cost of housing and impact low income workers, and low cost housing is often occupied by minorities or the elderly.

One factor that reduces the potential demand for low cost housing by USAF personnel is the Basic Allowance for Housing. This monthly allotment is designed to ensure that USAF personnel are adequately housed. An HRMA is performed to determine suitable housing. The HRMA specifically defines suitable housing and excludes housing such as mobile homes (frequently occupied by the elderly), housing that is not acceptable for health or safety reasons, or housing outside a 60-minute commute. Typically, this means that some lower income housing is not considered adequate housing for USAF personnel.

The increased demand for off-base housing would be primarily in markets where housing costs are above the low-income housing prices. The result is that there would be an overall increase in demand for housing and increased competition for rental and other units, but the USAF induced demand would be primarily for housing priced above that available to low income levels. There would be an overall effect on housing demand and potential increase in housing prices, but, because of USAF housing policies, the effect would not be expected to disproportionately affect environmental populations of low income or minority persons. The elderly on fixed incomes occupying lower-cost housing and mobile homes would not be expected to be adversely affected.

Vandenberg AFB has an established Child Development Center, a Family Child Care, and a School Age Care to support military children. Cities such as Lompoc and Santa Maria have similar programs for pre-school and after school child care. Children would not be expected to be adversely affected by the cumulative Vandenberg AFB actions.

5.3 OTHER ENVIRONMENTAL CONSIDERATIONS

5.3.1 Relationship Between Short-Term Uses and Long-Term Productivity

CEQ regulations (Section 1502.16) specify that environmental analysis must address "…the relationship between short-term uses of man's environment and the maintenance and enhancement of long-term productivity." Special 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 proposal compared to the long-term productivity derived from not pursuing the proposal. Short-term effects to the environment are generally defined as a direct consequence of a project in its immediate vicinity.

5.3.1.1 Tyndall AFB

Short-term effects include localized disruptions from construction and higher noise levels in some areas, including near the runway. Noise levels near the runway could increase but individual noise events would be short term and would not be expected to result in permanent or long-term changes in wildlife or habitat use.

The F-35A Wing and/or MQ-9 Wing beddowns involve changes in building structures and new construction within the existing base disturbed area. This would result in a long-term reduction in vegetation habitat but would not be expected to significantly impact the long-term productivity of the land.

The long-term increased population and regional expenditures would result in continuation of the ongoing increase in regional housing stock, housing costs, and increased commercial activity. After the surge of construction, the economic stimulation is expected to help restore the region's long-term productivity.

The construction projects on base would have short-term direct effects in the immediate vicinity. These projects would represent a long-term commitment to return Tyndall AFB to an active base with a substantial flying mission.

5.3.1.2 Vandenberg AFB

Short-term effects include localized disruptions from construction and higher noise levels in some areas, including near the runway. Noise levels near the runway would increase but would not approach 65 dB CNEL. Noise effects would be short term and would not be expected to result in permanent or long-term changes in wildlife or habitat use. The short-term overflight would have a negligible cumulative effect.

The MQ-9 Wing beddown proposal involves changes in building structures and new construction within the existing base disturbed area. This would result in a long-term reduction in vegetation habitat but would not be expected to significantly impact the long-term productivity of the land.

The long-term increased demand for housing and services would be expected to result in continuation of the ongoing increase in regional housing stock and the increased commercial activity. This is not expected to affect the region's long-term productivity.

5.3.2 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 primarily result from the use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action.

5.3.2.1 Tyndall AFB

For Tyndall AFB, most impacts are short term and temporary (such as air emissions from construction) or longer lasting, but negligible (such as reduction in habitat within the on-base disturbed area and aircraft noise). These developments would convert existing disturbed habitat to residential, industrial, and military uses. Should the MQ-9 Maintenance Complex be located at the drone runway, land in the less developed portions of the base would be disturbed, resulting in loss of wetlands and habitat. Construction would use materials (e.g., metal, wood, concrete) and energy (fuel, electricity) that would be irretrievably lost. USAF and personal vehicle use would consume fuel, oil, and lubricants.

F-35A and MQ-9 training operations would involve consumption of nonrenewable resources, such as gasoline used in vehicles, and jet fuel used in aircraft. These activities would not be expected to significantly decrease the availability of minerals or petroleum resources or have cumulative environmental consequences.

5.3.2.2 Vandenberg AFB

For Vandenberg AFB, most impacts are short term and temporary (such as air emissions from construction) or longer lasting, such as reduction in habitat within the base disturbed area and aircraft noise. Construction would use materials (e.g., metal, wood, concrete) and energy (fuel, electricity) that would be irretrievably lost. USAF and personal vehicle use would consume fuel, oil, and lubricants.

MQ-9 training operations and Space Force HQ would involve consumption of nonrenewable resources, such as gasoline used in vehicles, and jet fuel used in turboprop aircraft. These activities would not be expected to significantly decrease the availability of minerals or petroleum resources or have cumulative environmental consequences.

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