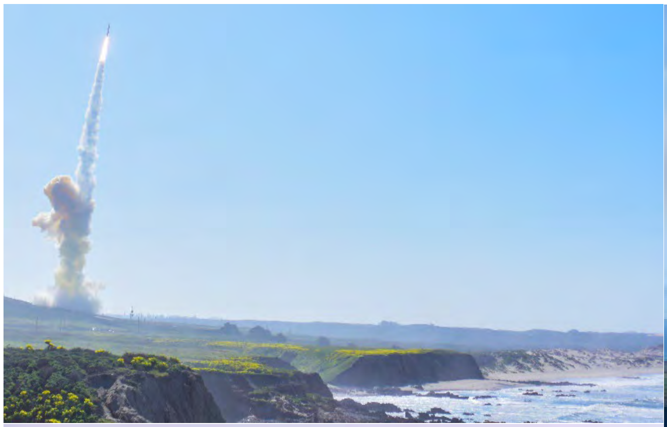

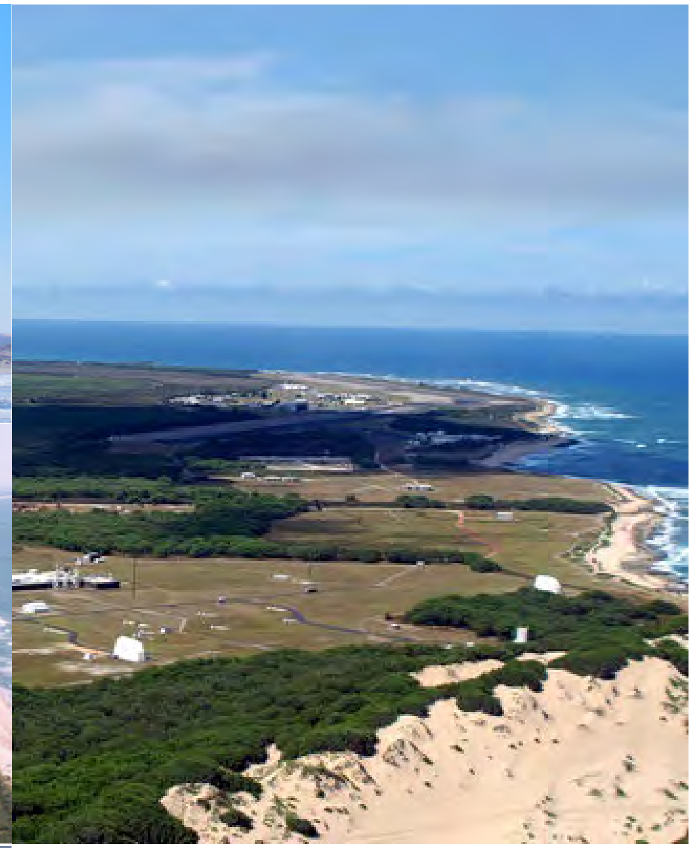

Joint Flight Campaign Environmental Assessment / Overseas Environmental Assessment

Final

U.S. Department of the Navy Strategic Systems Programs

U.S. Department of the Army Rapid Capabilities and Critical Technologies Office

February

2022

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FINDING OF NO SIGNIFICANT IMPACT/FINDING OF NO SIGNIFICANT HARM ENVIRONMENTAL ASSESSMENT / OVERSEAS ENVIRONMENTAL ASSESSMENT (EA/OEA) FOR JOINT FLIGHT CAMPAIGN (JFC)

AGENCY: Department of the Army, Department of the Navy

BACKGROUND: The Proposed Action, Joint Flight Campaign (JFC), is a joint action between the Department of the Navy (U.S. Navy) Strategic Systems Programs (SSP) and the U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO). SSP and RCCTO are the joint action proponents for this Environmental Assessment / Overseas Environmental Assessment (EA/OEA).

The Proposed Action entails up to six flight test launches at up to four different launch locations per year, over the next 10 years. Test objectives are expected to dictate range selection from Atlantic and Pacific test ranges. Due consideration will be given to existing launch ranges to avoid any unnecessary modifications to the environment. The launch range for each test will be determined based on the test objectives, availability, and technical suitability of the test range. Test scenarios are planned to include broad ocean area (BOA) impacts of the spent stages and the hypersonic payload, and do not include any land-based impacts. This EA/OEA is being prepared to provide an analysis of multiple alternative launch locations that will be available to the test directorates over the next 10 years. The launch selection process will utilize this EA/OEA and will also include a check of the relevancy of this document to support specific launch scenarios. It is anticipated that this EA/OEA will support future decisions; however, tiered National Environmental Policy Act (NEPA) documents could occur if there are significant changes to the proposed missile or facilities at a proposed launch location.

The U.S. Army RCCTO, the U.S. Navy SSP, the Missile Defense Agency, the Office of the Secretary of Defense, and the U.S. Army Space and Missile Defense Command, as Participating Agencies, along with the Department of Energy, the National Aeronautics and Space Administration (NASA), the U.S. Air Force Space Launch Delta 30, and the U.S. Air Force 45th Space Wing as Cooperating Agencies, have prepared this EA/OEA in accordance with the NEPA (42 United States Code 4321, as amended), the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (Title 40 Code of Federal Regulations [CFR] Parts 1500-1508, 1978, July 1, 1986), the Department of the Army Procedures for Implementing NEPA (32 CFR Part 651), the Department of the Air Force Procedures for Implementing NEPA (32 CFR Part 989), Chief of Naval Operations Instruction (OPNAVINST) 5090.1E, and Executive Order [EO] 12114, Environmental Effects Abroad of Major Federal Actions. The Proposed Action was finalized prior to the 14 September 2020 version of the CEQ NEPA regulations, and therefore this document relies on CEQ NEPA regulations in effect prior to September 14, 2020.

PURPOSE OF AND NEED FOR THE PROPOSED ACTION: The purpose of the Proposed Action is to perform the land-based tests needed to prove that the U.S. Navy Conventional Prompt Strike (CPS) weapon system and Army Long Range Hypersonic Weapon (LRHW) system meet all key performance requirements within the capabilities of the All Up Round (AUR) missile used by both systems. The Proposed Action is needed to establish CPS and LRHW capabilities required to improve the United States' capabilities to respond to time-sensitive threats, thereby maintaining technical superiority against its adversaries. The successful development and eventual fielding of the CPS and LRHW weapon systems has been identified as a National priority by the Department of Defense (DOD).

This series of land-based tests is needed to allow the U.S. Army and the U.S. Navy to collect the data required to prove that weapon system development has been successful, thereby enabling these key weapons systems to be fielded to the warfighter. To meet the CPS and LRHW program objectives, test events must satisfy certain critical objectives, to include demonstrating weapon system effectiveness, demonstrating applicable design features, and establishing effective operating procedures, which also ensure the safety of the warfighter and the public.

The AUR test configurations included in the Proposed Action include launches from a stool or from a canister. The U.S. Navy canister would be emplaced on a "box launcher," and the U.S. Army canister would be emplaced on the LRHW transporter erector launcher.

ALTERNATIVES CONSIDERED: The U.S. Army RCCTO and U.S. Navy SSP determined that only four alternative launch locations meet the screening criteria / evaluation factors and the test requirements for vehicle performance and data collection. They also considered the No Action Alternative, as required by the CEQ regulations. There is one launch location on the west coast and one in Hawai`i, both with sites in the Pacific Ocean and two launch locations on the east coast, with both sites in the Atlantic Ocean. The Pacific locations analyzed are the Pacific Missile Range Facility (PMRF), Barking Sands, Kauai, Hawai`i; Vandenberg Space Force Base (VSFB), California; and BOAs in the Pacific Ocean. The east coast locations include the NASA Wallops Flight Facility (WFF), Virginia; Cape Canaveral Space Force Station (CCSFS), Florida; and the Atlantic BOA. VSFB is analyzed as an alternative launch location in the EA/OEA; however, the Action Proponents have determined that VSFB will not be considered as part of the Preferred Alternative in this Finding of No Significant Impact / Finding of No Significant Harm (FONSI/FONSH); therefore, it is not summarized in the Proposed Action below. Potential future actions of JFC Flight Tests at VSFB would therefore require additional NEPA documentation. The Preferred Alternative includes Alternative 1 - Launch from PMRF at the Sandia National Laboratories (SNL) / Kauai Test Facility (KTF) with impact in the Pacific BOA, Alternative 2 - Launch from WFF with impact in the Atlantic BOA, and Alternative 4 - Launch from CCSFS with impact in the Atlantic BOA. The Preferred Alternative includes up to six flight test launches annually over the next 10 years. Launches could occur from any of the three locations included in the Preferred Alternative.

SUMMARY OF ENVIRONMENTAL RESOURCES EVALUATED IN THE EA/OEA: CEQ regulations, NEPA, Army and Navy instructions for implementing NEPA, specify that an EA/OEA should address those resource areas potentially subject to impacts. In addition, the level of analysis should be commensurate with the anticipated level of environmental impact.

The following table summarizes the resources that were evaluated in detail in the EA/OEA. The resources that were not further evaluated had potential impacts that were determined to be negligible or nonexistent.

	Preferred Alternative – Proposed Action				
Resource	PMRF (SNL/KTF)	Pacific Ocean	WFF	CCSFS	Atlantic Ocean
Air Quality		E		E	E
Water Resources					
Geological Resources					
Cultural Resources	E		E	E	
Biological Resources	E	E	E	E	E
Land Use					
Airspace					
Noise					
Public Health & Safety	E		E	E	
Hazardous Materials & Wastes	E		E	E	
Socioeconomics					
Infrastructure				E	
Transportation				E	
Environmental Justice					
Visual Resources					
Marine Sediments					
Note: Shaded areas marked "E" indicate resource areas that were evaluated in detail.					

SUMMARY OF POTENTIAL ENVIRONMENTAL CONSEQUENCES OF THE PROPOSED ACTION AND MAJOR MITIGATING ACTIONS

<u>Alternative 1 (Preferred Alternative) – Proposed Action</u>

Pacific Missile Range Facility

The Proposed Action will have no significant direct, indirect, or cumulative impacts to cultural resources, biological resources, public health and safety, and hazardous materials and wastes. There will be no disproportionate and adverse impacts to minority and low-income populations as a result of the Proposed Action.

Cultural Resources – The Proposed Action would not require construction at KTF Pad 42 or PMRF THAAD Launch Site. There are no properties eligible for listing on the National Register of Historic Places at either launch site. No impacts on cultural resources would be expected as a result of this Proposed Action.

Biological Resources – The potential impacts of the Proposed Action on terrestrial biological resources are expected to be minimal. No ground clearing or construction is expected and no long-term adverse impacts on vegetation are expected. Noise from launches may startle nearby wildlife but impacts will be minimal and short-term. The launch site at KTF is in an area that has routine human activity, equipment operation, and launch activity. Emissions from vehicle launches will have little effect on wildlife due to the low-levels and short-duration of emissions. Because aluminum oxide and hydrogen chloride do not bioaccumulate, no indirect effects on the food chain are anticipated from these exhaust emissions. Impact to Endangered Species Act-listed (ESA-listed) species will be minimal and short-term and are not expected to be different than those of ongoing operations at SNL/KTF. Potential effects on ESA-listed species as a result of the Proposed Action are covered, in part, under Section 7 consultations for SNL/KTF operations and the existing Biological Opinion for base-wide operations at PMRF. The U.S. Navy and U.S. Army have determined that launch activities, including noise and emissions, are not likely to adversely affect terrestrial ESA-listed species and will ensure that the appropriate Section 7 consultations are completed prior to each flight test. Marine wildlife are not expected to be impacted by JFC activities. Vehicle launch and overflight will result in elevated noise levels in marine areas, but no marine wildlife will be exposed to artificial lighting or increased levels of human activity and equipment operation. At most, elevated noise levels might cause temporary behavioral disturbance. No impacts on marine wildlife due to direct contact from debris are expected during normal flight operations.

Public Health and Safety – JFC mission personnel will follow the same health and safety procedures developed under existing plans at PMRF. Federal, state, and local regulations as well as PMRF standard operating procedures (SOPs) will be followed for launch site preparation, booster handling, and all hazardous operations. PMRF Missile Flight Analysis, Ground Safety, Range Safety, Ocean Clearance, Transportation Safety, and Fire and Crash Safety procedures will be followed to ensure the safety of workers and members of the public. PMRF will issue Notice to Airmen (NOTAMs) and Notice to Mariners (NTMs) ahead of any JFC flight test, in accordance with range safety and Federal Aviation Administration (FAA) requirements. In accordance with EO 13045, Protection of Children from Environmental Health and Safety Risks, the proponents have determined that since the JFC flight tests will be conducted on DOD property and out in the open ocean, the JFC flight test has no environmental health and safety risks that may disproportionately affect children. The Proposed Action will not impact public health and safety at PMRF.

Hazardous Materials and Waste – All applicable local, state, and federal regulations, range operating procedures, and JFC-specific safety plans will be followed to prevent accidents that could release hazardous materials or waste into the local environment. Although unlikely, should a release of hazardous materials or waste occur, PMRF is capable of mitigating personnel and environmental health risks by following SOPs and utilizing on-site emergency response teams. The Proposed Action will not exceed PMRF’s ability to manage, store, and dispose of hazardous materials and waste.

Major Mitigating Actions are not required for any of the noted resources at PMRF. Minor mitigation activities are incorporated into the Proposed Action such that there are no significant impacts to any resource from the planned activities.

Pacific Ocean Flight Corridor and Booster Drop/Payload Impact Zones

The Proposed Action will have no significant direct, indirect, or cumulative impacts to air quality or biological resources. There will be no disproportionate and adverse impacts to minority and low-income populations as a result of the Proposed Action.

Air Quality – Under the Proposed Action, following the JFC flight test, the majority of aluminum oxide will be removed from the stratosphere through dry deposition and precipitation. Emissions from a JFC launch (using Strategic Target System [STARS] vehicle emissions as a surrogate) will be relatively small compared to all emissions released on a global scale. The large air volume over which the JFC emissions are spread, and the dispersion of the emissions by stratospheric winds will reduce potential impacts. Ozone-depleting gas emissions from up to six flight tests per year represent such a minute increase that any incremental effects on the global atmosphere will be discountable and insignificant. The Proposed Action will not have a significant impact on stratospheric ozone or on the upper atmosphere. The amount of Greenhouse Gas (GHG) emissions that will be released from activities associated with up to six JFC flight tests is assumed to be negligible based on the small number of vessels and aircraft utilized and the short period of time for conducting each flight test. This limited amount of emissions will not likely contribute to global warming and climate change to any discernible extent. Implementation of the Proposed Action will not result in significant impacts to air quality or GHG emissions.

Biological Resources – The Proposed Action will have minimal to no impacts on marine wildlife in the BOA. The potential exists for exposure to elevated sound levels, direct contact from expended test components, hazardous materials, and vessel traffic. Based on the expected sound pressure levels and estimated density of special-status wildlife, no injury from elevated sound levels is expected. Any effects due to sound will likely be limited to short-duration behavioral response with no long-term impacts. Based on the available animal densities in the Pacific BOA and on the size and number of expended test components, no physical injury to special-status species is expected as a result of direct contact. Any hazardous chemicals introduced to the water column will be quickly diluted and dispersed and are not likely to impact marine wildlife or their habitats. Any test components or debris will sink to the ocean floor where most marine wildlife will not come into contact with it. The Proposed Action will not meaningfully increase vessel traffic in the BOA and vessel traffic will have minimal to no impacts. The Proposed Action may affect but is not likely to adversely affect ESA-listed marine species in the BOA. The U.S. Navy and U.S. Army consulted with the National Marine Fisheries Service (NMFS) under Section 7 of the ESA and NMFS concurred with the determination that proposed activities were not likely to adversely affect ESA-listed species. No incidental take or harassment of marine mammals protected under the Marine Mammal Protection Act (MMPA) is expected.

No impacts to environmentally sensitive habitats are expected, including designated critical habitat, Essential Fish Habitat (EFH), Habitat Areas of Particular Concern (HAPCs), marine national monuments, national marine sanctuaries, and Biologically Important Areas (BIAs).

Wallops Flight Facility

The Proposed Action will have no significant direct, indirect, or cumulative impacts to cultural resources, biological resources, public health and safety, and hazardous materials and wastes. There will be no disproportionate and adverse impacts to minority and low-income populations as a result of the Proposed Action.

Cultural Resources – The Proposed Action would not require new construction at Launch Pad 0-B—only the potential modification on an existing structure. In addition, the facilities to be used as part of the Proposed Action are not listed or eligible for listing on the National Register of Historic Places. The launch site does not contain a historic or tribal site of significance. Therefore, no impacts on cultural resources are anticipated as a result of the Proposed Action.

Biological Resources – Terrestrial vegetation will not be significantly impacted. No ground clearing or construction is expected for the Proposed Action, and the launch will take place at a location routinely used for launch activities. Terrestrial wildlife species have the potential to be impacted by elevated sound pressure levels from launch as well as hazardous chemicals, and artificial lighting. The launch site at WFF is in an area that has routine human activity, equipment operation, and launch activity. Noise from launches and launch related activity may startle nearby wildlife but any disturbance will be brief with no long-term impacts. Emissions from vehicle launches will have little effect on wildlife due to the low-levels and short-duration of emissions. No impacts on wildlife due to direct contact from debris are expected during normal flight operations. Vibrations from launches and lighting present at launch pads may affect loggerhead turtles at nest sites close to launch pads but the impacts of launch activities on loggerhead populations will be minor. Overall, terrestrial wildlife will not be significantly impacted by activities at WFF. Impacts to ESA-listed species will be minimal and short-term and are not expected to be different than those of ongoing operations at WFF. Any potential effects on ESA-listed species as a result of the Proposed Action are covered under Section 7 consultations and the existing Biological Opinion for ongoing launch operations at WFF. Marine wildlife are not expected to be significantly impacted by the Proposed Action. Any impacts, if realized, will likely be limited to short-term startle reactions due to elevated noise levels and marine wildlife will be expected to return to normal behaviors within minutes. Noise from launches and launch related activity may startle nearby wildlife, but this startle reaction will be of short duration and no injury will occur. No impacts on marine wildlife due to direct contact or exposure to hazardous chemicals from debris are expected during normal flight operations.

Public Health and Safety – JFC launch activities will follow established protocols at WFF and will involve risks to safety that are similar to those previously analyzed in NEPA documents (Flight Experiment-2, etc.). WFF will implement protective measures to ensure risks to personnel and the general public from these operations are minimized. The JFC mission personnel will follow the same health and safety procedures developed under existing plans at WFF. Federal, state, NASA, and local regulations as well as WFF SOPs will be followed for launch site preparation, booster handling, and all hazardous operations. WFF Missile Flight Analysis, Ground Safety, Range Safety, Ocean Clearance, Transportation Safety, and Fire and Crash Safety procedures will be followed to ensure the safety of workers and members of the public. WFF will issue NOTAMs and NTMs ahead of any JFC flight test, in accordance with range safety and FAA requirements. In accordance with EO 13045, Protection of Children from Environmental Health and Safety Risks, NASA and the JFC proponents have determined that since the JFC flight tests will be conducted on NASA property and out in the open ocean, the JFC flight test has no environmental health and safety risks that may disproportionately affect children. The Proposed Action will not impact health and safety in the WFF region of influence (ROI).

Hazardous Materials and Waste – All applicable local, state, and federal regulations, range operating procedures, NASA requirements, and JFC-specific safety plans will be followed to prevent accidents that could release hazardous materials or waste into the local environment. The modification of the existing Mobile Service Structure (MSS) at the launch pad will have no impact on management of hazardous materials and wastes at WFF. All federal, state, local and WFF-specific SOPs will be followed during MSS modification to ensure worker and environmental safety. Although unlikely, should a release of hazardous materials or waste occur, WFF is capable of mitigating personnel and environmental health risks by following SOPs and utilizing on-site emergency response teams. The Proposed Action will not exceed WFF's ability to manage, store, and dispose of hazardous materials and waste.

Major Mitigating Actions are not required for any of the noted resources at WFF. Minor mitigation activities are incorporated into the Proposed Action such that there are no significant impacts to any resource from the planned activities.

Cape Canaveral Space Force Station

The Proposed Action will have no significant direct, indirect, or cumulative impacts to air quality, cultural resources, biological resources, public health and safety, hazardous materials and wastes, infrastructure, and transportation resources. There will be no disproportionate and adverse impacts to minority and low-income populations as a result of the Proposed Action.

Air Quality – No significant impacts to air quality are expected at CCSFS. Estimated annual emissions do not exceed the Prevention of Significant Deterioration (PSD) significant indicator levels for pollutants of concern, and where appliable, launch activities are conducted in compliance with all applicable Brevard County rules and regulations equating to insignificance. Therefore, no significant impacts to air quality are anticipated from the JFC flight test.

Cultural Resources – The Proposed Action would not require new construction at Launch Complex-46, only the potential modification of an existing structure. In addition, the facilities to be used as part of the Proposed Action are not listed or eligible for listing on the National Register of Historic Places. The launch site does not contain a historic or tribal site of significance. Therefore, no impacts on cultural resources are anticipated as a result of the Proposed Action.

Biological Resources – Terrestrial vegetation near the launch complex may be temporarily affected by heat and launch emissions. However, impacts will be minimal and short-term. Terrestrial wildlife may be impacted by elevated sound pressure levels from launch as well as hazardous chemicals, and artificial lighting. The launch site is in an area that has routine human activity, equipment operation, and launch activity. Noise from launches and launch related activity may startle nearby wildlife but disturbance to wildlife from launches will be brief and is not expected to have any long-term impacts. Wildlife are not likely to be physically harmed by heat or emissions during launch. Overall, terrestrial wildlife will not be significantly impacted. Impact to ESA-listed species will be minimal and short-term and are not expected to be different than those of ongoing operations at CCSFS. Any potential effects on ESA-listed species as a result of the Proposed Action are covered under numerous Section 7 consultations and existing Biological Opinions for ongoing launch operations at CCSFS. Marine wildlife are not expected to be significantly impacted by the Proposed Action. Any impacts, if realized, will likely be limited to short-term startle reactions due to elevated noise levels and marine wildlife will be expected to return to normal behaviors within minutes. No impacts on marine wildlife due to direct contact or exposure to hazardous chemicals from debris are expected during normal flight operations.

Infrastructure – CCSFS launch pad suitability, data collection and storage capabilities, booster and explosive materials storage capabilities, and security systems were reviewed to be suitable for the JFC Flight Tests. CCSFS power, potable water management, wastewater, and stormwater management resources are numerous and will be capable of absorbing any potential stressors from the JFC Flight Launch. The modification of the existing MSS at the launch pad will have no significant impact on infrastructure resources at CCSFS. Any ground-disturbing activities are not expected to remove vegetation or earth as the MSS will be designed on existing man-made structures. All federal, state, local, and CCSFS-specific SOPs will be followed during MSS modification to ensure worker and environmental safety. The Proposed Action will not impact infrastructure resources in the CCSFS ROI.

Transportation – The transportation network at CCSFS will be capable of absorbing any potential stressors from the JFC Flight Launch. Fewer than 100 support personnel will be at each JFC Flight Test, and are required to follow all applicable federal, state, DOD and local traffic laws, rules, and regulations. The modification of the existing MSS at the launch pad will have no significant impact on infrastructure resources at CCSFS. Any ground-disturbing activities are not expected to remove vegetation or earth as the MSS will be designed on existing man-made structures and will not impact the CCSFS transportation network. All federal, state, local, and CCSFS-specific SOPs will be followed during MSS modification to ensure worker and environmental safety. The Proposed Action will not impact transportation resources in the CCSFS ROI.

Public Health and Safety – JFC launch activities will follow established protocols at CCSFS and will involve risks to safety that are similar to those previously analyzed in NEPA documents. CCSFS will implement protective measures to ensure risks to personnel and the general public from these operations are minimized. The JFC mission personnel will follow the same health and safety procedures developed under existing plans at CCSFS. Federal, state, and local regulations as well as CCSFS SOPs will be followed for launch site preparation, booster handling, and all hazardous operations. CCSFS Missile Flight Analysis, Ground Safety, Range Safety, Ocean Clearance, Transportation Safety, and Fire and Crash Safety procedures will be followed to ensure the safety of workers and members of the public. CCSFS will issue NOTAMs and NTMs ahead of any JFC flight test, in accordance with range safety and FAA requirements. In accordance with EO 13045, Protection of Children from Environmental Health and Safety Risks, the proponents have determined that since the JFC flight tests will be conducted on DOD property and out in the open ocean, the JFC flight test has no environmental health and safety risks that may disproportionately affect children. The Proposed Action will not impact health and safety in the CCSFS ROI.

Hazardous Materials and Waste – All applicable local, state, and federal regulations, range operating procedures, and JFC-specific safety plans will be followed to prevent accidents that could release hazardous materials or waste into the local environment. The modification of the existing MSS at the launch pad will have no impact on management of hazardous materials and wastes at CCSFS. All federal, state, local, and CCSFS-specific SOPs will be followed during MSS modification to ensure worker and environmental safety. Although unlikely, should a release of hazardous materials or waste occur, CCSFS is capable of mitigating personnel and environmental health risks by following SOPs and utilizing on-site emergency response teams. The Proposed Action will not exceed CCSFS's ability to manage, store, and dispose of hazardous materials and waste.

Major Mitigating Actions are not required for any of the noted resources at CCSFS. Minor mitigation activities are incorporated into the Proposed Action such that there are no significant impacts to any resource from the planned activities.

Atlantic Ocean Flight Corridor and Booster Drop/Payload Impact Zones

The Proposed Action will have no significant direct, indirect, or cumulative impacts to air quality or biological resources. There will be no disproportionate and adverse impacts to minority and low-income populations as a result of the Proposed Action.

Air Quality – Under the Proposed Action, following the JFC flight test, the majority of aluminum oxide will be removed from the stratosphere through dry deposition and precipitation. Emissions from a JFC vehicle launch (using STARS vehicle emissions as a surrogate) will be relatively small compared to all emissions released on a global scale. The large air volume over which the JFC emissions are spread, and the dispersion of the emissions by stratospheric winds will reduce potential impacts. Ozone-depleting gas emissions from up to six flight tests per year represent such a minute increase that any incremental effects on the global atmosphere will be discountable and insignificant. The Proposed Action will not have a significant impact on stratospheric ozone or on the upper atmosphere. The amount of GHG emissions that will be released from activities associated with up to six JFC flight tests is assumed to be negligible based on the small number of vessels and aircraft utilized and the short period of time for conducting a JFC flight test. This limited amount of emissions will not likely contribute to global warming and climate change to any discernible extent. Implementation of the Proposed Action will not result in significant impacts to air quality or GHG emissions.

Biological Resources – The Proposed Action will have minimal to no impacts on marine wildlife in the BOA. The potential exists for exposure to elevated sound levels, direct contact from expended test components, hazardous materials, and vessel traffic. Based on the expected sound pressure levels and estimated density of special-status wildlife, no injury from elevated sound levels is expected. Any effects due to sound will likely be limited to short-duration behavioral response with no long-term impacts. Based on the available animal densities in the Atlantic BOA and on the size and number of expended test components, no physical injury to special-status species is expected as a result of direct contact. Any hazardous chemicals introduced to the water column will be quickly diluted and dispersed and are not likely to impact marine wildlife or their habitats. Any test components or debris will sink to the ocean floor where most marine wildlife will not come into contact with it. The Proposed Action will not meaningfully increase vessel traffic in the BOA and vessel traffic will have minimal to no impacts. The Proposed Action may affect but is not likely to adversely affect ESA-listed species in the BOA. The U.S. Navy and U.S. Army consulted with NMFS under Section 7 of the ESA and NMFS concurred that proposed activities were not likely to adversely affect ESA-listed species. No incidental take or harassment of marine mammals protected under the MMPA is expected.

No impacts to environmentally sensitive habitats are expected, including designated critical habitat, EFH, HAPCs, marine national monuments, national marine sanctuaries, and BIAs.

PUBLIC INVOLVEMENT: The U.S. Navy and U.S. Army circulated the Draft EA/OEA for public review for 30 days from June 11, 2021 to July 10, 2021. Thirty-six comments were received from the public. U.S. agencies provided two comments on the Draft EA/OEA, and responses to those comments are provided in Appendix B of the Final EA/OEA.

POINT OF CONTACT: The EA/OEA addressing this action may be obtained from: U.S. Army Space and Missile Defense Command, P.O. Box 1500 Huntsville, AL 35807, Attn: David Fuller, 256-425-2016, or at the project website: JFCeaoea.govsupport.us

CONCLUSION: Based on the analysis presented in the EA/OEA, the U.S. Navy and U.S. Army conclude that the Proposed Action will not significantly impact the quality of the human and natural environment. Accordingly, there is no requirement to prepare an Environmental Impact Statement.

APPROVED:

L. NEIL THURGOOD Lieutenant General, U.S. Army Director of Hypersonics, Directed Energy, Space and Rapid Acquisition	2022 05 01 DATE
JOHNNY R. WOLFE, JR Vice Admiral, U.S. Navy Director, Strategic Systems Programs	14 APR 2022 DATE

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DISTRIBUTION A. Approved for public release; distribution unlimited.

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N/A

14. ABSTRACT
This EA/OEA provides analysis of proposed U.S. Navy SSP and U.S. Army RCCTO experimental flight tests with a payload from one of four candidate launch sites, which include the Kauai Test Facility / Pacific Missile Range Facility, Kauai, Hawai`i; Wallops Flight Facility, Wallops Island, Virginia; Vandenberg Space Force Base, California; and Cape Canaveral Space Force Station, Florida. Candidate impact areas include broad ocean areas in the Pacific and Atlantic Oceans. The purpose of the project is to collect data on a developmental payload by testing range performance and to demonstrate technologies for prospective strike capabilities specifically to flight test the developmental payload concept to demonstrate the maturity of key technologies including precision navigation, guidance and control, and enabling capabilities.

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
a. REPORT	**b. ABSTRACT**	**c. THIS PAGE**			Mr. David Fuller
Unclassified	Unclassified	Unclassified	SAR	430	**19b. TELEPHONE NUMBER** *(include area code)* (256) 955-5585

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Appendices

Figures

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Acronyms and Abbreviations

AFB	Air Force Base
AFMAN	Air Force Manual
AFSPC	Air Force Space Command
AFSPCMAN	Air Force Space Command Manual
ARRW	Air-Launched Rapid Response Weapon
ARTCC	Air Route Traffic Control Center
AUR	All Up Round
BCC	Birds of Conservation Concern
BGEPA	Bald and Golden Eagle Protection Act
BLM	Bureau of Land Management
BOA	Broad Ocean Area
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
CCSFS	Cape Canaveral Space Force Station
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CHRIMP	Consolidated Hazardous Materials Reutilization and Inventory Management Program
CO	Carbon Monoxide
CO_2e	Carbon Dioxide Equivalent
CPS	Conventional Prompt Strike
CWA	Clean Water Act
CZM	Coastal Zone Management
CZMA	Coastal Zone Management Act
dB	Decibel(s)
DOD	Department of Defense
DoDI	Department of Defense Instruction
DOE	Department of Energy
DOT	U.S. Department of Transportation
DPS	Distinct Population Segment
EA	Environmental Assessment
EA/OEA	Environmental Assessment/Overseas Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EJ	Environmental Justice
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESQD	Explosive Safety-Quantity Distance
FAC	Florida Administrative Code
FDOT	Florida Department of Transportation
FE-1	Flight Experiment-1
FE-2	Flight Experiment-2
FONSH	Finding of No Significant Harm
FONSI	Finding of No Significant Impact
ft	Foot/Feet
FTS	Flight Termination System
FUDS	Formerly Used Defense Sites
FY	Fiscal Year
GBSD	Ground Based Strategic Deterrent
GHG	Greenhouse Gases
HAP	Hazardous Air Pollutant
HAPC	Habitat Areas of Particular Concern
HAZMAT	Hazardous Materials
HRC	Hawai`i Range Complex
ICBM	Intercontinental Ballistic Missile
in	Inch/Inches
INRMP	Integrated Natural Resources Management Plan
IRP	Installation Restoration Program
JFC	Joint Flight Campaign
km	Kilometer(s)
km^2	Square Kilometer(s)

KSC	Kennedy Space Center
KTF	Kauai Test Facility
lb	Pound(s)
LC-	Launch Complex
LRHW	Long Range Hypersonic Weapon
LOA	Letter of Authorization
m	Meter(s)
MACA	Missile Assembly and Checkout Area
MBTA	Migratory Bird Treaty Act
MDA	Missile Defense Agency
mi	Mile(s)
mi^2	Square Mile(s)
MMPA	Marine Mammal Protection Act
MSA	Magnuson-Stevens Fishery Conservation and Management Reauthorization Act
MSAT	Mobile Source Air Toxics
MSS	Mobile Service Structure
MUS	Management Unit Species
N/A	Not Applicable
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NAVSEA	Naval Sea Systems Command
NAVSEAOP	Naval Sea System Command Publication
NEPA	National Environmental Policy Act
NGA	National Geospatial-Intelligence Agency
NHPA	National Historic Preservation Act
nm	Nautical Mile(s)
NMFS	National Marine Fisheries Service
NNSA	National Nuclear Security Administration
NO_x	Oxides of Nitrogen
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NOTAM	Notice to Airmen
NPL	National Priorities List
NTM	Notice to Mariners
OEA	Overseas Environmental Assessment
OEIS	Overseas Environmental Impact Statement
OPAREA	Operations Area
OPNAVINST	Chief of Naval Operations Instruction
OSHA	Occupational Health and Safety Administration
PCB	Polychlorinated Biphenyl
PEIS	Programmatic Environmental Impact Statement
PFMC	Pacific Fishery Management Council
$PM_{2.5}$	Particulate Matter Less than or Equal to 2.5 Microns In Diameter
PM_{10}	Particulate Matter Less than or Equal to 10 Microns in Diameter
PMRF	Pacific Missile Range Facility
PMRFINST	Pacific Missile Range Facility Instruction
PSCA	Pacific Spaceport Complex-Alaska
PSD	Prevention of Significant Deterioration
PSFB	Patrick Space Force Base
RCC	Range Commander's Council
RCCTO	U.S. Army Rapid Capabilities and Critical Technologies Office
RCRA	Resource Conservation and Recovery Act
RDT&E	Research, Development, Test, and Evaluation
RMI	Republic of the Marshall Islands
ROD	Record of Decision
ROI	Region of Influence
RTS	Ronald Reagan Ballistic Missile Defense Test Site (Reagan Test Site)
SAFMC	South Atlantic Fishery Management Council
SBCAPCD	Santa Barbara County Air Pollution Control District

SEA	Supplemental Environmental Assessment
SHOTL	Short Hot Launch
SHPD	State Historic Preservation Division
SNL	Sandia National Laboratories
SOP	Standard Operating Procedure
SO_x	Oxides of Sulfur
SR	State Road
SSP	Strategic Systems Programs
STARS	Strategic Target System
STS	Strategic Target System
SWI	Space Wing Instruction
TBD	To Be Determined
TFR	Temporary Flight Restriction
THAAD	Terminal High Altitude Area Defense
tpy	Tons Per Year
TSCA	Toxic Substances Control Act
U.S.	United States
USAF	United States Air Force
USAG-KA	United States Army Garrison Kwajalein Atoll
USASMDC	United States Army Space and Missile Defense Command
UAV	Unmanned Aerial Vehicle
USC	United States Code
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USSF	United States Space Force
VACAPES	Virginia Capes
VAFB	Vandenberg Air Force Base (now named VSFB)
VDEQ	Virginia Department of Environmental Quality
VOC	Volatile Organic Compound
VSFB	Vandenberg Space Force Base
WFF	Wallops Flight Facility
WPRFMC	Western Pacific Regional Fishery Management Council
°	Degree(s)
µPa	Micropascal

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1.0 Purpose of and Need for the Proposed Action

1.1 Introduction

The Proposed Action, Joint Flight Campaign (JFC), is a joint action between the Department of the Navy (U.S. Navy) Strategic Systems Programs (SSP) and the U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO). SSP and RCCTO are the joint action proponents for this Environmental Assessment / Overseas Environmental Assessment (EA/OEA).

The Proposed Action entails up to six flight test launches annually over the next 10 years. Test objectives are expected to dictate range selection from Atlantic and Pacific test ranges. Due consideration will be given to existing launch ranges to avoid any unnecessary modifications to the environment. The launch range for each test will be determined based on the test objectives, availability, and technical suitability of the test range. Test scenarios are planned to include broad ocean area (BOA) impacts of the spent stages and the hypersonic payload, and do not include any land-based impacts. This EA/OEA is being prepared to provide an analysis of multiple alternative launch locations that will be available to the test directorates over the next 10 years. The launch selection process will utilize this EA/OEA and will also include a check of the relevancy of this document to support specific launch scenarios. It is anticipated that this EA/OEA will support future decisions; however, tiered National Environmental Policy Act (NEPA) documents could occur if there are significant changes to the proposed missile or facilities at a proposed launch location.

The Proposed Action initial flight test would take place within the second half of fiscal year (FY) 2022 after the Finding of No Significant Impact / Finding of No Significant Harm (FONSI/FONSH) is signed, if approved. The U.S. Army RCCTO, the U.S. Navy SSP, the Missile Defense Agency (MDA), the Office of the Secretary of Defense, and the United States Army Space and Missile Defense Command (USASMDC), as Participating Agencies, along with the Department of Energy (DOE) the National Aeronautics and Space Administration (NASA), the U.S. Air Force Space Launch Delta 30, and the U.S. Air Force 45th Space Wing as Cooperating Agencies, have prepared this EA/OEA in accordance with the NEPA (42 United States Code [USC] 4321, as amended), the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (Title 40 Code of Federal Regulations [CFR] Parts 1500-1508, 1978, July 1, 1986), the Department of the Army Procedures for Implementing NEPA (32 CFR Part 651), the Department of the Air Force Procedures for Implementing NEPA (32 CFR Part 989), Chief of Naval Operations Instruction (OPNAVINST) 5090.1E, and Executive Order [EO] 12114, Environmental Effects Abroad of Major Federal Actions. The Proposed Action was finalized prior to the September 14, 2020 version of the CEQ NEPA regulations, and therefore this document relies on CEQ NEPA regulations in effect prior to September 14, 2020.

1.2 Locations

The U.S. Navy SSP and U.S. Army RCCTO are considering four alternative launch locations, one on the west coast and one in Hawai`i, both with downrange sites in the Pacific Ocean and two on the east coast, with downrange sites in the Atlantic Ocean. The Pacific locations analyzed in this EA/OEA are the Pacific Missile Range Facility (PMRF), Barking Sands, Kauai, Hawai`i; Vandenberg Space Force Base (VSFB), California; and BOAs in the Pacific Ocean. The east coast locations include the NASA Wallops Flight Facility (WFF), Virginia; Cape Canaveral Space Force Station (CCSFS), Florida; and the Atlantic BOA. Launch locations and notional stage 1 booster drop zones, and stage 2 booster drop/payload impact zones are shown in **Figure 1-1** through **Figure 1-4**.

Various other Government facilities would participate in support operations related to the Proposed Action. These additional facilities, listed in **Table 1-1**, maintain NEPA documentation and/or regulatory permitting for their ongoing activities. As such, analysis of these support operations is incorporated by reference and not discussed in detail in this EA/OEA.

Table 1-1. Support Locations Not Analyzed in this EA/OEA

Location	Support Activity
Draper Labs, Cambridge, Massachusetts	• Provide navigation for the payload system
Lawrence Livermore National Laboratory, Livermore, California	• Component development
Redstone Arsenal, Alabama	U.S. Army Space and Missile Defense Command (USASMDC) • Mission planning • Test execution U.S. Army Aviation and Missile Research Development and Engineering Center • Component development and testing Naval Sea Systems Command (NAVSEA) Crane • Perform Strategic Target System (STARS) motor processing • Logistics Missile Defense Agency (MDA) • Test instrumentation
Lockheed Martin, Courtland, Alabama	• Missile body and All Up Round (AUR), integration, and testing
Dynetics, Huntsville, Alabama	• Glide body (GB) development
Sandia National Laboratories, Albuquerque, New Mexico	• Vehicle assembly, integration, and testing
Naval Air Weapons Station China Lake	• Box launcher development testing

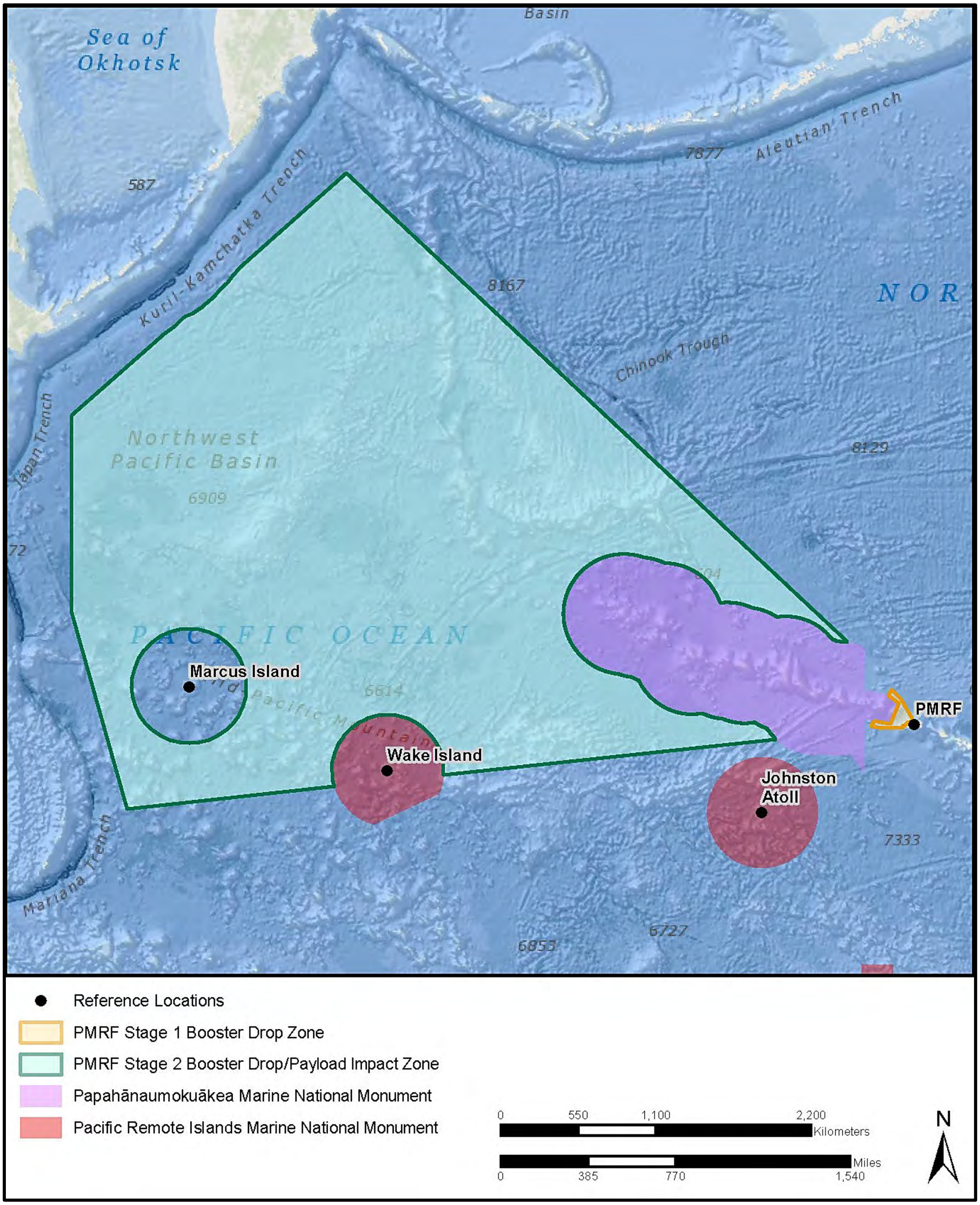

Figure 1-1. JFC Activity Location Map Pacific: General Map with PMRF – BOA

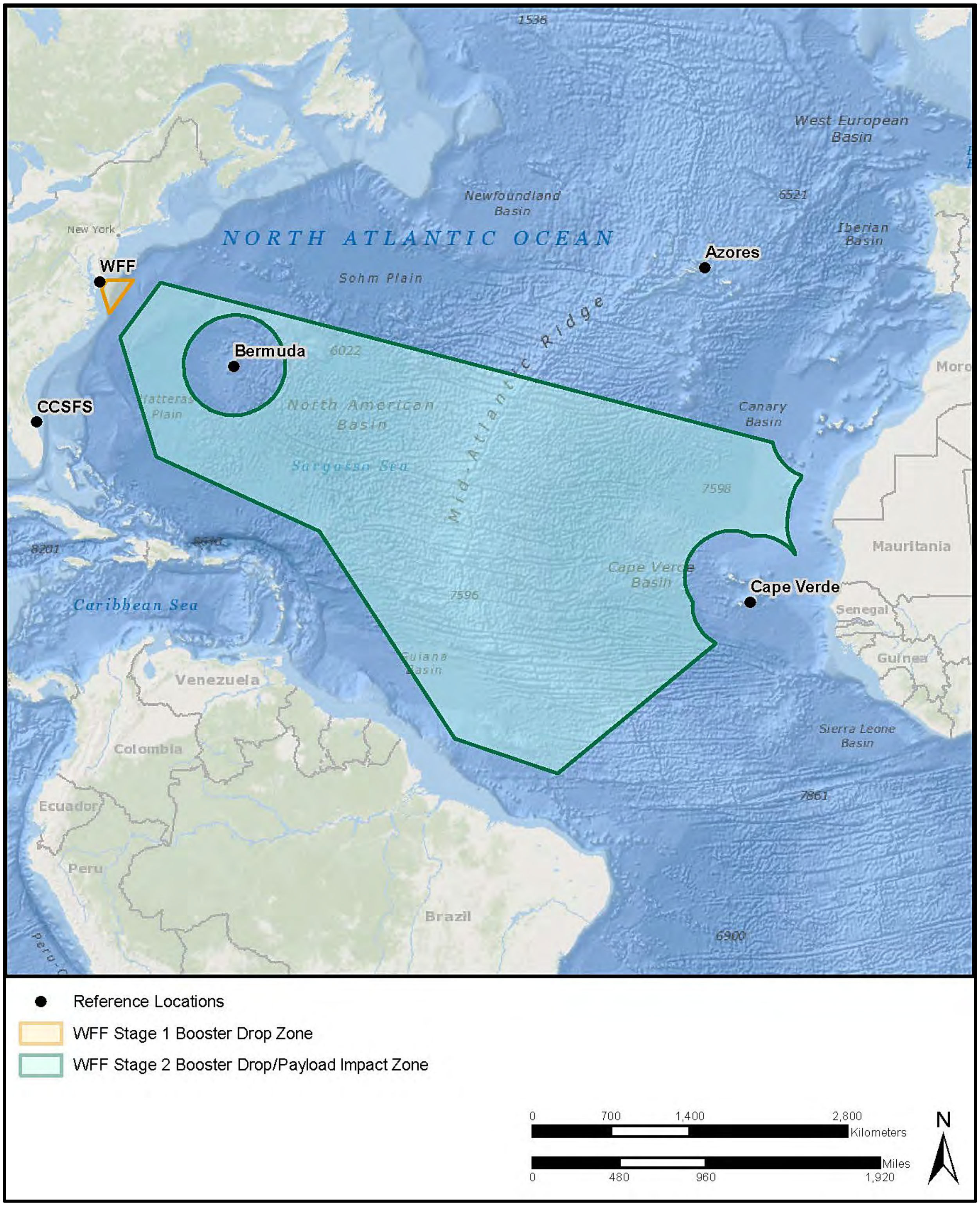

Figure 1-2. JFC Activity Location Map Atlantic: General Map with WFF – BOA Impact

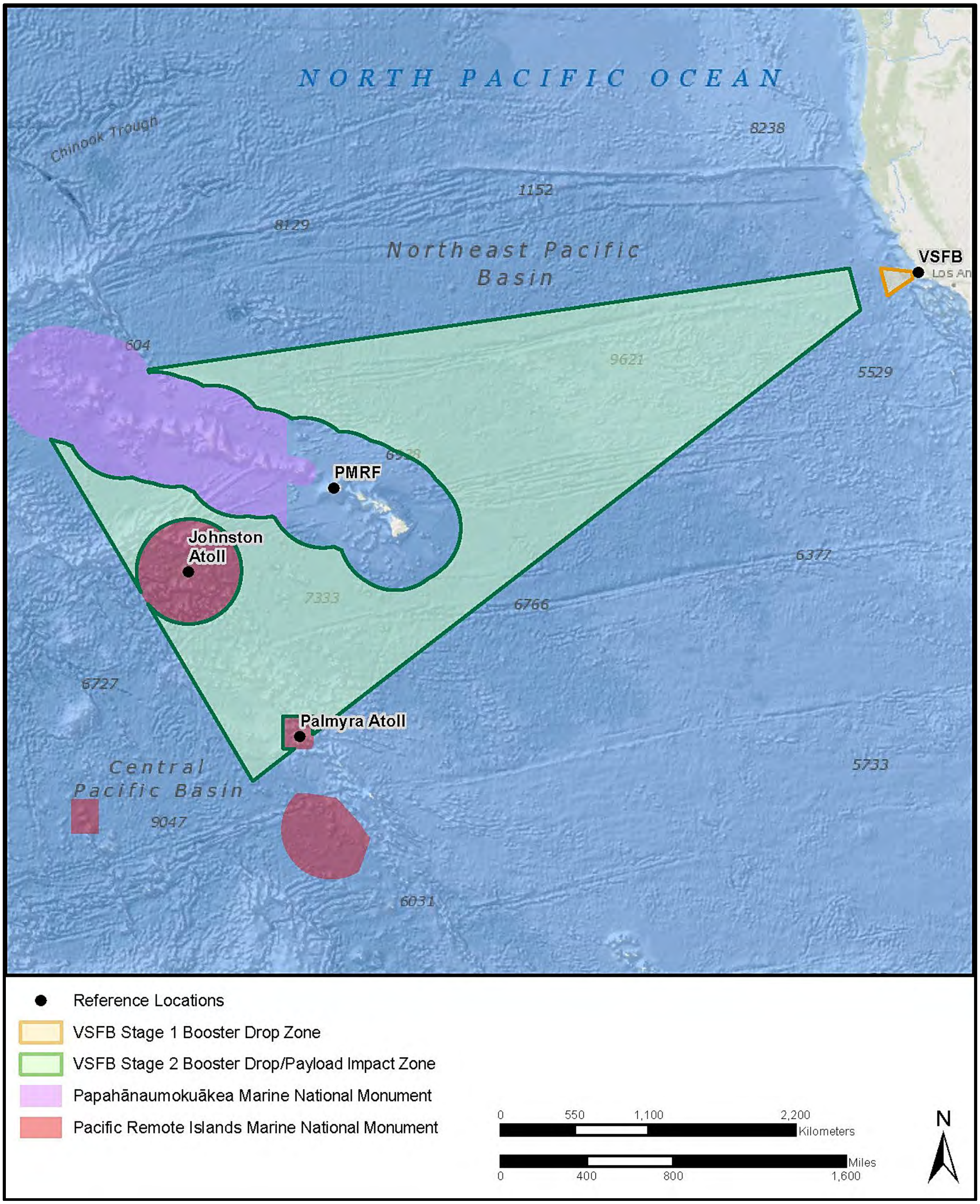

Figure 1-3. JFC Activity Location Map Pacific: General Map with VSFB – BOA Impact

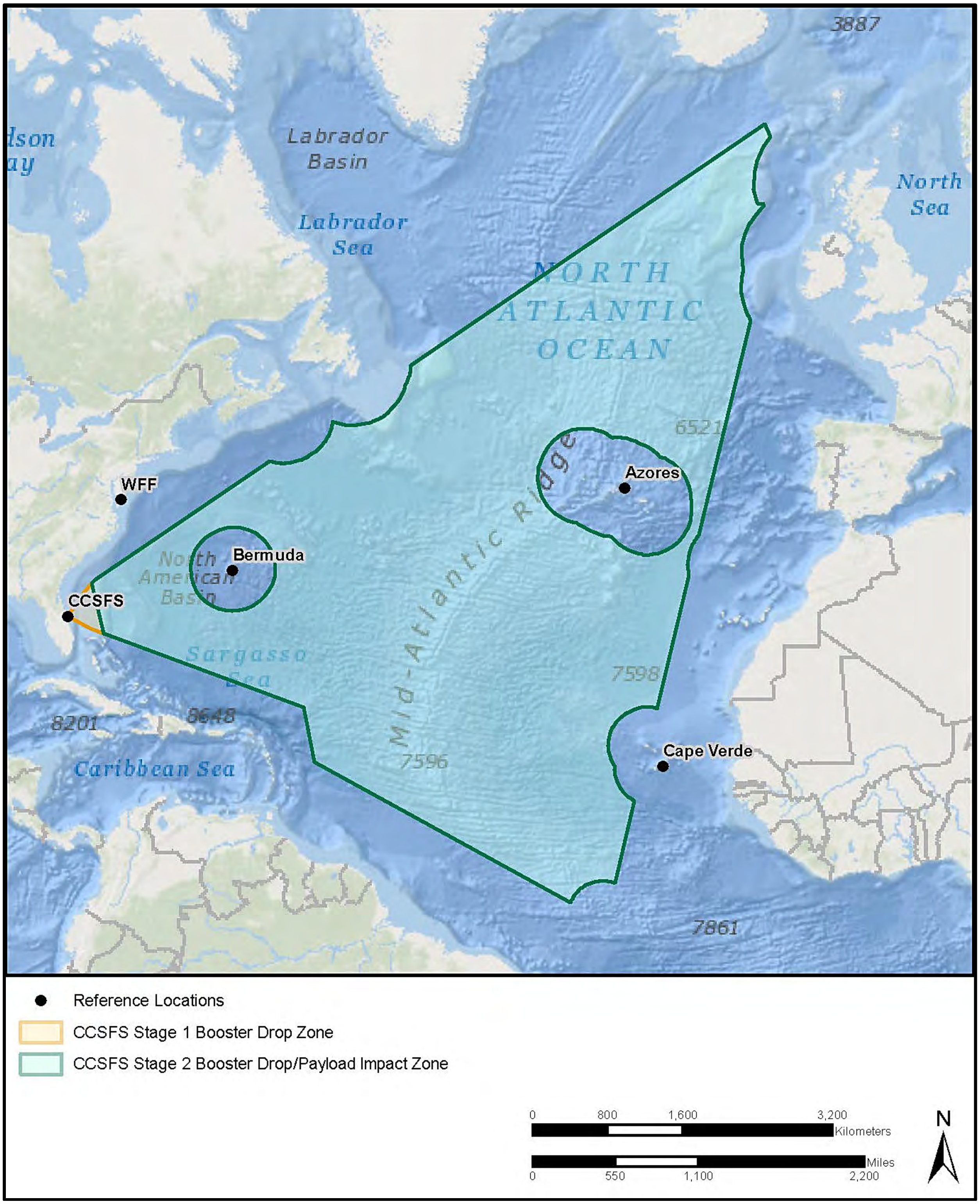

Figure 1-4. JFC Activity Location Map Atlantic: General Map with CCSFS – BOA Impact

1.3 Purpose of and Need for the Proposed Action

The purpose of the Proposed Action is to perform the land-based tests needed to prove that the U.S. Navy Conventional Prompt Strike (CPS) weapon system and Army Long Range Hypersonic Weapon (LRHW) system meet all key performance requirements within the capabilities of the All Up Round (AUR) missile used by both systems. The Proposed Action is needed to establish CPS and LRHW capabilities required to improve the United States' capabilities to respond to time-sensitive threats, thereby maintaining technical superiority against its adversaries. The successful development and eventual fielding of the CPS and LRHW weapon systems has been identified as a National priority by the Department of Defense (DOD).

This series of land-based tests is needed to allow the U.S. Army and the U.S. Navy to collect the data required to prove that weapon system development has been successful, thereby enabling these key weapon systems to be fielded to the warfighter. To meet the CPS and LRHW program objectives, test events must satisfy certain critical objectives, to include demonstrating weapon system effectiveness, demonstrating applicable design features, and establishing effective operating procedures, which also ensure the safety of the warfighter and the public.

The AUR test configurations included in the Proposed Action include launches from a stool or from a canister. The U.S. Navy canister would be emplaced on a "box launcher," and the U.S. Army canister would be emplaced on the LRHW transporter erector launcher.

1.4 Scope of Environmental Analysis

This EA/OEA includes an analysis of potential environmental impacts associated with the Proposed Action and the No Action Alternative. The proponents have considered alternate launch and impact locations, and only four launch locations meet the screening criteria / evaluation factors and the test requirements for vehicle performance and data collection. These four locations are carried forward as alternative launch locations for the Proposed Action.

1. Alternative 1 - Launch from PMRF at the Sandia National Laboratories/Kauai Test Facility (SNL/KTF) with impact in the Pacific BOA
2. Alternative 2 - Launch from WFF with impact in the Atlantic BOA
3. Alternative 3 - Launch from VSFB with impact in the Pacific BOA
4. Alternative 4 - Launch from CCSFS with impact in the Atlantic BOA

This EA/OEA analyzes potential impacts to the launch area, the over-ocean flight corridors in the Pacific and Atlantic, and booster drop/payload impact zones in the Pacific and Atlantic. The analysis evaluates up to six launches annually for the next 10 years from any of the alternative launch locations as they meet the requirements of the Purpose of and Need for the Proposed Action.

The environmental resource areas considered in this EA/OEA include air quality, water resources, geological resources, cultural resources, biological resources, land use, airspace, noise, infrastructure, transportation, public health and safety, hazardous materials and wastes, socioeconomics, environmental justice, aesthetics/visual resources, and marine sediments. The study area for each resource may differ due to how the Proposed Action interacts with or impacts the resource. For instance, the study area for geological resources may only include the construction footprint of a building, whereas the noise study area would expand to include areas that may be impacted by airborne noise. **Table 1-2** through **Table 1-5** summarize the potential impacts to the resources associated with each of the alternative actions analyzed.

Table 1-2. Summary of Anticipated Impacts to Resources Associated with Alternative 1, Pacific Missile Range Facility

Location / Resource Area	No Action Alternative	Preferred Action Alternative
Pacific Missile Range Facility, Hawai`i		
Cultural Resources	No change	No significant impact
Biological Resources	No change	No significant impact
Public Health and Safety	No change	No significant impact
Hazardous Materials and Wastes	No change	No significant impact
Pacific Ocean Broad Ocean Area		
Air Quality	No change	No significant impact
Biological Resources	No change	No significant impact

Table 1-3. Summary of Anticipated Impacts to Resources Associated with Alternative 2, Wallops Flight Facility

Location / Resource Area	No Action Alternative	Preferred Action Alternative
NASA Wallops Flight Facility, Virginia		
Cultural Resources	No change	No significant impact
Biological Resources	No change	No significant impact
Public Health and Safety	No change	No significant impact
Hazardous Materials and Wastes	No change	No significant impact
Atlantic Broad Ocean Area		
Air Quality	No change	No significant impact
Biological Resources	No change	No significant impact

Table 1-4. Summary of Anticipated Impacts to Resources Associated with Alternative 3, Vandenberg Space Force Base

Location / Resource Area	No Action Alternative	Proposed Action Alternative
Vandenberg Space Force Base, California		
Air Quality	No change	No significant impact
Cultural Resources	No change	No significant impact
Biological Resources	No change	No significant impact
Public Health and Safety	No change	No significant impact
Hazardous Materials and Wastes	No change	No significant impact
Pacific Broad Ocean Area		
Air Quality	No change	No significant impact
Biological Resources	No change	No significant impact

Table 1-5. Summary of Anticipated Impacts to Resources Associated with Alternative 4, Cape Canaveral Space Force Station

Location / Resource Area	No Action Alternative	Preferred Action Alternative
Cape Canaveral Space Force Station, Florida		
Air Quality	No change	No significant impact
Cultural Resources	No change	No significant impact
Biological Resources	No change	No significant impact
Public Health and Safety	No change	No significant impact
Hazardous Materials and Wastes	No change	No significant impact
Infrastructure	No change	No significant impact
Transportation	No change	No significant impact
Atlantic Broad Ocean Area		
Air Quality	No change	No significant impact
Biological Resources	No change	No significant impact

1.4.1 Key Documents

Key documents are sources of information incorporated into this EA/OEA. These documents are considered to be key because they address similar actions, analyses, or impacts that may apply to this Proposed Action.

Alternative 1 – PMRF and Pacific BOA

- *Continued Operation of the Kauai Test Facility Sandia National Laboratories, Hawaii Final Site-wide Environmental Assessment,* 2019. The U.S. DOE National Nuclear Security Administration (NNSA) prepared this EA for the continued operation of the SNL Kauai Test Facility located on the U.S. Navy's PMRF, Barking Sands, Kauai. The Proposed Action is to continue to conduct launch activities at the site and expand its vertical launch capabilities.

- *Hawai`i–Southern California Training and Testing Final Environmental Impact Statement/Overseas Environmental Impact Statement*, 2018. The U.S. Navy identified its need to support and conduct current, emerging, and future training and testing activities in the Hawai`i–Southern California Study Area, which is made up of air and sea space off Southern California, around the Hawaiian Islands, and the air and sea space connecting them.
- *Final Environmental Assessment/Overseas Environmental Assessment for Flight Experiment-1 (FE-1),* 2017*.* This assessment addresses the probable environmental effects of conducting U.S. Navy FE-1 from PMRF on Kauai, Hawai`i to Illeginni Islet, Ronald Reagan Ballistic Missile Defense Test Site (RTS), Republic of the Marshall Islands (RMI).
- *Advanced Hypersonic Weapon Flight Test 2 Hypersonic Technology Test Environmental Assessment*, 2014. This EA documents the demonstration flight test of a flight test vehicle launched from the Kodiak Launch Complex, using an existing three-stage Strategic Target System (STARS). Following booster separation, the test vehicle would fly to an impact site in the vicinity of Illeginni Islet at the U.S. Army Garrison–Kwajalein Atoll (USAG-KA) in the RMI.
- *Advanced Hypersonic Weapon Program Environmental Assessment*, 2011. This EA analyzes the impacts of launching a flight test vehicle from PMRF, Kauai, Hawai`i, using an existing STARS with three stages. The payload on the STARS vehicle would fly to a land or ocean impact at the USAG-KA/RTS (on or near Illeginni Islet) in the RMI.
- *Hawai`i Range Complex Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS),* 2008. The U.S. Navy has identified the need to support and conduct current, emerging, and future training and research, development, test, and evaluation (RDT&E) activities in the Hawai`i Range Complex (HRC). The alternatives—the No Action Alternative, Alternative 1, Alternative 2, and Alternative 3—are analyzed in this Final EIS/OEIS. All alternatives include an analysis of potential environmental impacts associated with the use of mid-frequency active and high-frequency active sonar. The No Action Alternative stands as no change from current levels of HRC usage and includes HRC training, support, and RDT&E activities, Major Exercises, and maintenance of the technical and logistical facilities that support these activities and exercises.
- *Environmental Assessment for Minuteman III Modification*, 2004. This EA documents the potential environmental impacts of (1) Minuteman III missile flight tests using modified reentry system hardware/software, in addition to the continuation of Force Development Evaluation flight tests; (2) deployment of new and modified reentry system hardware/software; and (3) deployment activities for new command and control console equipment. The locations covered in this EA include: F.E. Warren Air Force Base (AFB), Wyoming; Hill AFB, Utah; Malmstrom AFB, Montana; Minot AFB, North Dakota; VSFB, California; and USAG-KA, RMI.

- *North Pacific Target Launch Environmental Assessment*, 2001. This EA analyzes the impacts of using the STARS launch vehicle for strategic target launch services from Kodiak Launch Complex, Kodiak Island, Alaska. The STARS target would also continue to be launched from KTF at PMRF, Kauai, Hawai`i to the BOA near USAG-KA in the RMI. The proposed action was to increase the launch capability of the STARS by adding a new STARS flight trajectory from KTF and providing a launch capability from Kodiak Launch Complex. The proposed action would provide ballistic missile targets to test North American sensors, and for possible use in testing various sensors and ground-based interceptors at USAG-KA and various sensors and ship-based interceptors at PMRF.
- *Strategic Target System Environmental Impact Statement*, 1992. This Strategic Target System (STS) EIS documents the results of an analysis of the potential for and magnitude of impacts from launch activities of the STARS from KTF at PMRF on the island of Kauai, Hawai`i.
- *Kauai Test Facility Environmental Assessment*, 1991. This EA documents the results of an analysis of the potential for and magnitude of impacts from pre-launch and launch activities from SNL/KTF.
- *Strategic Target System Environmental Assessment*, 1990. This Programmatic EA/OEA documents the results of an analysis of the potential for and magnitude of impacts from pre-launch and launch activities of the STARS from PMRF.

Alternative 2 – WFF and Atlantic BOA

- *Wallops Flight Facility Site-wide Final Programmatic Environmental Impact Statement (PEIS), NASA Goddard Space Flight Center, Wallops Flight Facility, Wallops Island, Virginia*, 2019. The PEIS evaluates the environmental consequences of constructing and operating new facilities and infrastructure at WFF, to support a growing mission base in the areas of civil, commercial, defense, and academic aerospace while also preserving NASA's ability to safely conduct its historical baseline of operations.
- *Atlantic Fleet Training and Testing Final EIS/OEIS,* 2018*.* This EIS assesses the potential environmental impacts associated with military readiness for training and testing, research, development, and evaluation of active sonar and explosives in the Atlantic Ocean BOA along the eastern coast of North America, portions of the Caribbean Sea and Gulf of Mexico at Navy pier side locations, within port transit channels, near civilian ports, and in bays, harbors, and inshore waterways. This EIS/OEIS also specifically evaluates the potential environmental effects associated with military readiness training and research, development, testing, and evaluation activities conducted within the Virginia Capes (VACAPES) Range Complex.
- *Environmental Resources Document (External Version – Redacted), Goddard Space Flight Center, Wallops Flight Facility, Wallops, Virginia*, 2017. This document serves as

the primary reference for current environmental conditions at WFF. It addresses the ongoing operations of WFF rather than a proposed project.

- *Environmental Assessment – U.S. Navy Testing of Hypervelocity Projectiles and an Electromagnetic Railgun, National Aeronautics and Space Administration's Wallops Flight Facility, Wallops Island, Virginia*, 2014. This EA covers the installation of a 5-inch powder gun and an electromagnetic railgun, testing of hypervelocity projectiles, integrating hypervelocity projectiles with the electromagnetic railgun, and integrating the hyper-velocity projectiles / electromagnetic railgun weapon system with combat systems at NAVSEA's Surface Combat Systems Center located on WFF. The guns would fire into the VACAPES Range Complex in the Atlantic Ocean, which is used by the U.S. Navy for training and testing activities.
- *Environmental Assessment for Launch of NASA Routine Payloads*, 2011. This EA includes the potential impacts of processing and launching NASA Routine Payloads spacecraft from several sites including WFF.
- *Final Report – Environmental Assessment for the Expansion of the Wallops Flight Facility Launch Range*, 2009. This EA addresses the proposed expansion of the launch range at WFF. Under the Proposed Action, NASA and Mid-Atlantic Regional Spaceport facilities would be upgraded to support up to and including medium large class suborbital and orbital expendable launch vehicle launch activities from WFF.
- *Virginia Capes Range Complex Final Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS), United States Fleet Forces*, 2009. This EIS/OEIS assesses the potential environmental impacts over a 10-year planning horizon associated with U.S. Navy Atlantic Fleet training, research, development, testing, and evaluation activities, and associated range capabilities enhancements (including infrastructure improvements) in the VACAPES Range Complex.
- *Request for Letter of Authorization for the Incidental Harassment of Marine Mammals Resulting from Navy Training Operations Conducted within the VACAPES Range Complex*, 2008. The Department of the Navy has prepared a request for Letter of Authorization to analyze the potential environmental effects associated with Atlantic Fleet training in the VACAPES Range Complex.
- *Final Environmental Assessment for the Orbital/Sub-Orbital Program*, 2006. This EA documents the environmental analysis of implementing the Orbital/Sub-Orbital Program, which will provide enhanced capability and flexibility to the development of space launch and target vehicles using excess Minuteman and PK rocket motors including launches from WFF. The EA addresses applicable site modifications and construction activities (including some demolitions), rocket motor transportation, pre-flight preparations, flight activities, and post-launch operations. At each range, the Orbital/Sub-Orbital Program will use existing facilities, with limited construction and facility modifications.

Alternative 3 – VSFB and Pacific BOA

- *Final Ground Based Strategic Deterrent Test Program, Environmental Assessment / Overseas Environmental Assessment,* 2021. This EA/OEA analyzes implementation of the Ground Based Strategic Deterrent Test Program, which is meant to modernize the U.S. land-based nuclear arsenal, eventually replacing the aging Minuteman III intercontinental ballistic missile system. Test program-related actions would occur primarily at Hill AFB in Utah and at VSFB in California. Such tests would include conducting missile launches from VSFB with flights over the Pacific Ocean in the Western Test Range. Testing flights would terminate at the Kwajalein Atoll in the RMI. The EA/OEA also includes planning for the training of USAF Airmen on the new GBSD system, including the establishment a GBSD Schoolhouse at VSFB. Additional test support activities would occur at U.S. Army Dugway Proving Ground in Utah.
- *Final Supplemental Environmental Assessment for Minuteman III Modification and Fuze Modernization*, 2020. This SEA documents the potential environmental impacts of the ongoing Minuteman III missile flight tests conducted at VSFB and USAG-KA. It also extends the Minuteman III flight test program another 10 years through 2030, and Fuze Modernization flight tests using the same missile platform and infrastructure support between FY 2019 and 2022.
- *Final Supplemental Environmental Assessment for Minuteman III Extended Range Flight Testing*, 2013. This SEA analyzes the potential environmental impacts of the ongoing Minuteman III missile extended range flight testing conducted at VSFB and BOA of Guam, the Federated States of Micronesia, the Republic of Palau, and international waters.
- *Final Environmental Assessment—Minuteman III ICBM Extended Range Flight Testing*, 2006. This EA addresses the potential environmental effects of extending the targeting range of the Minuteman III Intercontinental Ballistic Missile from VSFB to the Pacific Ocean BOA. This EA focuses on the physical and biological effects in the impact areas in the Pacific Ocean.
- *Final Environmental Assessment for Minuteman III Modification*, 2004. This EA analyzes the potential environmental impacts of Minuteman III missile flight tests using modified Reentry System hardware/software, continuation of Force Development Evaluation flight tests, deployment of new and modified Reentry System hardware/software, and deployment activities for new command and control console equipment. Locations addressed include F.E. Warren AFB, Wyoming; Hill AFB, Utah; Malmstrom AFB, Montana; Minot AFB, North Dakota; VSFB, California; and Kwajalein Atoll, RMI.

Alternative 4 – CCSFS and Atlantic BOA

- *Final Environmental Assessment, Finding of No Significant Impact, and Appendices for SpaceX Falcon Launches at Kennedy Space Center and Cape Canaveral Air Force*

Station, 2020. This EA evaluates the potential environmental impacts from launching the Falcon 9 and Falcon Heavy from Kennedy Space Center's (KSC's) Launch Complex (LC-) 39A and CCSFS's LC-40.

- *Atlantic Fleet Training and Testing Final Environmental Impact Statement / Overseas Environmental Impact Statement,* 2018. This EIS assesses the potential environmental impacts associated with military readiness for training and testing, research, development, and evaluation of active sonar and explosives in the Atlantic Ocean BOA along the eastern coast of North America, portions of the Caribbean Sea and Gulf of Mexico at Navy pier side locations, within port transit channels, near civilian ports, and in bays, harbors, and inshore waterways.
- *Supplemental Environmental Assessment to the December 2014 EA for Space Exploration Technologies Vertical Landing of the Falcon Vehicle and Construction at Launch Complex 13 at Cape Canaveral Air Force Station*. 2017. This SEA analyzes the potential environmental impacts resulting from operations and construction associated with landing up to three Falcon Heavy first stage boosters on two additional landing pads at LC-13. This SEA also includes the operation and construction of a processing facility for the Space Exploration Technologies Corporation (SpaceX) Dragon capsule at LC-13.
- *Supplemental EA to November 2007 EA for Operation and Launch of the Falcon 1 and Falcon 9 Space Vehicles at Cape Canaveral Air Force Station, Florida*, 2013. This SEA evaluates the potential environmental impacts resulting from SpaceX operating and launching the Falcon 9 Version 1.1 from LC-40.
- *Federal Aviation Administration (FAA) FONSI and Record of Decision (ROD) for the March 2014 EA for Crew Dragon Pad Abort Test at LC-40, Cape Canaveral Air Force Station,* 2014. The EA describes the environmental impacts of SpaceX conducting a Crew Dragon pad abort test from LC-40 at CCSFS. The FAA FONSI concurred with the EA's analysis and adopted it to support the issuance of a launch license for the Pad Abort Test.
- *EA for Space Florida Launch Site Operator License at Launch Complex-46,* 2008. The EA addresses the potential environmental impacts of the FAA issuing a Launch Site Operator License to Space Florida to operate a launch facility at LC-46 at CCSFS in Brevard County, Florida. This EA evaluates the impacts of launching several types of vertical launch vehicles, including Athena-1 and Athena-2, Minotaur, Taurus, Falcon 1, Alliant Techsystems small launch vehicles, and launches of other Castor® 120-based or Minuteman-derivative booster vehicles.
- *EA for Operation and Launch of Falcon 1 and Falcon 9 Space Vehicles at Cape Canaveral Air Force Station, Florida. Prepared by Aerostar Environmental Services, Orlando, Florida.* Prepared for Space Exploration Technologies Corporation and United States Air Force, 45th Space Wing, PSFB. November 2007. This EA evaluates the

potential impacts associated with implementing the Falcon 1 and Falcon 9 Launch Vehicle Program (The Falcon Program) at CCSFS.

1.5 Relevant Laws and Regulations

The JFC proponents have prepared this EA/OEA based on federal and state laws, statutes, regulations, and policies that are pertinent to the implementation of the Proposed Action, including the following:

- NEPA (42 USC Sections 4321-4370h), which requires an environmental analysis for major federal actions that have the potential to significantly impact the quality of the human environment
- CEQ Regulations for Implementing the Procedural Provisions of NEPA (40 CFR Parts 1500-1508)
- Navy regulations for implementing NEPA (32 CFR Part 775), which provides U.S. Navy policy for implementing CEQ regulations and NEPA
- Department of the Army Procedures for Implementing NEPA (32 CFR Part 651)
- Department of the Air Force Procedures for Implementing NEPA (32 CFR Part 989)
- Clean Air Act (CAA) (42 USC Section 7401 et seq.)
- Clean Water Act (CWA) (33 USC Section 1251 et seq.)
- Coastal Zone Management Act (CZMA) (16 USC Section 1451 et seq.)
- National Historic Preservation Act (NHPA) (54 USC Section 306108 et seq.)
- Endangered Species Act (ESA) (16 USC Section 1531 et seq.)
- Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (MSA) (16 USC Section 1801 et seq.)
- Marine Mammal Protection Act (MMPA) (16 USC Section 1361 et seq.)
- Migratory Bird Treaty Act (MBTA) (16 USC Sections 703-712)
- Bald and Golden Eagle Protection Act (BGEPA) (16 USC Section 668-668d)
- EO 11988, Floodplain Management
- EO 12088, Federal Compliance with Pollution Control Standards
- EO 12114, Environmental Effects Abroad of Major Federal Actions
- EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations
- EO 13045, Protection of Children from Environmental Health Risks and Safety Risks

- EO 13089, Coral Reef Protection
- EO 13990, Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis
- EO 13175, Consultation and Coordination with Indian Tribal Governments

This EA/OEA has been organized under the 1978/1986 CEQ requirements instead of the September 14, 2020 CEQ requirements because the JFC Flight Test Program was finalized and necessary NEPA reviews were in process before the September 2020 streamlined NEPA regulations were effective. This determination is consistent with § 1506.13 and paragraph (a) of § 1507.3 of the 2020 Updated NEPA Implementing Regulations.

1.6 Public and Agency Participation and Intergovernmental Coordination

Regulations from the CEQ (40 CFR Part 1506.6) direct agencies to involve the public in preparing and implementing their NEPA procedures. The DOE NNSA/Sandia Field Office, NASA WFF, and the U.S. Air Force accepted the invitation to participate as cooperating agencies (40 CFR Part 1501.6) in the preparation of this EA/OEA (refer to **Appendix A** for relevant correspondence). Each of these cooperating agencies will follow their own implementing regulations for NEPA.

U.S. Fish and Wildlife Service Coordination and ESA Section 7 Compliance

The JFC proponents have determined that the potential effects of the Proposed Action on ESA-listed species and designated critical habitats under the jurisdiction of the U.S. Fish and Wildlife Service (USFWS) are covered under existing ESA Section 7 consultations and Biological Opinions for launch activities from SNL/KTF, WFF, and CCSFS. For launch activities at SNL/KTF, the DOE consulted with the USFWS for the potential effects of launch activities on terrestrial ESA-listed species and designated critical habitats and the USFWS concurred with the DOE determination that ongoing activities may affect but are not likely to adversely affect ESA-listed species (USFWS reference number 01EPIF00-2021-I-0329; USFWS 2021). If the Terminal High Altitude Area Defense (THAAD) launch site at PMRF were selected for JFC launches, additional coordination and/or consultation under Section 7 of the ESA may be required prior to launch. NASA has consulted with the USFWS on the potential effects of proposed and ongoing launch activities at WFF, including launches from Launch Pad 0-B (USFWS reference number: 2015-F-3317; USFWS 2019). The USAF has consulted with the USFWS for base-wide operations and maintenance activities (including launch activities) at VSFB (USFWS reference number 8-8-13-F-34 49R; USFWS 2018a). Numerous Biological Opinions have been issued by USFWS for operations at CCSFS (available in Appendix C of USAF 2020b). These consultations for activities at CCSFS included the effects of launch complex lighting and under the terms of the existing Biological Opinions, a JFC Light-Management Plan would need to be approved by the USFWS and in place prior to proposed launch operations at CCSFS. JFC pre-launch, launch, and post-launch activities at launch installations/facilities would be conducted within the standard operating procedures (SOPs) and relevant terms and conditions of existing Biological Opinions as implemented by operators of the launch installations or facilities.

National Marine Fisheries Service Coordination and Consultation

The JFC proponents have coordinated with and will continue to coordinate with the National Marine Fisheries Service (NMFS) regarding the potential effects of the Proposed Action on marine ESA-listed species, designated critical habitats, species protected under the MMPA, and essential fish habitat (EFH). The JFC proponents provided a copy of the EA/OEA to NMFS during the public comment period for their review and comment. No comments on the EA/OEA were received from NMFS.

The JFC proponents have determined that the Proposed Action may affect but is not likely to adversely affect a number of ESA-listed species and designated critical habitats. The JFC proponents initiated consultation with NMFS under Section 7 of the ESA for the potential effects of the Proposed Action on marine ESA-listed species and designated critical habitats in the BOA portion of the Action Area on 24 May 2021 (**Appendix A**). The JFC proponents requested NMFS concurrence with the conclusion that the Proposed Action may affect but is not likely to adversely affect marine ESA-listed species and critical habitats. NMFS issued a letter of concurrence on October 14, 2021 (**Appendix A**) concurring that the Proposed Action may affect but is not likely to adversely affect ESA-listed marine species and designated critical habitats.

JFC launch activities from VSFB have the potential to harass the MMPA-protected Pacific harbor seals. The NMFS has issued a programmatic “take” permit for launch activities at VSFB which allows Level B harassment of certain pinniped species, including the Pacific harbor seal, elephant seal, northern fur seal, and California sea lion (68 FR 67629-67636). A 5-year take permit, which was renewed in 2019, allows the NMFS to issue a 5-year Letter of Authorization (LOA) to VSFB for these harassments. NMFS has concluded that any permitted takes by Level B harassment would have no more than a negligible impact on the affected species and stocks (NMFS 2019, USAF 2020a). The JFC proponents have determined that the Proposed Action activities in the BOA would not result in the take or harassment of any marine mammals protected under the MMPA and that no permitting under the MMPA is required for JFC activities in the BOA. They have also determined that the Proposed Action would not significantly reduce the quality and/or quantity of EFH and that no consultation with NMFS for EFH is required for JFC activities.

Consultation on Cultural Resources

The JFC proponents analyzed baseline conditions of cultural resources at each Alternative Location. At PMRF and VSFB, no potential ground-breaking activities would be required and there are no properties eligible for listing on the National Register of Historic Places within the ROI. No Section 106 consultation would be required at PMRF. At VSFB, where the JFC Flight Test would not require any modifications to Test Pad 01 (TP01), a memorandum will be provided to the California SHPO by the VSFB environmental office for consultation related to historic properties at TP-01. Until this action takes place, and concurrence is received from the California SHPO, VSFB is not included as part of the Preferred Alternative.

At WFF, where the JFC Flight Test may require modifications to an existing MSS at Launch Pad 0-B, the Proponents investigated whether Section 106 consultation would be required for this Proposed Action. However, in accordance with the 2014 Programmatic Agreement with WFF, the Virginia State Historic Preservation Officer (SHPO), and the Advisory Council on Historic Preservation, no Section 106 consultation with the Virginia SHPO would be required for this Proposed Action. Additionally, the facilities to be used at WFF as part of the Proposed Action are not listed or eligible for listing on the National Register of Historic Places.

At CCSFS, where the JFC Flight Test may require modifications to an existing MSS at LC-46, the Proponents investigated whether Section 106 consultation would be required for this Proposed Action. In accordance with Florida SHPO/Clearinghouse policy, a letter will be provided to the Florida SHPO regarding this Proposed Action. The facilities to be used at CCSFS as part of this Proposed Action are not listed or eligible for listing on the National Register of Historic Places. No impacts to cultural resources from the JFC Proposed Action would be anticipated at any of the Alternative Locations.

Consultation on Coastal Resources

The JFC proponents did not identify any coastal resources at any of the Alternative Locations that would be impacted as a result of this Proposed Action. All potential actions to be taken for the JFC would occur on existing federal property with NEPA documentation to support operations and flight testing. Based on discussions with VSFB representatives, a Negative Determination under the CZMA will be submitted to the California Coastal Commission. Until this action takes place, and concurrence is received from the California Coastal Commission, VSFB is not included in the Preferred Alternative. At CCSFS, although no coastal resources would be expected to be impacted as a result of this Proposed Action, a federal Consistency Review at CCSFS was required of the Action Proponents. The Consistency Review was pursued through the Florida State Clearinghouse, and the results of the review are included in **Appendix C**.

A Notice of Availability (NOA) was published on June 11, 2021, indicating where copies of the Draft EA/OEA and Draft FONSI/FONSH could be obtained or reviewed, the duration of the comment period, and where comments should be sent. The NOA was published at the locations shown in **Table 1-6**.

Table 1-6. Newspaper Publications for the Notice of Availability

Launch Location	City/Town	Newspaper
Pacific Missile Range Facility, Hawai`i	Kekaha, Hawai`i Waimea, Hawai`i	*The Garden Island*
Wallops Flight Facility, Virginia	Salisbury, Maryland	*Chincoteague Beacon* *The Daily Times*
Vandenberg Space Force Base, California	Lompoc, California Santa Barbara, California Santa Maria, California	*Lompoc Record* *Santa Barbara News-Press* *Santa Maria Times*
Cape Canaveral Space Force Station, Florida	Volusia County, Florida	*Hometown News*

Comments on the EA/OEA and FONSI/FONSH were requested to be submitted to jfceaoea@govsupport.us or mailed to the following address:

U.S. Army Space and Missile Defense Command
Attention: SMDC-ENE (David Fuller)
Post Office Box 1500
Huntsville, AL 35807-3801

In accordance with CEQ and DOD regulations for implementing NEPA, the U.S. Navy and U.S. Army circulated the Draft EA/OEA for public review from June 11, 2021 to July 10, 2021. Substantive comments received on the Draft EA/OEA and their responses are provided in **Appendix B**. Copies of the Draft EA/OEA and Draft FONSI/FONSH were placed in local repositories for public access and made available over the Internet at https://jfceaoea.govsupport.us/. Those agencies, organizations, and repositories that were directly notified about the NOA or received a copy of the document are listed in **Appendix B**.

Following the public review period and after consideration of all comments, the JFC proponents have determined there are no significant impacts and have decided to sign the FONSI/FONSH, which will allow the Proposed Action to be implemented. The Final EA/OEA and FONSI/FONSH are accessible on the internet at https://jfceaoea.govsupport.us/.

1.7 Structure of the Environmental Assessment

1.7.1 Organization of the Environmental Assessment

This EA/OEA is organized into the following sections:

- Section 2 – Description of the Proposed Action and alternative launch locations
- Section 3 – The affected environment, the regulatory environment, and the process of addressing the various environmental regulations
- Section 4 – The potential environmental consequences of implementing the Proposed Action
- Section 5 – The cumulative impact assessment of implementing the Proposed Action
- Section 6 – A summary of other considerations required by NEPA including consistency with other federal, state, and local regulations
- Section 7 - Provides a list of references
- Section 8 – Provides a List of Preparers who contributed to this EA/OEA
- Section 9 – Provides a list of individuals at various agencies who received a copy of the Draft EA/OEA and Draft FONSI

1.7.2 Use of the Environmental Assessment

If the alternatives, level of analysis, findings, and site-specific information of a specific proposed flight test are fully and accurately described in this EA/OEA, SSP and RCCTO would document this determination in its administrative record (e.g., Memorandum for the Record), and no additional public or agency noticing would be completed.

If a specific flight test is expected to: (1) result in impacts not described in the EA/OEA; (2) result in impacts greater in magnitude, extent, or duration than those described in the EA/OEA; (3) require additional mitigation measures beyond than those described in this EA/OEA; or (4) significant new circumstances occur or information becomes available that could affect the proposed flight test and its potential environmental impacts, a Supplemental EA (SEA) would be prepared. The SEA would be tiered from this EA, in accordance with 40 CFR § 1508.28.

Figure 1-5 is a flowchart showing SSP’s and RCCTO’s process in applying the EA/OEA.

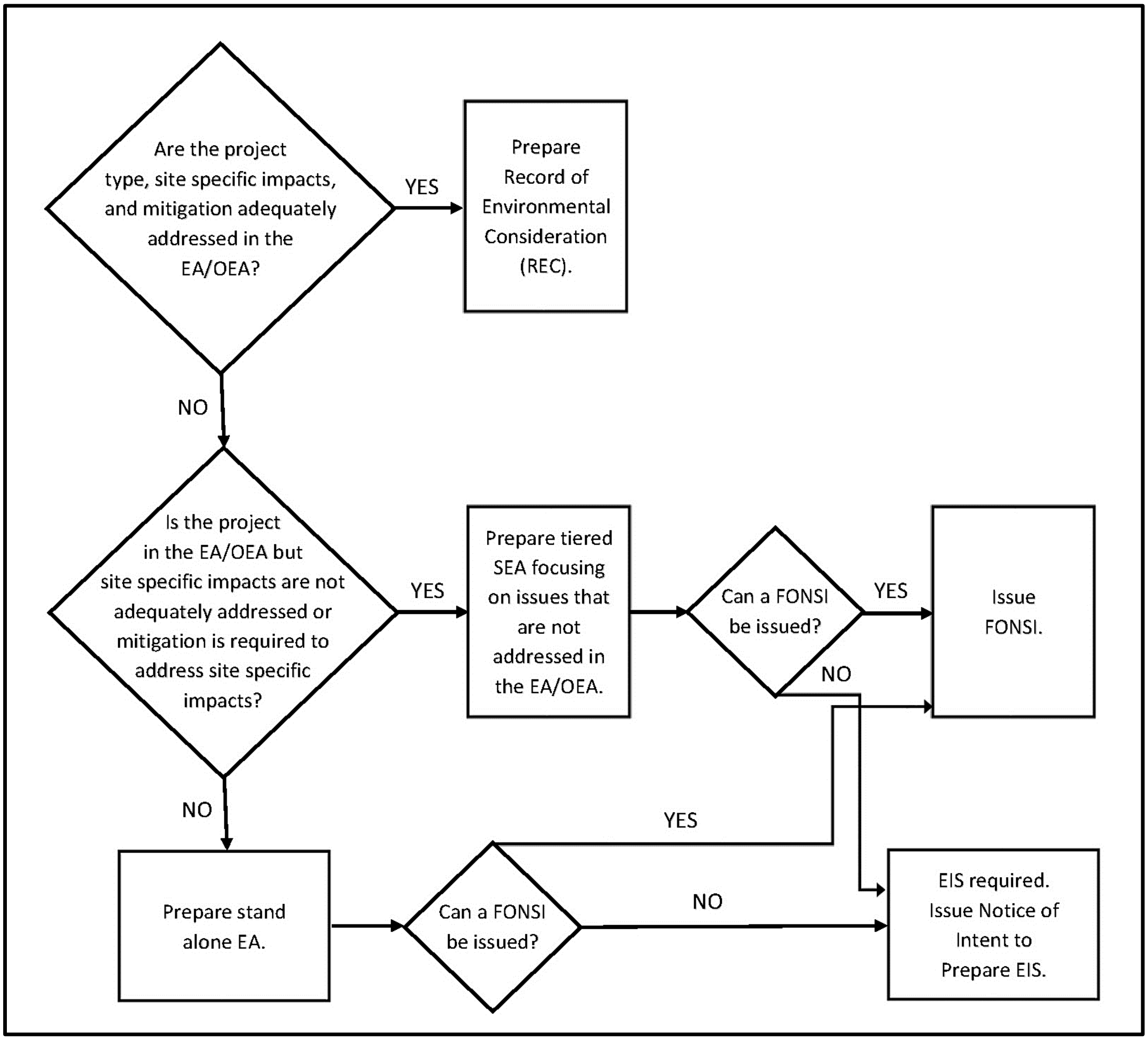

Figure 1-5. EA/OEA Utilization Flowchart

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2.0 Description of the Proposed Action and Alternative Locations

2.1 Proposed Action

The JFC Proposed Action would consist of up to six flight tests annually for the next 10 years designed to prove various aspects of the system's capabilities. The JFC launch vehicle consists of a two-stage booster system and payload known as an AUR missile (**Figure 2-1**). The AUR is approximately 87.6 centimeters (34.5 in) in diameter and 10.2 meters (m; 33.6 feet [ft]) in length. The first and second stage include a total of approximately 6,804 kilograms (kg; 15,000 pounds [lb]) of solid propellant.

The Proposed Action entails ground preparations for the test; launch and flight test; impact of the payload; and post launch operations.

Characteristics of the launch vehicle are presented in **Table 2-1.** The payload system characteristics are presented in **Table 2-2**. The Proposed Action initial launch would occur within the second half of FY 2022 after signing of the FONSI/FONSH, if approved.

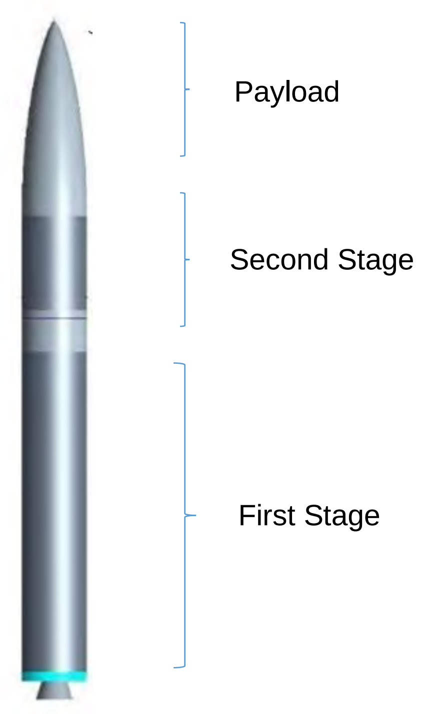

Figure 2-1. JFC Launch Vehicle AUR

Table 2-1. Launch Vehicle Characteristics

Major Components	Rocket motors, All Class 1.3 QEM propellant, magnesium thorium, nitrogen gas, halon, asbestos (contained in second stage), battery electrolytes (lithium-ion, silver zinc)
Communications	Various 5- to 20-watt radio frequency transmitters; one maximum 400-watt radio frequency pulse
Power	Up to nine lithium ion polymer and silver zinc batteries, each weighing between 1.3 and 18 kg (3 and 40 lb)
Propulsion/Propellant	Solid rocket propellant (approximately 6,804 kg (15,000 lb)) and approximately 1.3 kg (3 lb) of pressurized nitrogen gas
Other	Small Class C (1.4) electro-explosive devices for flight termination

Table 2-2. Payload System Characteristics

Structure	Aluminum, steel, titanium, magnesium and other alloys, copper, fiberglass, chromate coated hardware, tungsten, plastic, Teflon, quartz, room temperature vulcanizing silicone
Communications	Two up-to 20-watt radio frequency transmitters
Power	Up to three lithium ion polymer batteries, each weighing between 1 and 23 kg (3 and 50 lb)
Propulsion	None
Other	Class C (1.4) electro-explosive devices for safety and payload system subsystems operations

The AUR could be launched from a launch stool, a cannister/box launcher, or a transporter erector launcher as shown in **Figure 2-2**.

Launch Stool Cannister/Box Launcher Transporter Erector Launcher

Figure 2-2. JFC AUR Launch Configurations

As part of the Proposed Action a Short Hot Launch (SHOTL) could be conducted. The SHOTL test launch is designed to reduce risk by demonstrating a successful egress of a representative AUR from a transporter erector launcher canister. The SHOTL launch consists of the AUR with a mass representative payload having a subset of electronics required to control the launch operations. After egress from the canister, a pre-coordinated destruct action utilizing the onboard Flight Termination System (FTS) is planned to allow the debris to follow a ballistic trajectory and impact within the JFC booster drop zones.

The typical JFC flight test would include the launch, first-stage burn, separation, and descent into the first-stage booster drop zone; second stage burn, separation, and decent into the second-stage booster/payload impact; and payload flight and impact into the second stage/payload impact zone BOA as depicted in **Figures 1-1** through **1-4**. Note that the Booster 1 drop zone begins more than 22 kilometers (km; 12 nautical miles [nm]) from shore.

2.2 Screening Factors

NEPA's implementing regulations provide guidance on the consideration of alternatives to a federally proposed action and require rigorous exploration and objective evaluation of reasonable alternatives. Reasonable alternatives include those "that are practical or feasible from the technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant" (CEQ 2007). Only those alternatives determined to be reasonable and meeting the purpose and need require detailed analysis.

The alternatives for the JFC flight test were derived through the following screening criteria/ evaluation factors:

1. The launch and impact location must have the specialized infrastructure and personnel capable of conducting a JFC flight test such that:
    a. The launch pad is capable of supporting a JFC launch system;
    b. Data such as pre-mission analyses, real-time performance data and post-mission analyses can be collected and stored at a classified level and analyzed in the required timeframe;
    c. JFC booster stages and explosive materials can be stored according to requirements; and
    d. The number and type of equipment required to support the test (e.g., trailers, tractors, cranes, trucks, forklifts, and manlifts) are currently available or will be available when required.
2. The launch and impact location must be available for and capable of conducting the test within the required timeframe.
    a. Capable of conducting the test in the second half of FY 2022; and

   b. Able to complete all documentation required to support/authorize the test prior to the launch (e.g., memorandum of agreement/memorandum of understanding, range request letter, range safety data package, launch approval letter).

3. The launch and impact location must be capable of providing required range safety, including explosive safety.
4. The launch and impact location must meet security requirements.

Section 2.3 describes the alternatives carried forward for analysis; **Section 2.4** describes the No Action Alternative; **Section 2.5** describes the Proposed Action at the four alternative locations; **Section 2.6** describes the Preferred Alternative; and **Section 2.7** describes the alternatives considered but not carried forward for detailed analysis.

2.3 Alternative Locations Carried Forward for Analysis

Based on the screening criteria/evaluation factors, the proponents have identified four action alternatives that best meet the Proposed Action’s purpose and need. These four alternatives are analyzed in this EA/OEA:

1. Alternative 1 - Launch from PMRF at the SNL/KTF with impact in the Pacific BOA
2. Alternative 2 - Launch from WFF with impact in the Atlantic BOA
3. Alternative 3 - Launch from VSFB with impact in the Pacific BOA
4. Alternative 4 - Launch from CCSFS with impact in the Atlantic BOA

All four of these alternative locations are being evaluated within this EA/OEA; however, Alternatives 1, 2, and 4 combined make up the Preferred Alternative.

2.4 No Action Alternative

U.S. Navy SSP and U.S. Army RCCTO have been directed by the DOD to perform the JFC flight testing. The flight testing must meet certain mission and program objectives to provide the data required by DOD. In accordance with NEPA and the U.S. Navy and U.S. Army implementing regulations, the No Action Alternative is an alternative that must also be analyzed.

Under the No Action Alternative, the Proposed Action would not occur. Under the No Action Alternative, the proponents would not pursue the JFC program. The No Action Alternative would not meet the purpose and need for the Proposed Action; however, as required by NEPA, the No Action Alternative is carried forward for analysis in this EA/OEA and provides a baseline for measuring the environmental consequences of the action alternatives at each proposed location.

2.5 Proposed Action at all Alternative Locations

Section 2.5 describes the Proposed Action dissected across each alternative location: Pre-Flight Activities (**Section 2.5.1**), Rocket Motor Transportation (**Section 2.5.2**), Launch Site Preparations and Operations (**Section 2.5.3**), Terminal Location Preparations and Operations (**Section 2.5.4**), Flight Test (**Section 2.5.5**), and Post Flight Test (**Section 2.5.6**). The environmental descriptions of each alternative location are located throughout **Chapter 3.0**. The environmental consequences of the Proposed Action are discussed throughout **Chapter 4.0**. Potential cumulative environmental impacts are analyzed throughout **Chapter 5.0**.

2.5.1 Pre-Flight Activities

Support personnel would number fewer than 100 per test. Various other Government facilities would participate in pre-flight support operations related to the Proposed Action (**Table 1-1**). Those additional locations maintain NEPA documentation and/or regulatory permitting for their ongoing activities. As such, analysis of these support operations is not included in this EA/OEA.

2.5.2 Rocket Motor Transportation

All transportation, handling, and storage of the rocket motors and other ordnance would occur in accordance with DOD, U.S. Navy, U.S. Army, and U.S. Department of Transportation (DOT) policies and regulations to safeguard the materials from fire or other mishap.

2.5.2.1 Alternative 1 PMRF

All shipments would be inspected to prevent the introduction of non-native species of plants and animals into the environment at Hawai`i.

The proponents would arrange for the U.S. Air Force to transport the rocket motors to the PMRF airfield on Barking Sands, Kauai, Hawai`i. The proponents would transport the hazardous materials and test items from the PMRF airfield to SNL/KTF once the aircraft has landed in Hawai`i.

2.5.2.2 Alternative 2 WFF

The proponents would arrange to transport the rocket motors via truck or military aircraft. Once unloaded, they would be placed either in the Hazardous Processing Facility (Y-15) or the Mid-Atlantic Regional Spaceport Payload Processing Facility (V-139) on Wallops Island, or in the Payload Processing Facility (H-100) on the Wallops Main Base.

2.5.2.3 Alternative 3 VSFB

The proponents would arrange to transport the rocket motors via truck or military aircraft. Once unloaded, they would be placed in the MAB/Ordnance processing building 1806 on VSFB. Buildings 1833, 1824, and 1900 may also be utilized.

2.5.2.4 Alternative 4 CCSFS

The proponents would arrange to transport the rocket motors via truck or military aircraft. Once unloaded, they would be placed either in the Trident Magazines or at the Missile Assembly and Checkout Area (MACA) Complex building on CCSFS.

2.5.3 Launch Site Preparations and Operations

2.5.3.1 Alternative 1 PMRF

PMRF is located in Hawai`i on and off the western shores of the island of Kauai and includes BOAs to the north, south, and west. The relative isolation of PMRF, a year-round tropical climate, and an open ocean area relatively free of human presence are significant factors in PMRF's excellent record of safely conducting testing and training activities. PMRF's mission includes providing training for U.S. Navy and other DOD personnel using existing equipment and technologies to meet real world requirements to maintain and achieve required states of readiness. PMRF's mission also includes providing support to RDT&E programs being developed by the DOD and the MDA.

The DOE/NNSA's SNL operates KTF on the western coast of Kauai in the Hawaiian Islands for the DOE. SNL/KTF fulfills multiple purposes in support of DOE research and development activities including launching of rockets carrying experimental non-nuclear payloads. SNL/KTF has been an active rocket launching facility since 1962. Most of these launches are targeted to various areas of the South Pacific, including USAG-KA in the RMI.

SNL/KTF is located on and is a tenant activity of PMRF. SNL/KTF is operated independently by SNL personnel, but relies on base operations and logistic support from PMRF. For the purposes of this document, references to PMRF include all current range assets and tenants on Kauai and at remote locations regardless of ownership. PMRF is the standard reference for the land-based installations on Kauai, the underwater ranges, and their assets unless referring to a specific site or facility complex. PMRF on Kauai includes the main base complex (PMRF/Main Base), the DOE/NNSA's SNL/KTF, as a tenant within the base complex, Makaha Ridge, Kokee, Kamokala Magazines, and U.S. Navy activities at Port Allen. In addition, there are range assets on Niihau, Oahu, and Maui.

Figure 2-3 shows the primary existing facilities that would support the Proposed Action at PMRF and SNL/KTF.

Figure 2-3. Location Map for PMRF and SNL/KTF Support

Prior to launch, routine activities would take place at either SNL/KTF or PMRF to prepare for flight testing. While working within the guidance and limitations of PMRF and SNL/KTF oversight, project personnel would execute ground equipment checkout, flight vehicle-to-booster assembly and checkout, and other preparations for flight testing. These activities would be directed by the JFC proponent representatives who would coordinate activities with PMRF, SNL/KTF, and other range organizations. All activities would use existing facilities and infrastructure systems. A 3,048-m (10,000-ft) Ground Hazard Area adjacent to PMRF would be used (NNSA 2019). Other launch supporting activities would include the following:

- Final motor and experiment assembly and integration
- Placement of missile on existing pad – KTF Pad 42, or THAAD Launch Site
- Mechanical and electrical checkouts (equipment tested, controls of electronic components-systems exercised before launch activities)
- Demonstration of system performance prior to launch
- Preflight checkouts, recommendations, consultation
- Advisory role throughout launch operations

As with regular SNL routine operations for any launch at KTF, SNL personnel would also conduct various range responsibilities to ensure appropriate launch preparation, including explosive safety, support to PMRF range safety and inter-range coordination. PMRF personnel would be responsible for launch preparation including explosive safety and range safety when launching from the THAAD launch site.

2.5.3.2 Alternative 2 WFF

WFF, located on the Eastern Shore of Virginia, United States, approximately 160 km (100 miles [mi]) north-northeast of Norfolk, is operated by the Goddard Space Flight Center in Greenbelt, Maryland, primarily as a rocket launch site to support science and exploration missions for NASA and other federal agencies. WFF includes an extensively instrumented range to support launches of more than a dozen types of sounding rockets, small expendable suborbital and orbital rockets, high-altitude balloon flights carrying scientific instruments for atmospheric and astronomical research, and—using its Research Airport—flight tests of aeronautical research aircraft including unmanned aerial vehicles.

WFF has been located on Wallops Island since its inception in 1945. The unique location on the coast, controlled airspace, adjacency to DOD Atlantic operational areas, and large hazard buffer zones, all contribute to the WFF launch range operating in a safe and effective manner. **Figure 2-4** shows the primary areas that would be used to support the Proposed Action.

Figure 2-4. Location Map for WFF Support

Prior to launch, routine activities would take place at WFF to prepare for flight testing. While working within the guidance and limitations of WFF oversight, project personnel would execute ground equipment checkout, flight vehicle-to-booster assembly and checkout, and other preparations for flight testing. These activities would be directed by the JFC proponent representatives who would coordinate activities with WFF and other range organizations. All activities would use existing facilities and infrastructure systems. The existing mobile service structure (MSS) may need to be modified to provide better control of the environmental conditions. Although unlikely, there could be a need for trenching in previously disturbed areas to install additional power and communication lines.

Other launch supporting activities would include the following:

- Final motor and experiment assembly and integration – Hazardous Processing Facility (Y-15) or the Mid-Atlantic Regional Spaceport Payload Processing Facility (V-139) on Wallops Island, or in the Payload Processing Facility (H-100) on the Wallops Main Base.
- Placement of missile on existing pad – Launch Pad 0-B
- Mechanical and electrical checkouts (equipment tested; controls of electronic components-systems exercised before launch activities)
- Demonstration of system performance prior to launch
- Preflight checkouts, recommendations, consultation
- Preflight aircraft and/or vessel surveillance of the range
- Advisory role throughout launch operations

As regular WFF routine operations for any launch, WFF personnel would also conduct various range responsibilities to ensure appropriate launch preparation, including explosive safety, range safety, and inter-range coordination.

2.5.3.3 Alternative 3 VSFB

VSFB is located on the central coast of California approximately 240 km (150 mi) northwest of Los Angeles. As a USAF installation, VSFB is the headquarters of the Space Launch Delta 30 (formerly 30th Space Wing), which conducts space and missile test launches and operates the Western Range. The installation hosts a variety of federal agencies and commercial aerospace companies. The Western Range extends from the California coast to Hawai`i and the western Pacific and consists of a vast array of space and missile tracking and data-gathering equipment and facilities. Western Range instrumentation is supplemented by Point Mugu Naval Air Warfare Center in California, the USAG-KA, and U.S. Air Force Maui Optical Site in Hawai`i (USAF 2004, USAF 2021b). **Figure 2-5** shows the primary areas that would be used to support the Proposed Action.

Prior to launch, routine activities would take place at VSFB to prepare for flight testing. While working within the guidance and limitations of VSFB oversight, project personnel would execute ground equipment checkout, flight vehicle-to-booster assembly and checkout, and other preparations for flight testing. These activities would be directed by the proponent representatives who would coordinate activities with VSFB and other range organizations. All activities would use existing facilities and infrastructure systems. Other launch supporting activities would include the following:

- Final motor and payload assembly and integration – MAB/Ordnance processing building 1806. Buildings 1833, 1824, and 1900 may also be utilized.
- Placement of missile on existing pad – TP 01
- Mechanical and electrical checkouts (equipment tested; controls of electronic components-systems exercised before launch activities)
- Demonstration of system performance prior to launch
- Preflight checkouts, recommendations, consultation
- Advisory role throughout launch operations

As regular VSFB routine operations for any launch, VSFB personnel would also conduct various range responsibilities to ensure appropriate launch preparation, including explosive safety, range safety, and inter-range coordination.

Figure 2-5. Location Map for VSFB Support

2.5.3.4 Alternative 4 CCSFS

CCSFS occupies approximately 6,394 hectares (15,800 acres) of land on Florida's Cape Canaveral barrier island. It is approximately 7.2 km (4.5 mi) wide at its widest point. CCSFS is directly south and adjacent to KSC and has 130 km (81 mi) of paved roads connecting various launch support facilities within the centralized industrial area. **Figure 2-6** shows the primary areas that would be used to support the Proposed Action.

Prior to launch from Launch Complex-46 (LC-46), routine activities would take place at CCSFS to prepare for flight testing. All launches originating from LC-46 must comply with CCSFS environmental and safety standards. To comply with such standards, Space Florida has developed a Quality Assurance Plan to assess vehicles, propellants, and payloads upon delivery to CCSFS (FAA 2008). The Quality Assurance Plan provides a written description of delivery condition, compliance activities, and onsite repairs completed on the proposed vehicles. Space Florida would coordinate launch activities with CCSFS personnel, including environmental, engineering, and safety staff to ensure compliance (FAA 2008). All activities would use existing facilities and infrastructure systems, such as the Morrell Operations Center, the MACA Complex Building AH, the Trident Magazines, and other routine support facilities (See **Figure 2-6**). The existing MSS may need to be modified to provide better control of the environmental conditions. While unlikely, there could be a need for trenching in previously disturbed areas to install additional power and communication lines. Other launch supporting activities would include the following:

- Final motor and payload and integration
- Placement of missile on existing pad – LC-46
- Mechanical and electrical checkouts (equipment tested; controls of electronic components-systems exercised before launch activities)
- Demonstration of system performance prior to launch
- Preflight checkouts, recommendations, consultation
- Advisory role throughout launch operations

Prior to finalizing a launch date, proposed launch activities must be scheduled through the 45th Space Wing master scheduling pursuant to 45th SW Instruction 13-206, Space, Missile, Command and Control Eastern Range Scheduling (FAA 2008). Space Florida would provide launch site scheduling requirements to all launch and reentry vehicle operators prior to launch operations (FAA 2008). At least 2 days prior to a launch, Space Florida would notify appropriate parties, including local officials and the 45th Space Wing (FAA 2008). Space Florida would comply with all CCSFS requirements.

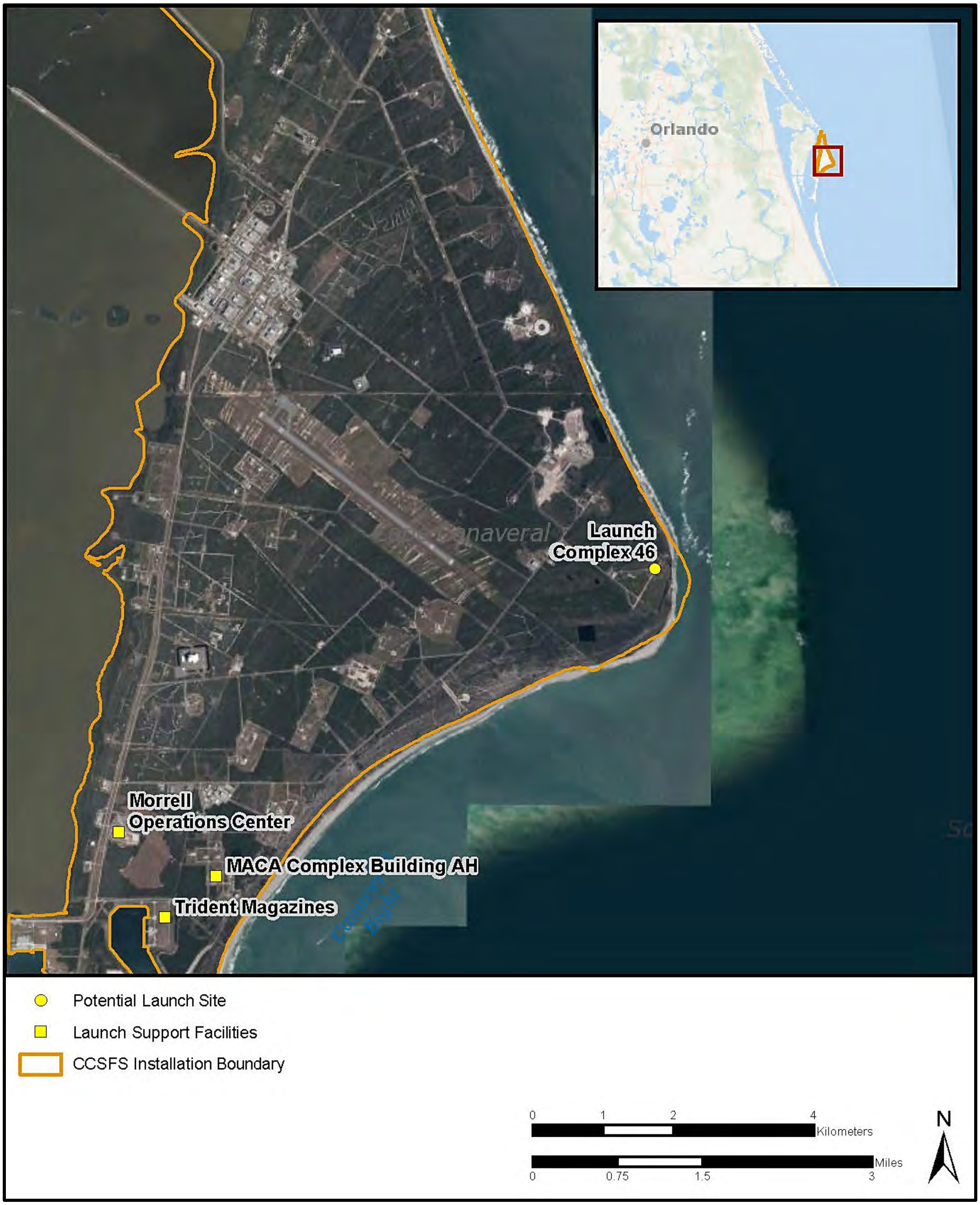

Figure 2-6. Location Map for CCSFS Support

The JFC stages would be transported to CCSFS by road/trailer following Department of Transportation guidelines. The various stages and payloads would be checked upon arrival and temporarily transferred to the MACA Complex Building AH for further inspection. The Trident Magazines may be utilized to store multiple boosters and payloads, or for potential AUR storage for rapid launch tempo. Once ready for assembly, the motors, which would be pre-loaded with solid propellant, would be transferred to LC-46. At LC-46, the JFC would be erected on the launch pad in the preferred launch configuration. No fueling activities would occur at LC-46. Once the vehicles are in place on the launch pad, a series of system and operational tests would be performed to ensure launch preparedness. Upon successful completion of these tests, the vehicle would be cleared for launch. The Morrell Operations Center would be used for launch command by appropriate JFC project personnel.

2.5.4 Terminal Location Preparations and Operations

2.5.4.1 Alternative 1 PMRF Pacific BOA

Self-stationing sensor rafts, deployed from a support ship, would be placed around the targeted site in the BOA to record and measure payload impacts. The support ship would then sail outside the target safety zone. Shipboard and other radars and sensors on the support ship would also gather information on the JFC flight test during terminal flight and impact. For a nominal mission, it is anticipated that up to 4 weeks of increased activities would be required. Included among these activities are:

- Set up mobile terminal area scoring
- Deploy sea-based sensor rafts at the impact area (as many as a dozen)
- Deploy telemetry assets

The support ship would be supplemented with self-stationing sea-based sensor rafts with associated radar, acoustic, and optical sensors. It is anticipated that the instrumentation suite would be installed on the support ship prior to being deployed to the test support location. After transit, it is expected that the support ship would remain on station for up to 2 weeks while waiting for the test to occur.

The self-stationing sea-based sensor rafts generally use twin battery-powered trolling motors for differential thrust navigation and station-keeping to ensure proper positioning for the flight impacts. Power to the trolling motors is provided by marine gel-cell batteries. None of the rafts would require an anchoring system. These rafts would also be outfitted and checked out at port prior to being emplaced for the test. This emplacement would also occur from the same sea craft that tows the main instrumentation raft to the test support location.

During travel to and from impact zones, and during raft deployment, ship personnel would monitor for marine mammals and sea turtles to avoid potential vessel strikes. Vessel operators would adjust speed or raft deployment based on expected animal locations, densities, and/or lighting and turbidity conditions.

Vessel operations, particularly in the BOA, would only occur when weather and sea conditions are acceptable for safe travel. Vessel operations would not involve any intentional ocean discharges of fuel, toxic wastes, or plastics and other solid wastes that could potentially harm marine life.

2.5.4.2 Alternative 2 WFF Atlantic BOA

Activities would be the same as described under **Section 2.5.4.1**.

2.5.4.3 Alternative 3 VSFB Pacific BOA

Activities would be the same as described under **Section 2.5.4.1**.

2.5.4.4 Alternative 4 CCSFS Atlantic BOA

Activities would be the same as described under **Section 2.5.4.1**.

2.5.5 Flight Test

2.5.5.1 Alternative 1 PMRF

Flight testing activities would include the launch from the SNL/KTF and the impact of the payload in the BOA.

Following motor ignition and liftoff from the launch location, the first-stage motor would burn out downrange and separate from the second stage with the inter-stage assembly also being jettisoned. The first-stage drop zone, which would take place more than 22 km (12 nm) from shore, is shown in **Figure 2-7**. Farther into flight, the second-stage would burn out and separate, with the payload adapter also being jettisoned from the payload. The payload would fly toward predesignated sites in the BOA. Splashdown of the spent motor stage, inter-stage, payload adaptor and payload would occur at different points in the open ocean within the stage 2 booster drop/payload impact zone, all of which would be greater than 22 km (12 nm) from shore, as shown on **Figure 1-1**.

Jettison of the inter-stage and separation of the payload would occur outside the atmosphere, and all anticipated impacts would be outside any Marine National Monuments. If data from payload onboard sensors indicate that there is insufficient energy to reach the target area, the payload could be directed to descend in a controlled termination of the test flight into the stage 2 booster drop/payload impact zone.

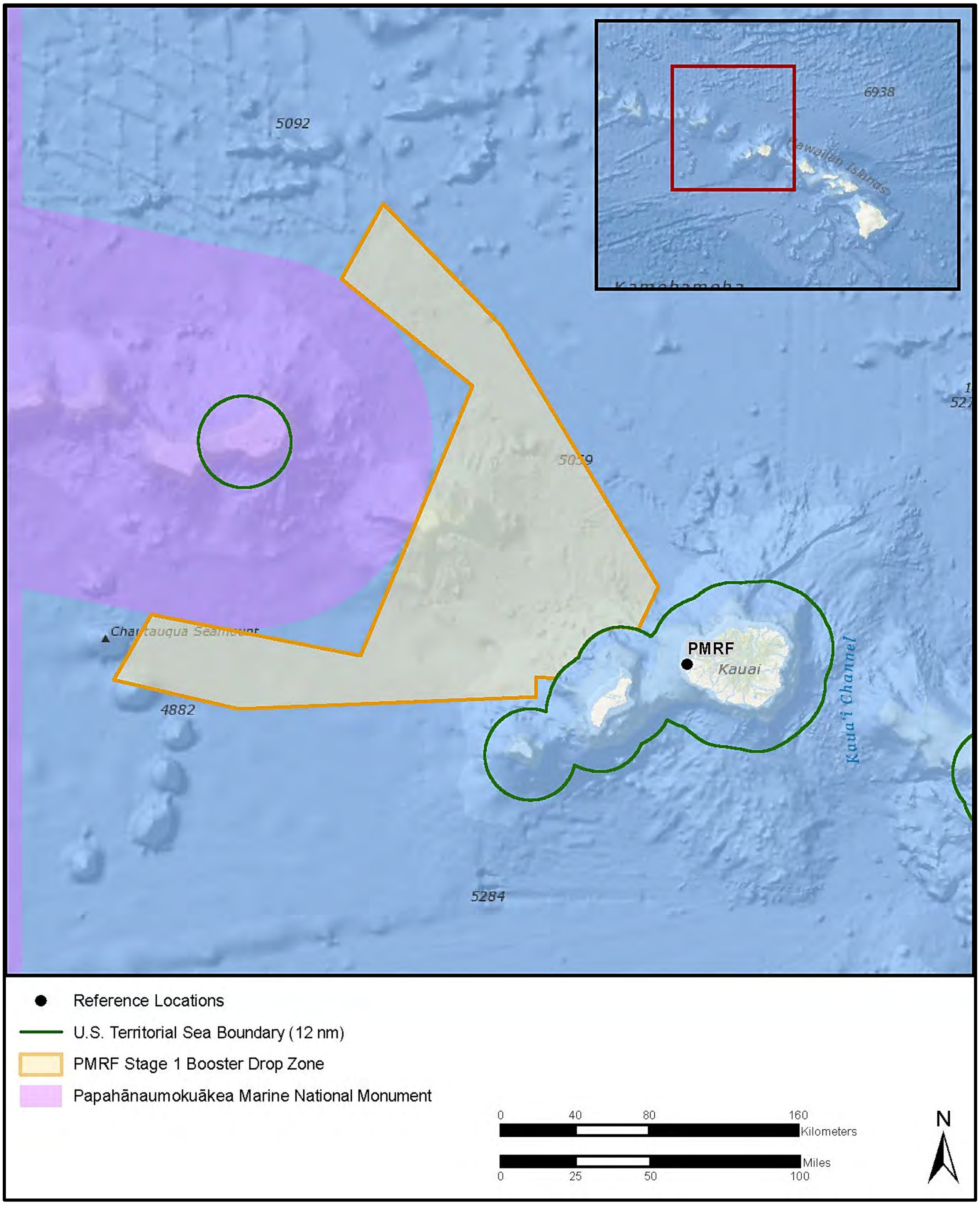

Figure 2-7. Stage 1 Booster Drop Zone – Alternative 1 PMRF

Flight Safety

If the launch vehicle were to deviate from its course or should other problems occur during flight that might jeopardize public safety, the onboard FTS would be activated. This action would initiate a predetermined safe mode for the vehicle, causing it to fall towards the ocean and terminate flight. No inhabited land areas would be subject to unacceptable risks of falling debris. Computer-monitored destruct lines, based on no-impact lines, are preprogrammed for the flight safety software to avoid any debris falling on inhabited areas, as per Space System Software Safety Engineering protocols and U.S. range operation standards and practices. In accordance with U.S. range operation standards, the risk of casualty (probability for serious injury or death) from falling debris for an individual of the general public cannot exceed 1 in 1,000,000 during a single flight test or mission (Range Commanders Council [RCC] 2017). In addition to the commanded FTS operation, an FTS on the payload would include a failsafe operation to further ensure the safety of the public.

The FTS also would contain logic to detect a premature separation of the booster stages and initiate a thrust termination action on all the prematurely separated stages. Thrust would be terminated by initiation of an explosive charge to vent the motor chamber, releasing pressure, and significantly reducing propellant combustion. This action would stop the booster's forward thrust, causing the launch vehicle to fall along a ballistic trajectory into the ocean.

The FTS would be designed to prevent any debris from falling into marine protected areas as described in **Section 3.5.2** and **Section 3.6.2** to the extent feasible.

Sensor Coverage

The flight path would be monitored by a series of sensors with overlapping coverage of the flight from launch at KTF until impact in the BOA. The sensors would include:

- Ground based optics, telemetry, and radars at PMRF
- Sea based sensors include the Range Safety System onboard the U.S. Motor Vessel *Pacific Collector*, and the Pacific Tracker. In addition, ship-based unmanned aerial vehicles (UAVs) and drones may be used for telemetry, video, and surveillance.
- Additional airborne and waterborne sensors on military or commercial aircraft are not planned as part of the JFC flight test. Other agencies might collect data on JFC for their own purposes, but these extra sensors are speculative and outside the scope of this EA/OEA.

All sensors are existing programs and would be scheduled for use based on availability.

2.5.5.2 Alternative 2 WFF

For the flight test, the booster would lift off from WFF and fly in an east or southeasterly direction from WFF. Following motor ignition and liftoff from the launch location, the first-stage motor would burn out downrange and separate from the second stage with the inter-stage assembly also being jettisoned. The first-stage drop zone is shown in **Figure 2-8**. Farther into flight, the second-stage would burn out and separate, with the payload adapter also being jettisoned from the payload. The payload would fly toward predesignated sites in the BOA. Splashdown of the spent motor stage, inter-stage, payload adaptor and payload would occur at different points in the open ocean within the stage 2 booster drop/payload impact zone shown on **Figure 1-2**.

Jettison of boosters, inter-stage, and payload adaptor and the separation of the payload would occur outside the atmosphere over the Atlantic Ocean. The flight path would be designed to avoid any impacts to Bermuda or other islands. If data from payload onboard sensors indicate that there is insufficient energy to reach the target area, the payload could be directed to descend in a controlled termination into the stage 2 booster drop/payload impact zone.

Flight Safety

Flight safety would be similar to that described for Alternative 1. Flight safety at WFF would include preflight aircraft and/or vessel surveillance and clearance of the range.

Sensor Coverage

A series of sensors would overlap coverage of the flight from launch at WFF until impact in the BOA. The sensors to be included are similar to those in Alternative 1 and include:

- Ground based optics, telemetry, and radars at WFF and on Bermuda.
- Sea based sensors include ship-based mobile instrumentation. In addition, ship-based UAVs and drones may be used for telemetry, video, and surveillance.
- Safety Relay aircraft may be used as additional range safety support “off-axis” to ensure public safety. Takeoff and landing operations would be required at the WFF or another airfield. These activities could occur in the day or night.
- Additional airborne and waterborne sensors on military or commercial aircraft are not planned as part of the JFC flight test. Other agencies might collect data on JFC for their own purposes, but these extra sensors are speculative and outside the scope of this EA/OEA.

All sensors would be existing programs and would be scheduled for use based on availability.

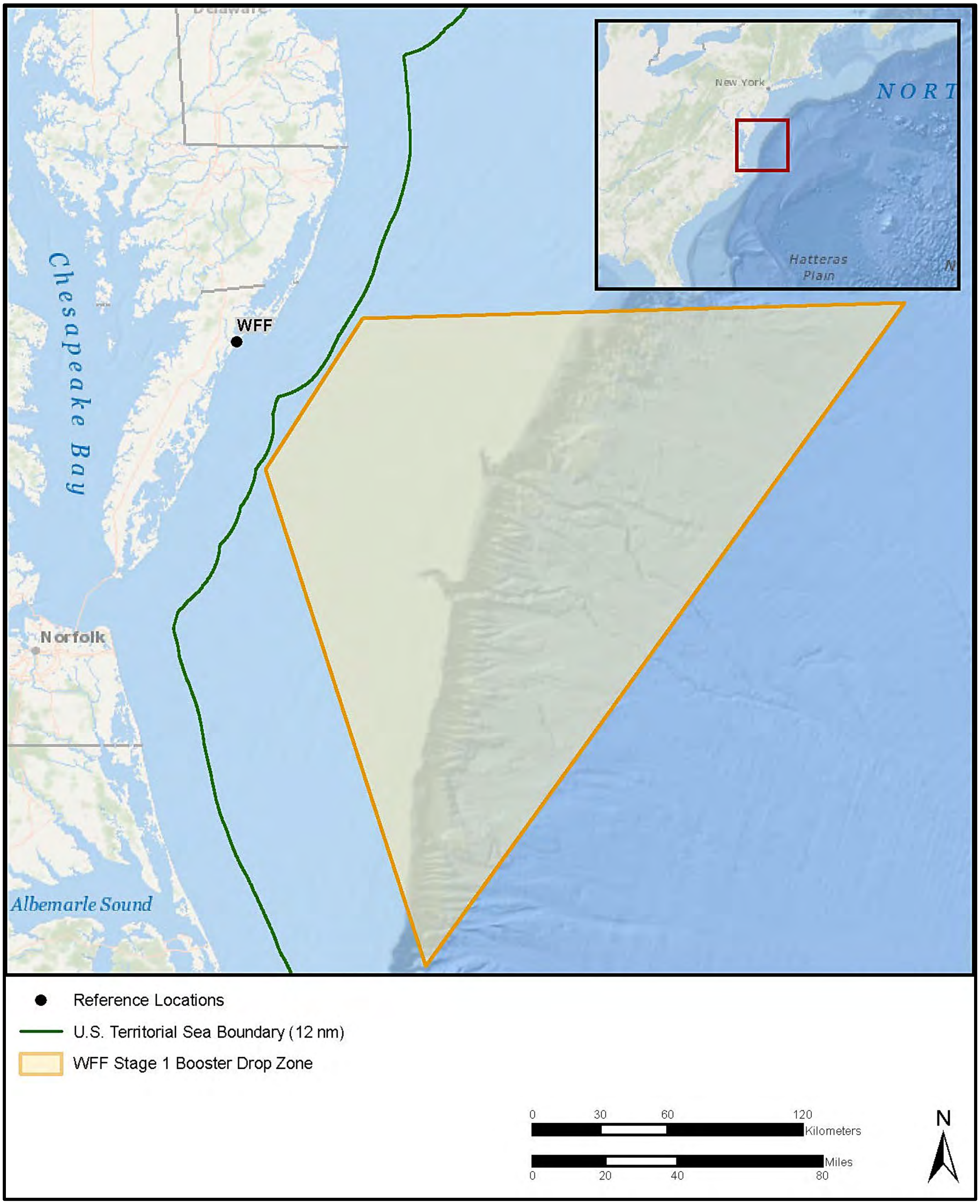

Figure 2-8. Stage 1 Booster Drop Zone – Alternative 2 WFF

2.5.5.3 Alternative 3 VSFB

For the flight test, the booster would lift off from VSFB and fly in a westerly direction. Following motor ignition and liftoff from the launch location, the first-stage motor would burn out downrange and separate from the second stage with the inter-stage assembly also being jettisoned. The first-stage drop zone is shown in **Figure 2-9**. Farther into flight, the second-stage would burn out and separate, with the payload adapter also being jettisoned from the payload. The payload would fly toward predesignated sites in the BOA. Splashdown of the spent motor stage, inter-stage, payload adaptor and payload would occur at different points in the open ocean within the stage 2 booster drop/payload impact zone shown on **Figure 1-3**.

The flight path would be designed to avoid any impacts to offshore islands and Hawai`i. The flight test would also be designed to avoid impacts to marine protected areas including state and federal marine reserves, marine national monuments, and national marine sanctuaries. If data from payload onboard sensors indicate that there is insufficient energy to reach the target area, the payload could be directed to descend in a controlled termination of the test flight into the Stage 2 booster drop/payload impact zone.

Flight Safety

Flight safety would be similar to that described for Alternative 1.

Sensor Coverage

A series of sensors would overlap coverage of the flight from launch at VSFB until impact in the BOA. The sensors to be included are similar to those in Alternative 1 and include:

- Ground based optics, telemetry and radars at VSFB, Pillar Point AFS, and Naval Air Warfare Center Point Mugu.
- Sea based sensors include ship-based mobile instrumentation. In addition, ship-based UAVs and drones may be used for telemetry, video, and surveillance.
- Safety Relay aircraft may be used as additional range safety support “off-axis” to ensure public safety. Takeoff and landing operations would be required at the VSFB or another airfield. These activities could occur in the day or night.
- Additional airborne and waterborne sensors on military or commercial aircraft are not planned as part of the JFC flight test. Other agencies might collect data on JFC for their own purposes, but these extra sensors are speculative and outside the scope of this EA/OEA.
- All sensors would be existing programs and would be scheduled for use based on availability.

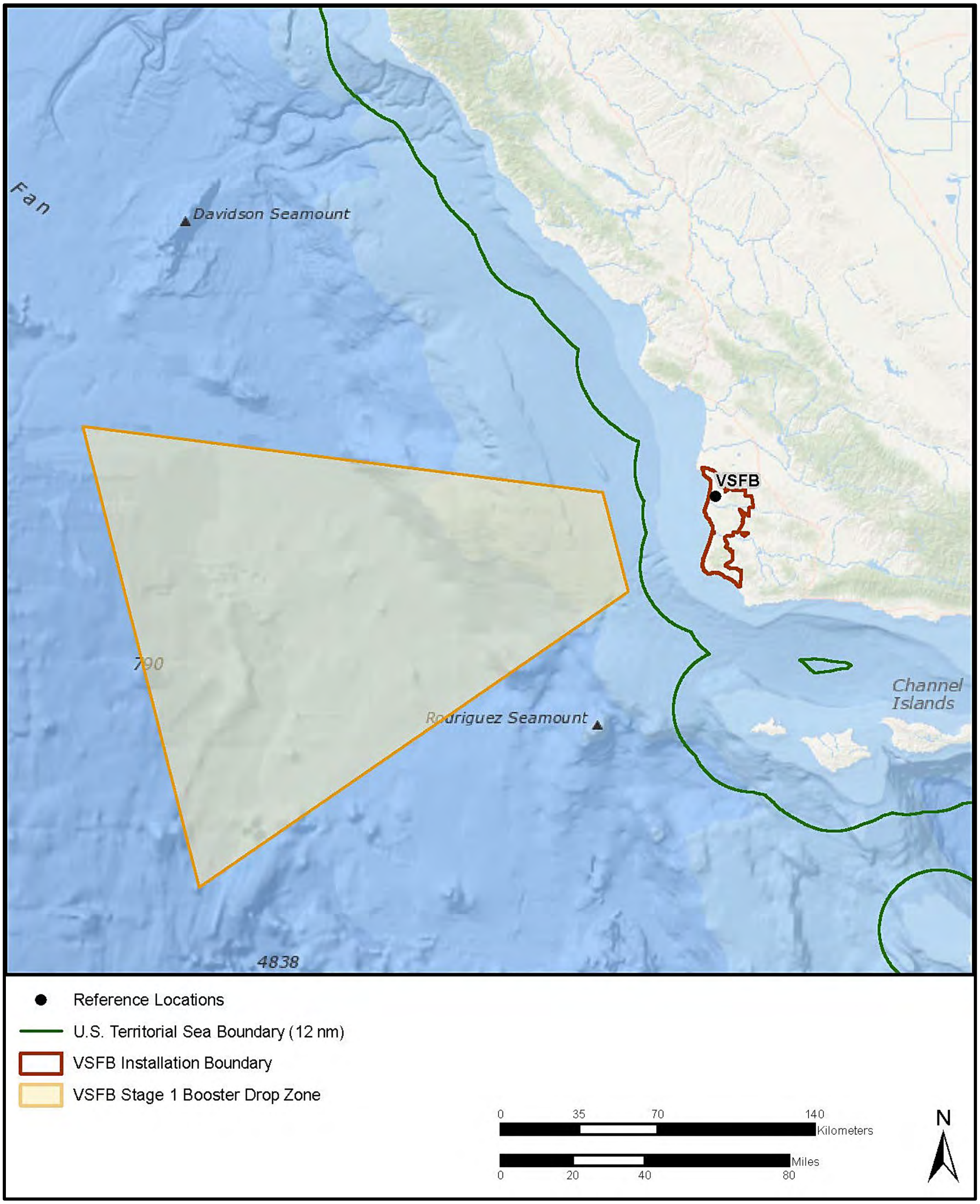

Figure 2-9. Stage 1 Booster Drop Zone – Alternative 3 VSFB

2.5.5.4 Alternative 4 CCSFS

For the flight test, the booster would lift off from LC-46 and fly in a northeast, east, or southeasterly direction. Following motor ignition and liftoff from the launch location, the first-stage motor would burn out downrange and separate from the second stage with the inter-stage assembly also being jettisoned. The first-stage drop zone is shown in **Figure 2-10**. Farther into flight, the second-stage would burn out and separate, with the payload adapter also being jettisoned from the payload. The payload would fly toward predesignated sites in the BOA. Splashdown of the spent motor stage, inter-stage, payload adaptor and payload would occur at different points in the open ocean within the stage 2 booster drop/payload impact zone shown on **Figure 1-4**.

Jettison of boosters, inter-stage, and payload adaptor and the separation of the payload would occur outside the atmosphere over the Atlantic Ocean. The flight path would be designed to avoid any impacts to Bermuda or other islands. If data from payload onboard sensors indicate that there is insufficient energy to reach the target area, the payload could be directed to descend in a controlled termination into the stage 2 booster drop/payload impact zone.

Flight Safety

Flight safety would be similar to that described for Alternative 1.

Sensor Coverage

A series of sensors would overlap coverage of the flight from launch at CCSFS until impact in the BOA. The sensors to be included are like those in Alternative 1 and include:

- Ground based optics, telemetry, and radars at CCSFS, PSFB, KSC, and Ascension Auxiliary Airfield.
- Sea based sensors include ship-based mobile instrumentation. In addition, ship-based UAVs and drones may be used for telemetry, video, and surveillance.
- Safety Relay aircraft may be used as additional range safety support “off-axis” to ensure public safety. Takeoff and landing operations would be required at the PSFB or another airfield. These activities could occur in the day or night.
- Additional airborne and waterborne sensors on military or commercial aircraft are not planned as part of the JFC flight test. Other agencies might collect data on JFC for their own purposes, but these extra sensors are speculative and outside the scope of this EA/OEA.
- All sensors would be existing programs and would be scheduled for use based on availability.

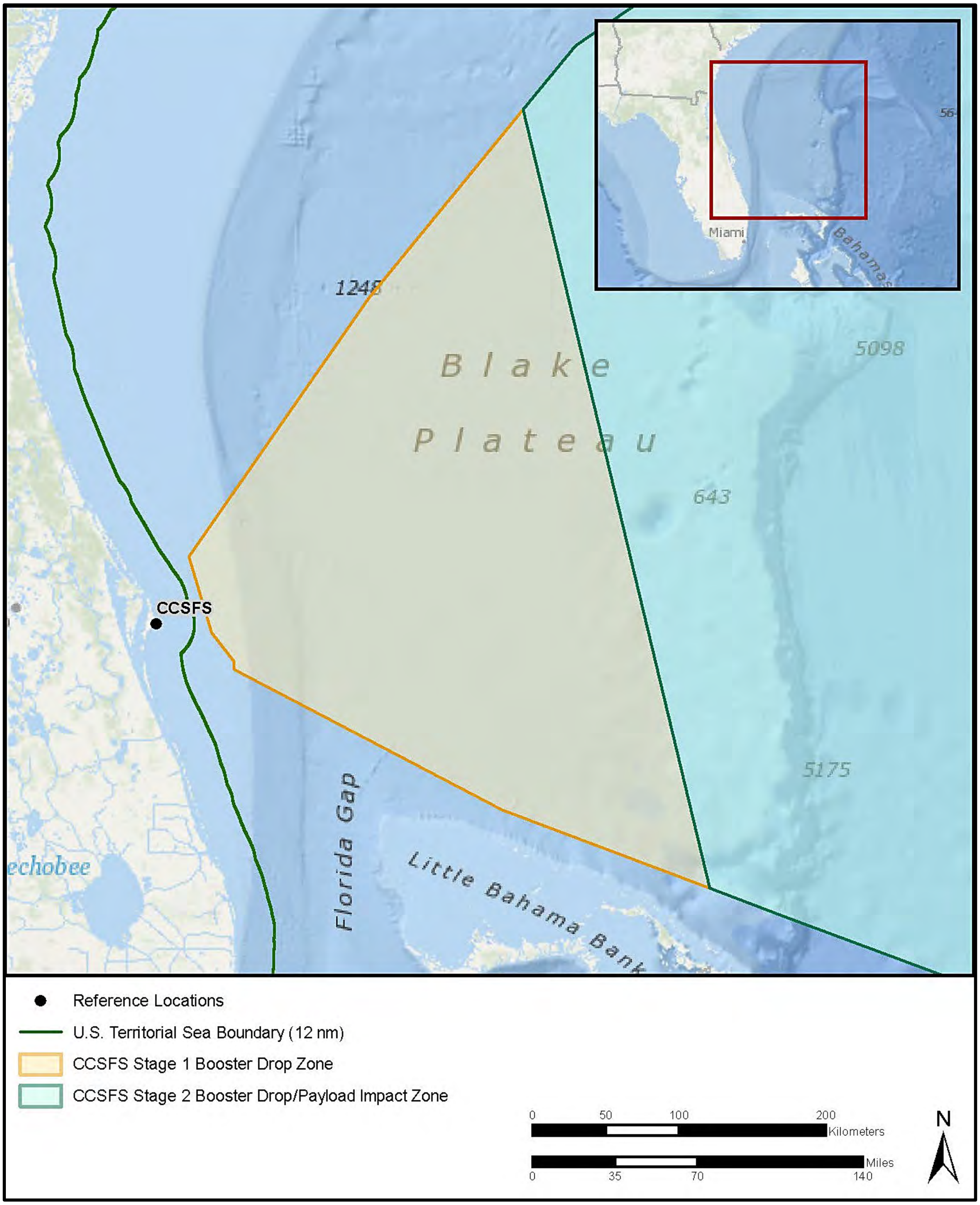

Figure 2-10. Stage 1 Booster Drop Zone – Alternative 4 CCSFS

2.5.6 Post Flight Test

2.5.6.1 Alternative 1 PMRF

At the launch location on SNL/KTF, the launch pad area would be checked for safe access after vehicle liftoff. Post-launch activities would include inspection of the launch pad facilities and equipment for damage, as well as general cleanup and performance of maintenance and repairs necessary to accommodate launches for other programs. The expended rocket motors and other vehicle hardware would not be recovered from the ocean following flight.

For the BOA impact zones, the proposed impact would occur in deep ocean waters. No residual debris is expected following impact; however, a recovery team would be sent to inspect the impact location as soon as range safety clears the area. The BOA areas are too deep to allow safe recovery of any hardware that might survive the impact with the water and still have sufficient mass to sink. Visible debris still on the surface of the water would be recovered and removed. The self-stationing rafts and the large instrumentation raft would be recovered, and the data analyzed.

2.5.6.2 Alternative 2 WFF

At the launch location on WFF, the launch pad area would be checked for safe access after vehicle liftoff. Post-launch activities would include inspection of the launch pad facilities and equipment for damage, as well as general cleanup and performance of maintenance and repairs necessary to accommodate launches for other programs. The expended rocket motors and other vehicle hardware would not be recovered from the ocean following flight.

The proposed impact would occur in the deep Atlantic Ocean waters. No residual debris is expected following impact; however, a support asset would be sent to inspect the impact location as soon as range safety clears the area. The impact area is too deep to allow safe recovery of any hardware that might survive the impact with the water and still have sufficient mass to sink. Visible debris still on the surface of the water would be recovered and removed. The self-stationing rafts and the large instrumentation raft would be recovered, and the data analyzed.

2.5.6.3 Alternative 3 VSFB

At the launch location on VSFB, the launch pad area would be checked for safe access after vehicle liftoff. Post-launch activities would include inspection of the launch pad facilities and equipment for damage, as well as general cleanup and performance of maintenance and repairs necessary to accommodate launches for other programs. The expended rocket motors and other vehicle hardware would not be recovered from the ocean following flight.

The proposed impact would occur in the deep Pacific Ocean waters. No residual debris is expected following impact; however, a support asset would be sent to inspect the impact location as soon as range safety clears the area. The impact area is too deep to allow safe recovery of any hardware that might survive the impact with the water and still have sufficient mass to sink. Visible debris still on the surface of the water would be recovered and removed. The self-stationing rafts and the large instrumentation raft would be recovered, and the data analyzed.

2.5.6.4 Alternative 4 CCSFS

At the launch location on CCSFS, the launch pad area would be checked for safe access after vehicle liftoff. Post-launch activities would include inspection of the launch pad facilities and equipment for damage, as well as general cleanup and performance of maintenance and repairs necessary to accommodate launches for other programs. The expended rocket motors and other vehicle hardware would not be recovered from the ocean following flight.

The proposed impact would occur in the deep Atlantic Ocean waters. No residual debris is expected following impact; however, a support asset would be sent to inspect the impact location as soon as range safety clears the area. The impact area is too deep to allow safe recovery of any hardware that might survive the impact with the water and still have sufficient mass to sink. Visible debris still on the surface of the water would be recovered and removed. The self-stationing rafts and the large instrumentation raft would be recovered, and the data analyzed.

2.6 Preferred Alternative – Three Launch Locations

The Preferred Alternative includes Alternative 1 - Launch from PMRF at the SNL/KTF with impact in the Pacific BOA, Alternative 2 - Launch from WFF with impact in the Atlantic BOA, and Alternative 4 - Launch from CCSFS with impact in the Atlantic BOA.

The Preferred Alternative includes up to six flight test launches annually over the next 10 years. Launches could occur from any of the three locations included in the Preferred Alternative.

2.7 Alternatives Considered But Not Carried Forward for Detailed Analysis

Nine alternative sites were considered, but five sites were not carried forward for detailed analysis in this EA/OEA as they did not meet the purpose and need for the Proposed Action or satisfy the screening criteria / evaluation factors presented in **Section 2.2** as well as the top four sites. **Table 2-3** summarizes how well all locations met the screening criteria. Each location was scored out of 10 points by the Project Office on supportability, facilities, safety, environmental, availability, cost, and risk for the JFC Proposed Action. Evaluation factors such as supportability and cost are weighted greater than facilities and logistics. Reasons for excluding the five alternative sites are explained below.

Table 2-3. Alternatives Considered Including Those Not Carried Forward and Screening Criteria

Criteria Sites	Support-ability	Facilities	Logistics	Safety	Environ-mental	Availability	Cost	Risk	TOTALS
CCSFS	9.00	7.00	10.00	9.00	9.00	8.00	9.00	8.00	16.80
VSFB	9.00	6.00	10.00	10.00	9.00	10.00	4.00	7.00	15.20
WFF	6.00	7.00	9.00	7.00	9.00	9.00	9.00	6.00	13.85
PMRF	4.00	9.00	7.00	7.00	7.00	3.00	5.00	8.00	13.35
PSCA	6.00	9.00	6.00	5.00	9.00	6.00	5.00	7.00	13.25
Pt. Mugu	6.00	5.00	6.00	8.00	7.00	3.00	4.00	6.00	11.55
RTS	6.00	5.00	3.00	8.00	6.00	3.00	4.00	6.00	11.25
Wake	3.00	2.00	1.00	3.00	6.00	6.00	4.00	2.00	5.95
Guam	2.00	2.00	4.00	2.00	6.00	9.00	1.00	2.00	5.55
Weighting	25%	5%	5%	15%	15%	15%	20%	(PM)	

Notes:

(green)	Carried Forward
(peach)	Not Carried Forward

2.7.1 Pacific Spaceport Complex–Alaska

Pacific Spaceport Complex–Alaska (PSCA) currently supports missile launches and was considered as an alternative for launching JFC. However, logistic and scheduling challenges precluded PSCA from being considered as a launch site.

2.7.2 Point Mugu/San Nicolas Island

San Nicolas Island currently hosts missile launches and was considered as an alternative for launching JFC. However, the San Nicolas infrastructure is not adequate.

2.7.3 Reagan Test Site

The MDA occasionally conducts missile launches from Meck Island, and an alternative was considered to use RTS as a launch site with an impact in the BOA to the north or east. However, the launch facility and missile processing facilities would require extensive augmentation to support the JFC mission. Moreover, the logistical effort to transport equipment and personnel to RTS would be significant. Like Wake and Guam, the cost and schedule that would be needed to develop and certify such infrastructure would significantly delay the completion of the Proposed Action and significantly exceed programmed resources.

2.7.4 Wake Island

Wake Island is used for launching target missiles in support of MDA programs. Although there is some existing launch infrastructure on Wake Island, it would require significant augmentation to support motor processing and missile launch operations for the Proposed Action. Like Guam, the cost and schedule that would be needed to develop and certify such infrastructure would significantly delay the completion of the Proposed Action and significantly exceed programmed resources.

2.7.5 Guam

An alternative entailing a launch from Guam into the BOA east of Guam was considered. Guam hosts Naval Base Guam and Anderson AFB, under the command of Joint Region Marianas. However, there is currently no infrastructure at either base or elsewhere on the island to support rocket motor processing and launch operations. The cost and schedule that would be needed to develop and certify such infrastructure would significantly delay the completion of the Proposed Action and significantly exceed programmed resources.

3.0 Affected Environment

This chapter describes the environmental conditions that could be affected by the Proposed Action and No Action Alternatives. In compliance with NEPA (42 USC 4321, as amended), CEQ Regulations (Title 40 CFR Parts 1500-1508), and Army Procedures for Implementing NEPA (32 CFR Part 651), the information and data presented are commensurate with the importance of the potential impacts to provide the proper context for evaluating such impacts. Sources of data used and cited in the preparation of this chapter include past EAs and EISs, environmental resource documents and other related environmental studies, installation and facility personnel, and regulatory agencies.

3.1 Pacific Missile Range Facility

This section includes detailed descriptions of cultural resources, biological resources, public health and safety, and hazardous materials and wastes.

The potential impacts to the following resource areas are considered to be negligible or non-existent, so they were not analyzed in detail in this EA/OEA:

Air Quality: The HRC EIS/OEIS (U.S. Navy 2008; Section 3.3.2.1.1, Pages 3-126 through 3-128) and the SNL/KTF EA for Continued Operation (DOE 2019; Section 3.4, Pages 24 through 29) describe in depth the air quality at PMRF and Main Base. General Conformity analysis was considered, but due to the existing recent air quality analyses mentioned above, a new conformity analysis was not necessary to determine the potential effects of this Proposed Action. Per OPNAVINST 5090, no Record of Non-Applicability is needed. Based on an estimation of the JFC flight test emissions in comparison to all the aforementioned NEPA air quality analyses previously made, and regulations specific to PMRF, it was decided that any impacts to air quality from the JFC flight tests would not exceed the air quality standards at PMRF or in the local region. No impact to air quality would be expected as a result of the Proposed Action.

Airspace: The JFC flight tests would be similar to previous missile tests including FE-1, FE-2, FT-2, Advanced Hypersonic Weapon Program, and STS launched out of PMRF. The potential impacts on controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, and airports and airfields would be similar to that described for missile launches in previous environmental documentation (U.S. Navy 2017, U.S. Navy 2019a, USASMDC/ARSTRAT 2014, USASMDC/ARSTRAT 2011, USASDC 1992). PMRF would issue Notices to Airmen (NOTAMs) and Notices to Mariners (NTMs) ahead of any JFC flight test, in accordance with range safety and FAA requirements. No changes to current airspace management would be required to perform the JFC flight tests. A slight increase in air traffic due to arriving components and mission personnel would be expected but would not overwhelm or change current airspace management. Advanced planning and coordination with the FAA regarding scheduling of special use airspace, and coordination of the proposed JFC flight test relative to en route airways and jet routes, would result in no impacts on airspace within the PMRF region of influence (ROI).

Water Resources: The HRC EIS/OEIS (U.S. Navy 2008; Section 3.3.2.1.13, Pages 3-168 through 3-170) and the SNL/KTF EA for Continued Operation (DOE 2019; Section 3.7, Pages 38 through 40) describe in depth the water resources at PMRF and Main Base. Based on an estimation of the JFC flight tests potential releases, current regulations and infrastructure specific to PMRF, it was decided that any impacts to water resources from the JFC flight tests would not have adverse impacts on hydrologic function or quality at PMRF. No impact to water resources would be expected as a result of the Proposed Action.

Geological Resources: The HRC EIS/OEIS (U.S. Navy 2008; Section 3.3.2.1.5, Page 3-141) describes in depth the geological resources at PMRF and Main Base. The JFC flight test requires no ground-disturbing activities at PMRF. No impacts to geological resources would be expected as a result of the Proposed Action.

Land Use: The HRC EIS/OEIS (U.S. Navy 2008; Section 3.3.2.1.8, Page 3-152) describes in depth the land uses for the Main Base Complex and adjacent areas on the Mana Plain. The JFC flight test represents activities that are consistent with the mission and well within the limits of current operations of both PMRF and KTF. No impacts to land use resources would be expected as a result of the Proposed Action.

Noise: The HRC EIS/OEIS (U.S. Navy 2008; Section 3.3.2.1.9, Page 3-158) describes in depth the noise environment at PMRF, Main Base, adjacent areas on the Mana Plain, and the city of Kekaha. Typical launches at PMRF, Main Base, and KTF result in high-intensity, short-duration sound events, such as those described in Table 3.3.3.1.9-2 in the HRC EIS/OEIS (U.S. Navy 2008; Page 3-160). The KTF EA (DOE 2019; Section 3.6, Page 32-38) was the primary basis for understanding the noise environment at PMRF/KTF. Empirical data on sound pressure of JFC vehicle launch have not yet been collected, but modeling indicates that initial liftoff of the launch vehicle would result in peak sound pressures of approximately 145 dB in-air (re 20 µPa) at approximately 30 m (100 ft) from the launch site (Kahle et al. 2021). After launch, the vehicle would ascend quickly, and sound pressures are expected to remain elevated above ambient sound levels for less than 60 seconds (Kahle et al. 2021). The JFC launch acoustics model used several conservative assumptions and did not account for atmospheric absorption, ground interference, or atmospheric conditions (Kahle et al. 2021); therefore, these sound pressure estimates should be considered maximum possible sound pressures from launch. There is a potential for a sonic boom to result from the JFC launch tests; however, the sonic boom should occur over the Pacific Ocean and leave land-based receptors unaffected. Potential noise impacts on wildlife receptors at PMRF are discussed under Biological Resources (**Section 3.1.2**). The JFC flight tests would result in a short-term noise event during the liftoff of the vehicle, but the noise would be expected to be within the limits analyzed in the HRC EIS/OEIS, and the KTF EA.

Only minor short-term impacts to the noise environment would occur. No long-term impacts to noise would be expected as a result of the Proposed Action.

Infrastructure: PMRF has the existing infrastructure to support the JFC flight test and was scored the highest of the four alternative sites in **Table 2-3** for facilities screening. The Proposed Action is not expected to impact PMRF's infrastructure resources beyond the limits of current operations. No impacts to infrastructure resources would be expected as a result of the Proposed Action.

Socioeconomics: There would be a temporary increase in personnel at PMRF as a result of the JFC flight test. Any increase would be temporary and only for the duration of the Proposed Action. The Kauai hospitality industry would see the greatest increase in expenditures from launch-related personnel, primarily lodging and restaurants. Because Kauai's economy is dominated by tourism, these additional individuals would represent only a small increase in economic activity within the ROI. The Hawaii-Southern California EIS/OEIS (U.S. Navy 2018a; Section 3.11, Page 3.11-1) describes the economics and social conditions (specifically: commercial transportation and shipping, commercial and recreational fishing, subsistence fishing, and tourism) across Hawai`i. Limits on accessibility to public fishing areas during the Proposed Action would be temporary and of short duration (hours). Restrictions would be lifted, and conditions would return to normal upon completion of the Proposed Action. Limits on accessibility would not result in a direct loss of income, revenue or employment, resource availability, or quality of experience. No foreseeable negative impacts to socioeconomic resources would be expected as a result of the Proposed Action. See the Environmental Justice discussion below as it relates to impacts to minority and low-income populations.

Environmental Justice: The EPA's Environmental Justice Screening and Mapping Tool, known as EJSCREEN, is a publicly available dataset that combines environmental and demographic indicators into 11 EJ indexes. For more information about EJSCREEN visit https://www.epa.gov/ejscreen. At PMRF, the highest percentile EJ index is the Wastewater Discharge Indicator, at 98% national percentile. This models the stream proximity and toxicity-weighted concentration at PMRF. The JFC flight test includes a launch trajectory, range safety regulations and procedures, and dispersing of noise over a wide area that averts disproportionate impacts to minority populations and low-income populations under EO 12898, and to child populations under EO 13045. No impacts to environmental justice would be expected as a result of the Proposed Action.

Aesthetics/Visual Resources: The JFC flight test does not require any new construction at PMRF, and the visual aesthetics of PMRF would not be changed. No impacts to aesthetics/visual resources would be expected as a result of the Proposed Action.

Marine Sediments: The Hawaii-Southern California EIS/OEIS (U.S. Navy 2018a; Section 3.2.2.1.1, Page 3.2-8) describes the marine sediment quality for nearshore and offshore regions of the Hawaiian Islands, including Kauai. No effects to marine sediments at PMRF would be expected as a result of the Proposed Action because no expended material would be expected in the ROI.

3.1.1 Cultural Resources (PMRF)

Cultural resources include prehistoric-archaeological, historic, architectural, Native American resources, and any physical evidence of human presence considered important to a culture, subculture, or community for scientific, traditional, religious or any other reasons. Areas potentially impacted include properties, structures, landscapes, or traditional cultural sites that qualify for listing in the National Register of Historic Places.

3.1.1.1 Regulatory Setting

The NHPA protects cultural resources in the United States. Section 106 of the NHPA requires a federal agency to consider the effects of the Proposed Action on historic properties with the Hawai`i State Historic Preservation Division (SHPD). Only one extant KTF building/structure has undergone eligibility evaluation and consultation with the SHPD: the Missile Service Tower, which was found to be not eligible.

In addition to the NHPA, the Archaeological Resources Protection Act of 1979 (16 U.S.C. 470aa-470mm), prohibits the excavation or removal of items of archaeological interest from federal lands without a permit; the Antiquities Act of 1906 (16 U.S.C. 431); and the Native American Graves Protection and Repatriation Act (25 U.S.C. 3001 et seq.), require that federal agencies return "Native American cultural items" to the federally recognized native groups with which they are associated, and specifies procedures to be followed if such items are discovered on federal land.

In 2012, a Programmatic Agreement was executed for Navy undertakings in Hawai`i, and the area of responsibility encompasses Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility; outlying Oahu installations; and PMRF at Barking Sands, Kauai (U.S. Navy 2018a). The Programmatic Agreement covers Navy installations undertakings on land up to 5.5 km (3 nm) from shore, but not the at-sea training and testing activities (U.S. Navy 2018a). The Programmatic Agreement includes stipulations for development of an integrated cultural resources management plan, determinations of areas of potential effects, identification of historic properties, access to historic sites and interpretative activities, review of project effects, monitoring of ground disturbing activities, annual reporting requirements, and consultation with Native Hawaiians and other consulting parties (U.S. Navy 2018a).

3.1.1.2 Region of Influence

The ROI for potential impacts includes work areas associated with JFC flight test launch operations, including payload processing, transport, and launch.

The HRC EIS/OEIS (U.S. Navy 2008; Section 3.3.2.1.4, Page 3-139) describes in depth the cultural resources at PMRF, Main Base, and KTF.

PMRF/Main Base and KTF are situated in a region known as Mana (U.S. Navy 2008). Throughout prehistory, large areas of the Mana Plain were covered by the great Mana swamp, allowing Native Hawaiians to canoe as far south as Waimea (U.S. Navy 2008). The first successful sugar plantation to export from the islands was established at Koloa in 1835 (Hawaii Visitors Bureau, 1993), and by the 1930s, nearly all of the Mana swamp had been filled to produce this crop.

In 1940, 549 acres in Mana were deeded to the U.S. War Department for an Army Air Corps flight training field (U.S. Navy 2008). The Navy was given permission to use the facilities in 1944 (U.S. Navy 2008). In 1964, 1,884 acres of the Mana Plain were officially transferred to the Navy, and by 1966 the facility was renamed PMRF (U.S. Navy 2008).

In the late 1980s, KTF was revitalized with new capabilities and pursued rocket launches in support of the Strategic Defense Initiative Organization's development of non-nuclear missile defenses (this organization became the Ballistic Missile Defense Organization and, since 2002, has been called the Missile Defense Agency) (DOE 2019). Pad 42 and its supporting structures were built in 1988 to support vertical rocket launches in support of this new mission, as was a new control building (DOE 2019). The follow-on Strategic Targeting System became a KTF mission immediately post-Cold War in 1993, requiring this dedicated launch pad for its three-stage test vehicle, a vehicle based on the Polaris ballistic missile (DOE 2019).

Large portions of PMRF, surrounding KTF, have been surface surveyed for archaeological resources, and some areas have included subsurface investigations such as conducting excavations and monitoring ground disturbance (DOE 2019). Identified resources include burials, cemeteries, heiaus (temples), campsites, traditional house foundations, lithic (stone tools and tool-making debris) scatters, aquaculture ponds, and plantation-era resources (DOE 2019). Many of these resources also have traditional cultural significance for Native Hawaiians. Burial sites have been identified throughout the Mana Plain and are the most significant cultural concern in the area (DOE 2019). Identified burials include individuals from both Native Hawaiian and Plantation-era periods (DOE 2019). The Nohili Dune, adjacent to KTF to the north, has been determined to be a site eligible for the National Register as a traditional cultural property for its importance to Native Hawaiians (DOE 2019).

3.1.2 Biological Resources (PMRF)

For the purposes of this EA/OEA, biological resources are defined as native or naturalized vegetation and wildlife and the habitats in which they occur. Plant and plant communities are referred to as vegetation and animal species are referred to as wildlife. Habitat is defined as the biotic and abiotic conditions that support plant or animal species. Within this EA/OEA, biological resources are divided into five major categories: (1) terrestrial vegetation, (2) terrestrial wildlife, (3) marine vegetation, (4) marine wildlife, and (5) environmentally sensitive habitats. Within each category, threatened and endangered species (i.e., those listed or proposed for listing under the ESA) are described in detail. Environmentally sensitive habitats are those areas designated by the USFWS or NMFS as critical habitat for ESA listed species or other sensitive habitats such as wetlands, habitats limited in distribution, or important seasonal use areas for wildlife (e.g., breeding areas, feeding areas, or migration routes). In this EA/OEA, special-status species refers to those species listed by federal or state agencies including those afforded protection under the regulations listed in **Section 3.1.2.1**.

3.1.2.1 Regulatory Setting

The following federal regulatory requirements apply to biological resources within the PMRF ROI.

Endangered Species Act (ESA). The purpose of the ESA is to conserve the ecosystems upon which threatened and endangered species depend and to conserve and recover listed species. Section 7 of the ESA requires action proponents to consult with the USFWS or National Oceanic and Atmospheric Administration (NOAA) Fisheries to ensure that their actions are not likely to jeopardize the continued existence of federally listed threatened and endangered species or result in the destruction or adverse modification of designated critical habitat (16 USC §§ 1531-1544). For all ESA listed species, the ESA defines “harm” as an act which kills or injures wildlife including significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (16 USC §§ 1531-1544). The ESA defines harassment as an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering.

Magnuson-Stevens Fishery Conservation and Management Act (MSA). The MSA (16 USC § 1801 et seq.) provides for the conservation and management of the fisheries. Under the MSA, EFH consists of the waters and substrate needed by fish to spawn, breed, feed, or grow to maturity. An EFH may include U.S. waters within exclusive economic zones (EEZ; seaward boundary out to a distance of 370 km [200 nm]) and covers all fish species within in a fishery management unit (50 CFR §600.805). Under the MSA, an adverse effect means any impact that reduces quality and/or quantity of EFH (50 CFR §600.810). Adverse effects may include direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality and/or quantity of EFH (50 CFR §600.810). EFH and its geographic boundaries are defined by regional fisheries management councils. Federal agencies must evaluate the effects of an action on EFH and must consult with NMFS on actions that may adversely affect EFH (67 FR 2343 [January 17, 2002]).

Marine Mammal Protection Act (MMPA). All marine mammals are protected under the provisions of the MMPA (16 USC §1361 et seq.). The MMPA prohibits any person or vessel from “taking” marine mammals in the United States or the high seas without authorization. As defined by the MMPA, Level A harassment of cetaceans is any act that has the potential to injure a marine mammal or marine mammal stock in the wild. Level B harassment is defined as any act that has the potential to disturb a marine mammal or marine mammal stock in the wild by causing behavioral pattern disruptions, including but not limited to migration, breathing, nursing, breeding, feeding, or sheltering. The National Defense Authorization Act of Fiscal Year 2004 (Public Law 108-136) amended the definition of harassment as it applies to military readiness activities or scientific research activities conducted by or on behalf of the Federal Government, consistent with Section 104(c)(3). In this Act, military readiness activities were defined as “all training and operations of the Armed Forces that relate to combat” and “the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use.” For military readiness activities Level B harassment is defined as any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering to a point where such behavioral patterns are abandoned or significantly altered [16 USC 1362 (18)(B)(i) and (ii)]. Section 101(a)(5) of the MMPA directs the Secretary of the Department of Commerce to allow, upon request, the incidental (but not intentional) taking of marine mammals if certain findings are made and regulations are issued. Under the MMPA, marine mammal stocks can be listed as depleted. The term depleted is defined by the MMPA as any case in which a species or population stock is determined to be below its optimum sustainable population.

Migratory Bird Treaty Act (MBTA). Both migratory and most native-resident bird species are protected under the MBTA (16 USC §§ 703-712), and their conservation by federal agencies is mandated by EO 13186 (Migratory Bird Conservation). Under the MBTA it is unlawful by any means or in any manner, to pursue, hunt, take, capture, kill, attempt to take, capture, or kill, [or] possess migratory birds or their nests or eggs at any time, unless permitted by regulation. Under EO 13186, federal agencies must evaluate the effects of actions on migratory birds with emphasis on species of concern, which were later defined as birds of conservation concern (BCC) by USFWS (USFWS 2008). Birds listed as BCC are species with the highest conservation priority which without additional conservation actions are likely to become candidates for listing under the ESA (USFWS 2008). The 2003 National Defense Authorization Act gave the Secretary of the Interior authority to prescribe regulations to exempt the Armed Forces from the incidental taking of migratory birds during authorized military readiness activities. As directed by Section 315 of the Authorization Act, the USFWS issued a final rule authorizing incidental take, with limitations, that result from military readiness activities of the Armed Forces (72 FR 8931 [February 28, 2007]). The final rule authorizing the DOD to take migratory birds in such cases includes a requirement that the Armed Forces must confer and cooperate with USFWS to develop and implement appropriate conservation measures to minimize or mitigate adverse effects of the proposed action if the action is likely to result in a significant adverse effect on the sustainability of a population of a migratory bird species (72 FR 8931 [February 28, 2007]).

Other Biological Resource-Related Executive Orders (EO). This EA/OEA also evaluates the effects of the action on biological resources as required by EO 13112, Invasive Species; EO

11990, Protection of Wetlands; EO 13089, Coral Reef Protection; and EO 13158, Marine Protected Areas.

3.1.2.2 Region of Influence

The ROI for biological resources at PMRF includes the areas subject to effects of the Proposed Action as described in **Chapter 2.0** including:

- The locations of the launch pad and test support facilities at PMRF to be used for the Proposed Action (see **Figure 3-1**);
- The over-ocean flight corridor over U.S. territorial waters (within 22 km [12 nm] of shore) near PMRF; and
- Terrestrial and marine areas in the vicinity of these sites which may be subject to effects of the Proposed Action including elevated noise levels.

Biological resources in the PMRF ROI include terrestrial and marine vegetation as well as terrestrial and marine wildlife. Biological resources within the affected environment for the Proposed Action are described with the purpose of evaluating the effects of the Proposed Action and in proportion to the magnitude of potential effects.

Biological resources in the ROI were recently evaluated for the effects of continued launch operations in the SNL/KTF Site-wide EA (DOE 2019) as well as for recent test program launch activities such as FE-2 (U.S. Navy 2019a). The status of biological resources in the PMRF ROI as described in the SNL/KTF Site-wide EA (DOE 2019) and the FE-2 EA/OEA (U.S. Navy 2019a) remains the best available information for the ROI and is incorporated by reference. This section provides a brief summary of biological resources in the ROI with focus on the presence of any special-status species, but detailed descriptions can be found in the SNL/KTF Site-wide EA (DOE 2019) and the FE-2 EA/OEA (U.S. Navy 2019a). ESA and State of Hawai`i listed species that may be present in the ROI at or near PMRF are listed in **Table 3-1**.

Table 3-1. ESA and State of Hawai`i Listed Species with the Potential to Occur in the PMRF ROI.

Common Name	Scientific Name	U.S. ESA Listing Status	State Listing Status	Area of Occurrence at PMRF
Terrestrial Mammals				
Hawaiian hoary bat or ʻōpeʼapeʼa	*Lasiurus cinereus semotus*	E	E	Forages throughout PMRF, roosts in trees
Marine Mammals				
Humpback whale or koholā (Hawai`i DPS)	*Megaptera novaeangliae*	-	E	Offshore waters
Hawaiian monk seal or īlio holo i ka uaua	*Neomonachus schauinslandi*	E	E	Nearshore and offshore waters, hauls out on PMRF beaches
False killer whale (Main Hawaiian Islands Insular DPS)	*Pseudorca crassidens*	E	E	Offshore waters
Birds				
Hawaiian duck or kola maoli	*Anas wyvilliana*	E	E	Ditches, ponds, and wetlands
Hawaiian goose or nēnē	*Branta sandvicensis*	T	E	Mowed grass, nests in a variety of habitats
Hawaiian coot or ʻalae keʼokeʼo	*Fulica alai*	E	E	Ditches, ponds, and wetlands
Hawaiian gallinule or ʻalae ʻula	*Gallinula galeata sandvicensis*	E	E	Ditches, ponds, and wetlands
Hawaiian stilt or aeʼo	*Himantopus mexicanus knudseni*	E	E	Ditches, ponds, wetlands, and beach
Band-rumped storm-petrel or ʻakēʼakē	*Oceanodroma castro*	E	E	Flies through ROI
Short-tailed albatross	*Phoebastria albatrus*	E	E	Very rarely observed
Black-footed albatross or kaʻupu	*Phoebastria nigripes*	-	T	Rarely observed
Hawaiian petrel or ʻuaʻu	*Pterodroma sandwichensis*	E	E	Flies through ROI
Newell's shearwater or ʻaʼo	*Puffinus auricularis newelli*	T	T	Flies through ROI
Reptiles				
Loggerhead turtle (North Pacific Ocean DPS)	*Caretta caretta*	E	T	Nearshore and offshore waters
Green turtle or honu (Central North Pacific DPS)	*Chelonia mydas*	T	T	Nearshore waters, hauls out and nests on PMRF beaches
Leatherback turtle	*Dermochelys coriacea*	E	E	Offshore waters
Hawksbill turtle	*Eretmochelys imbricata*	E	E	Offshore waters
Olive ridley turtle	*Lepidochelys olivacea*	T	T	Offshore waters

Abbreviations: DPS = Distinct Population Segment, E = endangered, PMRF, Pacific Missile Range Facility, T = threatened.

Terrestrial Vegetation

KTF and the other potential launch sites are located in the northern portion of PMRF Main Base. These areas are covered primarily with landscaped vegetation that is managed by mowing (DOE 2019, U.S. Navy 2010). Some kiawe-koa haole scrub habitat is found along the eastern boundary of KTF (DOE 2019). Vegetation south and east of KTF is dominated by introduced and invasive species with stands of kiawe (*Prosopis pallida*) trees that have patches of koa haole (*Leucaena leucocephala*), guinea grass (*Panicum maximum*), and lantana (*Lantana camara*) within them (DOE 2019). Coastal dune habitats occur to the north and west of KTF. Patches of kiawe-koa haole scrub habitat occur along the inland side of the dunes and is also dominated by introduced species (DOE 2019). Seaward dune areas contain more native vegetation and are covered by pohinahina-naupaka dune vegetation (DOE 2019, U.S. Navy 2010). No threatened or endangered plants have been observed at KTF or PMRF (DOE 2019, U.S. Navy 2019a). Two ESA listed endangered plants have been observed north of PMRF, lau'ehu (*Panicum niihauense*) and 'ohai (*Sesbania tomentosa*) (DOE 2019, U.S. Navy 2019a). Critical habitat has been designated for these species and is discussed in the *Environmentally Sensitive Habitats* subsection.

Terrestrial Wildlife

Mammals. Several non-native mammal species occur at PMRF including feral cats (*Felis catus*), rats (*Rattus* spp.), feral pigs (*Sus scrofa*), and black-tailed deer (*Odocoileus columbianus*) (U.S. Navy 2010).

The Hawaiian hoary bat (*Lasiurus cinereus semotus*) is the only strictly terrestrial special-status mammal species found at PMRF. This federally and Hawaiian state listed endangered species is the only land mammal endemic to Hawai`i. Hawaiian hoary bats are known to use many areas on PMRF as well as Polihale State Park north of KTF (DOE 2019). Hawaiian hoary bats have been recorded foraging on PMRF throughout the year but are most active in the ROI in the fall and winter (September through December) (Bonaccorso and Pinzari 2011). The current population size of Hawaiian hoary bats is unknown, but the greatest threats to populations are habitat loss, mortality from entanglement or collision with man-made objects, and use of pesticides (USFWS 2011).

Hawaiian monk seals (*Neomonachus schauinslandi*) are found on and near Kauai, especially in shallow waters within 22 km (12 nm) of the PMRF coastline (U.S. Navy 2019a). While these marine mammals do haul out on beaches and rock coastlines, the closest observed Hawaiian monk seal haul-out area is approximately 1.6 km (0.9 mi) south of Launch Pad 42 (DOE 2019, U.S. Navy 2019a). Critical habitat has been established for the Hawaiian monk seal at Kauai and most other Hawaiian Islands; however, there is no designated critical habitat for this species at PMRF.

Birds. During bird surveys of PMRF in 2000, introduced lowland species were the most abundant birds (U.S. Navy 2010). These non-native, resident bird species include the red junglefowl (*Gallus gallus*), ring-necked pheasant (*Phasianus colchicus*), and northern mockingbird (*Mimus* *polyglottos*) (U.S. Navy 2019a). Migratory seabirds and shorebirds commonly observed at PMRF include brown boobies (*Sula leucogaster*), sanderlings (*Calidris alba*), wandering tattlers (*Tringa incana*), ruddy turnstones (*Arenaria interpres*), and Pacific golden plovers (*Pluvialis fulva*) (U.S. Navy 2010, U.S. Navy 2019a). Wedge-tailed shearwaters (*Puffinus pacificus*) nest in the Nohili dunes area and near the beach cottages (**Figure 3-1**) from February through November (U.S. Navy 2010). Laysan albatross (*Phoebastria immutabilis*) also nest in maintained, disturbed areas at PMRF (U.S. Navy 2010) and are known to use the mowed areas of KTF for courtship and nesting (DOE 2019). The majority of the native birds (and some non-native species) present on PMRF are protected under the MBTA. A complete list of birds observed during PMRF bird surveys is available in Appendix B2 of the PMRF Integrated Natural Resources Management Plan (INRMP) (U.S. Navy 2010).

Nine ESA-listed bird species are known or expected to occur at the KTF site (**Table 3-1**). The threatened Hawaiian goose or nēnē (*Branta sandvicensis*) is known to occur on PMRF (DOE 2019); however, only a few nēnē have been recorded on KTF in recent years and no nēnē nesting has been documented on KTF or in nearby habitats. Four endangered waterbirds, the Hawaiian coot (*Fulica alai*), Hawaiian black-necked stilt (*Himantopus mexicanus knudseni*), Hawaiian gallinule (*Gallinula galeata sandvicensis*), and Hawaiian duck (*Anas wyvilliana*), may occur at or near the KTF area (U.S. Navy 2019a, DOE 2019). These Hawaiian waterbirds primarily use wetland habitats on PMRF including man-made ditches and ponds, and the Kawaiele Waterbird Sanctuary east of PMRF (U.S. Navy 2010, DOE 2019). Short-tailed albatross (*Phoebastria albatrus*) have been observed only once on PMRF (DOE 2019) and are unlikely to occur at KTF.

Three ESA-listed seabird species may fly through the ROI at night as they transit between mountain nesting colonies and the ocean: the band-rumped storm-petrel (*Oceanodroma castro*), Hawaiian petrel (*Pterodroma sandwichensis*), and Newell's shearwater (*Puffinus auricularis newelli*). One of the primary threats to these seabirds at PMRF is fallout, which occurs when seabirds flying over the area are disoriented by artificial light sources and fall to the ground or strike artificial structures. The U.S. Navy has consulted with the USFWS on the effects of base-wide operations on seabirds and a number of measures have been implemented on PMRF to reduce fallout of seabirds (USFWS 2018b). These measures include turning off all non-essential lighting on the base and modifying nighttime operations during the seabird fledging season (September 15 to December 15) to prevent disorientation of sea birds during nocturnal flight (U.S. Navy 2019a, USFWS 2018b).

<u>Sea Turtles</u>*.* Although five sea turtle species potentially inhabit the nearshore and offshore area of Hawai`i, green (*Chelonia mydas*) and hawksbill (*Eretmochelys imbricata*) turtles account for nearly all sightings in the area (Hanser et al. 2017). While sea turtle nesting at PMRF has been relatively rare, green sea turtles have regularly nested along the beachfront on PMRF (**Figure 3-1**) (U.S. Navy 2010). In 2015, at least 6 green sea turtle nests hatched successfully between July 18 and September 3, with a total of 468 hatchlings on PMRF (U.S. Navy 2019a). In 2020, two green sea turtle nests near the airfield successfully hatched.

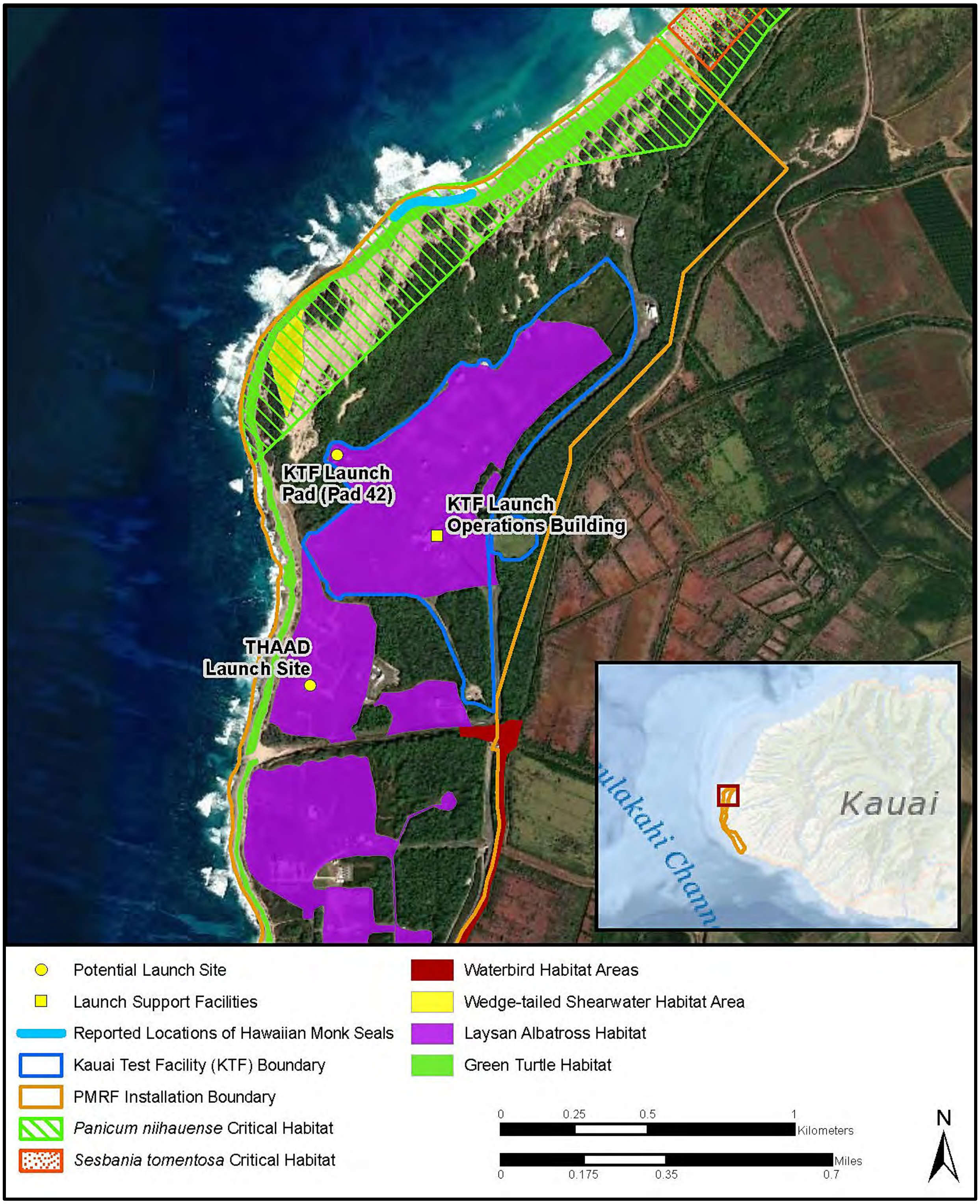

Figure 3-1. Designated Critical Habitat and Other Important Wildlife Habitat near KTF, PMRF.

Marine Vegetation

Common vegetation found in the rocky intertidal habitats offshore of PMRF includes algae such as sea lettuce (*Ulva*), Sargasso or kala (*Sargassum*), coralline red algae (*Hydrolithon*), red fleshy algae (*Melanamansia, Pterocladiella,* and *Jania*), brown algae (*Padina, Turbinaria,* and *Dictyota*), and fleshy green algae (*Neomeris, Halimeda*, and *Caulerpa*) (U.S. Navy 2008, U.S. Navy 2019a). Algal species on the limestone bench fronting Nohili Point that are preferred by green turtles include but are not limited to lipuupuu (*Dictyospheria versluysii*), kala-laununui (*Sargassum echinocarpum*), pahalahala (*Ulva fasciatus*), and mane`one`o (*Laurencia nidifica*) (U.S. Navy 2008, U.S. Navy 2019a). Appendix C of the PMRF INRMP (U.S. Navy 2010) has a complete list of marine vegetation documented offshore of PMRF.

Marine Wildlife

Marine wildlife at PMRF that are considered in this EA/OEA are those that have the potential to be in the area exposed to elevated noise levels from the JFC launch. Due to the limited potential for proposed activities to impact marine biological resources, only a brief summary is included here of special-status species which might respond to stressors resulting from the Proposed Action. Additional descriptions of marine resources at PMRF can be found in the FE-2 EA/OEA (U.S. Navy 2019a), the SNL/KTF EA (DOE 2019), and the PMRF INRMP (U.S. Navy 2010), all incorporated here by reference.

Marine Mammals. Of the 26 marine mammal species with the potential to occur near PMRF (Table 3-2 of U.S. Navy 2019a), the Hawaiian monk seal, humpback whale (*Megaptera noveangliae*), and spinner dolphin (*Stenella longirostris*) are the most likely species to be observed within 22 km (12 nm) of the PMRF coastline (U.S. Navy 2019a). Other species that are most commonly observed in Main Hawaiian Island waters less than 2,000 m (6,560 ft) deep are short-finned pilot whales (*Globicephala macrorhynchus*), pantropical spotted dolphins (*Stenella attenuata*), common bottlenose dolphins (*Tursiops truncatus*), and rough-toothed dolphins (*Steno bredanensis*) (Baird et al. 2013). All marine mammals in the ROI are protected under the MMPA and two species likely to occur in nearshore waters are listed under the ESA (**Table 3-1**).

The endangered Hawaiian monk seal is known to occur in the waters near PMRF, especially in shallow waters within 22 km (12 nm) of the PMRF coastline. These seals regularly haul out on sandy beaches of PMRF as described in the *Terrestrial Wildlife* subsection. While critical habitat has been established for the Hawaiian monk seal on and near Kauai and most other Hawaiian Islands, there is no designated critical habitat for this species offshore of PMRF.

The Insular Hawaiian Distinct Population Segment (DPS) of false killer whales (*Pseudorca crassidens*) is listed as endangered under the ESA. False killer whales have been sighted off the west coast of Kauai near PMRF (DOE 2019) and have the potential to occur in the ROI.

The humpback whale peak abundance around the Hawaiian Islands is from late February through early April (U.S. Navy 2019a). During the fall-winter period, primary occurrence is expected from the coast to 92 km (50 nm) offshore, including the areas off PMRF (U.S. Navy 2019a). The Hawai`i DPS of humpback whales is not listed under the ESA, but humpback whales are listed by the State of Hawai`i as an endangered species.

Reptiles. Of the five sea turtle species that have the potential to occur near PMRF, green and hawksbill turtles are the most common sea turtles in offshore waters around the Main Hawaiian Islands, as they prefer reef-type environments that are less than about 100 m (328 ft) in depth (U.S. Navy 2019a). Green turtles have been observed hauled out across the entire PMRF shoreline and are likely do occur in all nearshore waters off PMRF.

Fish. The nearshore marine areas of PMRF support a diversity and abundance of fish species. During 2006 surveys of waters offshore of PMRF, 75 fish species were observed in the Nohili Point area (complete list in Appendix C of U.S. Navy 2010). Some of the most abundant fish species in nearshore waters off Nohili Point included the squirrelfish *Myripristis amaena*, bluestripe snapper (*Lutjanus kasmira*), yellowstripe goatfish (*Mulloidichthys flavolineatus*), yellowfin goatfish (*M. vanicolensis*), Vanderbilt's chromis (*Chromis vanderbilti*), and several surgeonfish species (*Acanthurus* spp.) (U.S. Navy 2010). No ESA-listed fish species are known to occur in the nearshore waters off PMRF.

Environmentally Sensitive Habitats

Critical Habitat. Designated critical habitat for the endangered ‘ohai and lau`ehu occurs north of PMRF at Polihale State Park (**Figure 3-1**). Critical habitat for lau’ehu also extends into sand dune and coastal shrubland habitats on the northern part of PMRF (DOE 2019, 68 FR 9116 [February 27, 2003]), but is north of the KTF site and is unoccupied critical habitat.

Critical habitat has been designated for the Hawaiian monk seal in both terrestrial and marine areas in the Hawaiian Islands (80 FR 50925 [August 21, 2015]). Designated critical habitat for the Main Hawaiian Islands insular false killer whale DPS has also been designated in nearshore marine habitats around Kauai (83 FR 35062 [July 24, 2018]). The designated critical habitat for these species does not occur in the PMRF ROI and no Proposed Action activities would impact these critical habitats.

Essential Fish Habitat. Under the MSA, regional fisheries management councils are responsible for defining EFH and its geographic boundaries to protect and manage fisheries. The Western Pacific Regional Fishery Management Council (WPRFMC) has authority over the fisheries and EFH designation in and surrounding the State of Hawai`i. The flight path for JFC crosses over waters designated as EFH near the Hawaiian Islands; however, no Proposed Action activities would impact EFH in the PMRF ROI (within territorial waters).

3.1.3 Public Health and Safety (PMRF)

This discussion of public health and safety includes consideration for any activities, occurrences, or operations that have the potential to affect the safety, well-being, or health of members of the public. The primary goal is to identify and prevent potential accidents or impacts on the general public.

A safe environment is one in which there is no, or optimally reduced, potential for death, serious bodily injury or illness, or property damage. Various stressors in the environment can adversely affect human health and safety. Identification and control or elimination of these stressors can reduce risks to health and safety to acceptable levels or eliminate risk entirely. Emergency services are organizations which ensure public safety and health by addressing different emergencies. The three main emergency service functions include police, fire and rescue service, and emergency medical service.

The U.S. NTM provides timely marine safety information for the correction of all U.S. Government navigation charts and publications from a wide variety of sources, both foreign and domestic (National Geospatial-Intelligence Agency [NGA] 2019). To ensure the safety of life at sea, the information published in the NTM is designed to provide for the correction of unclassified nautical charts, the unclassified NGA / Defense Logistics Information Service Catalog of Hydrographic Products, United States Coast Pilots, NGA List of Lights, U.S. Coast Guard (USCG) Light Lists, and other related nautical publications produced by NGA, National Ocean Service, and the USCG (NGA 2019). The USCG also publishes weekly local NTMs with hazard operations notes at https://www.navcen.uscg.gov/?pageName=lnmDistrict&region=14.

Environmental health and safety risks to children are defined as those that are attributable to products or substances a child is likely to come into contact with or ingest, such as air, food, water, soil, and products that children use or to which they are exposed (EO 13045).

The PMRF Range Safety Office is responsible for establishing Ground Hazard Areas and Launch Hazard Areas over water beyond which no debris from early flight termination is expected to fall. The Ground and Launch Hazard Areas for missile launches are determined by size and flight characteristics of the missile, as well as individual flight profiles of each flight test (U.S. Navy 2017). Data processed by ground-based or onboard missile computer systems may be used to recognize malfunctions and terminate missile flight. Before a launch is allowed to proceed, the range is determined cleared using input from ship sensors, visual surveillance from aircraft and range safety boats, radar data, and acoustic information (U.S. Navy 2017). All range users must: (1) provide a list of project materials, items, or test conditions that could present hazards to personnel or material through toxicity, combustion, blast, acoustics, fragmentation, electromagnetic radiation, radioactivity, ionization, or other means; (2) describe radiation, toxic, explosive, or ionization problems that could accumulate as a result of their tests; (3) provide aerodynamic and flight control information, and destruct system information and parameters; (4) submit plans, specifications, and procedural or functional steps for events and activities involving explosives to conform to criteria in the PMRF instruction; and (5) provide complete operational specifications of any laser to be used and a detailed description of its planned use (U.S. Navy 2017).

Missile Flight Analysis

PMRF conducts missile flight safety in accordance with Naval Air Warfare Center Weapons Division Instruction. Missile flight safety includes analysis of missile performance capabilities and limitations, of hazards inherent in missile operations and destruct systems, and of the electronic characteristics of missiles and instrumentation. It also includes computation and review of missile trajectories, launch azimuths, kinetic energy intercept debris impact areas, and hazard area dimensions, review and approval of destruct systems proposals, and preparation of the Range Safety Operation Plan required of all programs at PMRF. These plans are prepared by the PMRF Safety Office for each mission and must be approved by the Commanding Office prior to any launch (U.S. Navy 2017). Launch is only allowed when the risk levels are less than the acceptable risk criteria in PMRF Instruction 8020.16, which are equivalent to the criteria developed by the RCC (e.g., RCC 321) (U.S. Navy 2017).

Ground Safety

Range Safety at PMRF is controlled by Range Control, which is responsible for hazard area surveillance and clearance and control of all PMRF operational areas. Range Control maintains real time surveillance, clearance, and safety at all PMRF areas including SNL/KTF. PMRF sets requirements for minimally acceptable risk criteria to occupational and non-occupational personnel, test facilities, and nonmilitary assets during range operations. For all range operations at PMRF, the Range Control Officer requires a safety plan. A Range Safety Operation Plan is generated by PMRF Range Safety personnel prior to range operations.

The Range Control Officer using PMRF assets is solely responsible for determining range status and setting RED (no firing – unsafe condition due to a fouled firing area) and GREEN (range is clear and support units are ready to begin the event) range firing conditions (U.S. Navy 2017). The Range Safety Approval and the Range Safety Operation Plan documents are required for all weapon systems using PMRF (U.S. Navy 2017). PMRF uses RCC 321, Common Risk Criteria for National Test Ranges. RCC 321 sets requirements for minimally acceptable risk criteria to occupational and non-occupational personnel, test facilities, and nonmilitary assets during range operations. In accordance with U.S. range operation standards, the risk of casualty (probability for serious injury or death) from falling debris for an individual of the general public cannot exceed 1 in 1,000,000 during a single flight test or mission (RCC 2017). Under RCC 321, the general public shall not be exposed to a probability of casualty greater than 1 in 1 million (1E-6) for each individual during any single mission and a total expectation of casualty must be less than 100 in 1 million (1E-4) (U.S. Navy 2017).

To ensure the protection of all persons and property, SOPs have been established and implemented for the Ground Hazard Areas. These SOPs include establishing road control points and clearing the area using vehicles and helicopters (if necessary) (U.S. Navy 2017). Road control points are established 3 hours prior to launches (U.S. Navy 2017). This allows security forces to monitor traffic that passes through the Ground Hazard Areas. At 20 minutes before a launch, the Ground Hazard Area is cleared of the public to ensure that, in the unlikely event of early flight termination, no injuries or damage to persons or property would occur (U.S. Navy 2017). After the Range Safety Officer declares the area safe, the security force gives the all-clear signal, and the public is allowed to reenter the area. No inhabited structures are located within the off-base sections of the Ground Hazard Area (U.S. Navy 2017). The potential for launch-associated hazards is further minimized through the use of the PMRF Missile Accident Emergency Team. This team is assembled for all launches from PMRF facilities and on-call for all PMRF launches in accordance with PMRF Instruction 5100.1F (U.S. Navy 2017).

On arrival at PMRF, support equipment and material hazards will be placed in secure storage until assembly and launch preparations. Explosive Safety Quantity Distance (ESQDs) are established around ordnance storage and missile (rocket) assembly buildings. Access to storage and support facility is limited to trained and authorized mission critical personnel.

PMRF/Main Base has defined ESQD arcs. The arcs are generated by launch pads, the Kamokala Magazine ordnance storage area, the Interim Ordnance Handling Pad, and the Missile Assembly/Test Buildings 573, 590, and 685 (U.S. Navy 2017). Only the ESQD arcs generated by the Interim Ordnance Handling Pad and Building 573 are covered by a waiver or exemption (U.S. Navy 2017). The Sandia Launcher site and Missile Assembly Buildings (647 and 685) can accommodate a 381-m (1,250-ft) ESQD arc (U.S. Navy 2017).

Ordnance Management and Safety

Ordnance safety includes procedures to prevent premature, unintentional, or unauthorized detonation of ordnance. Any program using a new type of ordnance device for which proven safety procedures have not been established requires an Explosive Safety Approval before the ordnance is allowed on PMRF or used on a test range (U.S. Navy 2017). This approval involves a detailed analysis of the explosives and of the proposed test activities, procedures, and facilities for surveillance and control, an adequacy analysis of movement and control procedures, and a design review of the facilities where the ordnance items will be handled.

Ordnance management procedures are found in Pacific Missile Range Facility Instruction (PMRFINST) 8020.5, Explosive Safety Criteria for Range Users Ordnance Operations. The Range Control Branch of the Range Programs Division is responsible for: (1) providing detailed analysis of all proposals concerning missiles or explosives and their proposed operation on the range; (2) establishing procedures for surveillance and control of traffic within and entering hazard areas; (3) reviewing the design of facilities in which ordnance items are to be handled to ensure that safety protection meets the requirements of Naval Sea System Command Publication (NAVSEAOP), Ammunition and Explosives Ashore; Safety Regulations for Handling, Storing, Production, Renovation, and Shipping; (4) training, certifying, and providing Launch Control

Officers, Safety Monitors, and Ordnance personnel for activities involving explosive ordnance; (5) assuming responsibility for the control of all emergency facilities, equipment, and personnel required in the event of a hazardous situation from a missile inadvertently impacting on a land area; (6) providing positive control of the ordering, receipt, issue, transport, and storage of all ordnance items; and (7) ensuring that only properly certified handling personnel are employed in any handling of ordnance (U.S. Navy 2017).

Rocket motors and other ordnance components will be stored at specialized facilities and then taken to the processing facility for assembly, and ultimately moved to the designated launch site. KTF rocket motors and other ordnance components are stored in explosive storage magazines by PMRF, except when needed by SNL/KTF for processing, assembly, and launch.

The transportation of hazardous materials to the launch facility will be covered under a separate transportation safety plan and will not be discussed in this EA/OEA. Onsite ordnance storage and handling procedures follow established facility safety plans.

Ocean Area Clearance

Range Safety officials manage operational safety for projectiles, targets, missiles, and other hazardous activities into PMRF operational areas. The operational areas consist of two warning areas (W-186 and W-188) and one restricted area (R-3101) under the local control of PMRF (U.S. Navy 2017). The warning areas are in international waters and are not restricted; however, the surface area of the warning areas is listed as “HOT” (actively in use) 24 hours a day (U.S. Navy 2017). PMRF publishes dedicated warning NOTAMs and NTMs 1 week before hazardous operations. In addition, a 24-hour recorded message is updated on the hotline daily by Range Operations to inform the public when and where hazardous operations will take place. Prelaunch NOTAMs and NTMs will be issued 24 hours before launch in the ocean and flight areas defined, and the areas will be actively monitored prior to an imminent launch.

Prior to a hazardous operation proceeding, the range is determined to be cleared using inputs from ship sensors, visual surveillance of the range from aircraft and range safety boats, radar data, and acoustic information from a comprehensive system of sensors and surveillance from shore (U.S. Navy 2017).

Transportation Safety

Ordnance is either delivered to PMRF/Main Base by aircraft to the on-base airfield or by ship to Nawiliwili Harbor, and then over land by truck transport along Highway 50 to the base (U.S. Navy 2017). The barges carrying explosives are met at Nawiliwili Harbor by trained ordnance personnel and special vehicles for transit to and delivery at PMRF/Main Base (U.S. Navy 2017). All ordnance is transported in accordance with U.S. DOT regulations. Rocket components, including the propellant and explosives, are transported in U.S. DOT and military designed and approved shipping containers. Where necessary, ESQDs will be established at transshipping sites. The movement of explosives and other hazardous materials between PMRF and SNL/KTF is conducted in accordance with PMRF procedures and DOD Explosives Safety Standards.

PMRF has established PMRFINST 8023.G, which covers the handling and transportation of ammunition, explosives, and hazardous materials on the facility. In addition, liquid fuels (e.g., nitrogen tetroxide and unsymmetrical dimethylhydrazine) are transported to KTF (U.S. Navy 2017). These fuels can be shipped to the site by truck, aircraft or barge, which do not affect transportation routes on the island of Kauai (U.S. Navy 2017). Transportation of these materials is conducted in accordance with U.S. DOT regulations and specific safety procedures developed for the location.

The transportation of hazardous materials to PMRF will be covered under a separate transportation safety plan. Range Control and the FAA are in direct communication in real time to ensure the safety of all aircraft using the airways and the warning areas (U.S. Navy 2017). Within the special use airspace, military activities in warning areas W186 and W-188 are under PMRF control (U.S. Navy 2017). Warning areas W-189, W-187, and W-190 are scheduled through the Fleet Area Control and Surveillance Facility (U.S. Navy 2017). Because the warning areas are located in international airspace, the procedures of the International Civil Aviation Organization are followed. The FAA acts as the U.S. agent for aeronautical information to the International Civil Aviation Organization, and air traffic in the ROI is managed by the Honolulu Control Facility and Oakland ARTCC.

Fire and Crash Safety

PMRF provides fire protection and firefighting services to SNL/KTF and enforces base safety regulations and programs on SNL/KTF. PMRF Crash/Fire is located in the base of the Air Traffic Control Tower, Building 300 (U.S. Navy 2017). Personnel are trained to respond to activities such as aircraft fire fighting and rescue in support of airfield operations, hazardous material incidents, confined space rescue, and hypergolic fuel releases, plus structure and brush fire fighting, fire prevention instruction, and fire inspections. Ambulance and basic life support Emergency Medical Technician services are provided by nationally registered Emergency Medical Technicians assigned to Crash/Fire (U.S. Navy 2017). These contractor-operated services are available to military, civil service, and non-government personnel at PMRF, 24 hours a day, 7 days a week. More extensive emergency medical services are available from the West Kauai Medical Center in Waimea, 16 km (10 mi) from the Main Gate at Barking Sands (U.S. Navy 2017).

3.1.3.1 Regulatory Setting

Aircraft safety is based on the physical risks associated with aircraft flight. Military aircraft fly in accordance with Federal Aviation 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 (U.S. Navy 2017). These rules include the use of tactical training and maintenance test flight areas, arrival and departure routes, and airspace restrictions as appropriate to help control air operations.

EO 13045, Protection of Children from Environmental Health Risks and Safety Risks, requires federal agencies to “make it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children and shall ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks.”

PMRF takes every reasonable precaution during the planning and execution of the range operations training and test activities to prevent injury to human life or property. In addition to explosive, physical impact, and electromagnetic hazards, potential hazards from chemical contamination, ionizing and non-ionizing radiation, radioactive materials, and lasers are studied by PMRF Range Safety Office to determine safety restrictions.

KTF is a launch facility operated by SNL for the DOE on PMRF/Main Base through Inter-Service Support Agreements (U.S. Navy 2017). SNL/KTF notifies PMRF Operations, Security, Fire Department, and Ordnance/Explosive Disposal as required prior to launch and other hazardous operations (U.S. Navy 2017). All hazardous operations at SNL/KTF are performed under strict adherence to existing SOPs. A site SOP provides general requirements and guidance for all range operations at SNL/KTF, including ordnance safety, pre-launch and hazardous operations control, ordnance handling and storage facilities, liquid fuels storage and handling, and launch pad operations.

3.1.3.2 Region of Influence

The ROI for potential impacts related to the health and safety of workers includes work areas associated with JFC flight test launch operations. The population of concern includes the workers employed at PMRF, including SNL/KTF, but also other personnel directly involved with range operation and training activities currently occurring at PMRF/KTF. The ROI for potential impact related to public health and safety also includes the areas of Kauai County adjacent to SNL/KTF that could be affected by the proposed launch. These areas include the PMRF overwater training areas. The population of concern consists of visitors to Kauai and permanent residents living in Kauai County.

3.1.4 Hazardous Materials and Wastes (PMRF)

This section discusses hazardous materials, hazardous waste, toxic substances, and contaminated sites. Hazardous materials are substances defined as hazardous by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the Toxic Substances Control Act (TSCA), and the Hazardous Materials Transportation Act.

In general, hazardous materials and wastes are defined as those substances that, because of their quantity, concentration, or physical, chemical, or infectious characteristics, would present substantial danger to public health and welfare or to the environment when released into the environment. The terms hazardous materials, toxic substances, and hazardous waste are often used interchangeably when used informally to refer to contaminants, industrial wastes, dangerous goods, and petroleum products. Each of these terms, however, has a specific technical meaning based on the relevant regulations.

Special hazards are those substances that might pose a risk to human health and are addressed separately from other hazardous substances. Special hazards include asbestos containing material, polychlorinated biphenyls (PCBs), and lead-based paint. The United States Environmental Protection Agency (USEPA) is given authority to regulate special hazard substances by TSCA. Asbestos is also regulated by USEPA under the CAA, and CERCLA.

Hazardous Materials Management

PMRF manages hazardous materials through the U.S. Navy's Consolidated Hazardous Materials Reutilization and Inventory Management Program (CHRIMP) (U.S. Navy 2017). CHRIMP mandates procedures to control, track, and reduce the variety and quantities of hazardous materials in use at facilities. All departments, tenant commands, and work centers must order hazardous materials from the Hazardous Materials Minimization Centers, where all such transactions are recorded and tracked. The exception to this is KTF, which obtains its hazardous materials through DOE channels (U.S. Navy 2017). Hazardous materials on PMRF are managed by the operations and maintenance contractor through CHRIMP. Hazardous materials managed through the CHRIMP program other than fuels are stored in Building 338 (U.S. Navy 2017). Typical materials used on PMRF/Main Base and stored at Building 338 include cleaning agents, solvents, and lubricating oils (U.S. Navy 2017).

PMRF has developed programs to comply with the requirements of the Superfund Amendments and Reauthorization Act Title III and Emergency Planning and Community Right-to-Know Act (U.S. Navy 2017). This effort has included submission to the State and local emergency planning committees of annual Tier II forms, which are an updated inventory of chemicals or extremely hazardous substances in excess of threshold limits (U.S. Navy 2017). These chemicals at PMRF include jet fuel, diesel fuel, propane, gasoline, aqueous firefighting foam, chlorine, used oil, paint/oils, and paint (U.S. Navy 2017).

PMRF/Main Base is a large-quantity hazardous waste generator with a USEPA identification number (U.S. Navy 2017). Hazardous waste on PMRF is not stored beyond the 90-day collection period. PMRF/Main Base has two storage areas on base for hazardous wastes: Building 392 and Building 419 (U.S. Navy 2017). Building 392 stores all base waste except for Otto (torpedo) fuel, a liquid monopropellant (U.S. Navy 2017). Building 419 is the torpedo repair shop (U.S. Navy 2017).

KTF is a small-quantity hazardous waste generator and has a USEPA identification number (U.S. Navy 2017). There is one hazardous waste storage area on KTF. PMRF outlines management and disposal procedures for used oils and fuels in the Hazardous Waste Management Plan (U.S. Navy 2017). PMRF maintains a Used Oil Transporter/Processor Permit through the Hawai`i

Department of Health (U.S. Navy 2017). Additionally, degraded jet fuel is used in crash-fire training events. The majority of wastes are collected and containerized at PMRF/Main Base for direct offsite disposal through the Defense Reutilization and Marketing Office at Pearl Harbor within 90 days (U.S. Navy 2017). The Defense Reutilization and Marketing Office provides for the transportation and disposal of the wastes to the final disposal facility.

There is one 2,500-gal underground storage tank and one 10,000-gal aboveground fuel tank at KTF (U.S. Navy 2017). KTF complies with PMRF's management plans for oil and hazardous materials outlined in the PMRF Spill Prevention Control and Countermeasures Plan and the Installation Spill Contingency Plan (U.S. Navy 2017).

PMRF manages asbestos in accordance with the Base Operations Support contractor's asbestos management plan (U.S. Navy 2017). Prior to any construction projects, areas to be disturbed are surveyed for asbestos, and any asbestos is removed, before disturbance, by a certified asbestos contractor. The handling of hazardous materials and the potential generation and disposal of hazardous wastes follow ongoing, standard, and applicable regulations and procedures at PMRF. All facilities associated with PMRF follow basic lead management principles and policies. The exception is KTF, which follows DOE plans for the removal of lead-based paint wastes (U.S. Navy 2017). The transformers on the KTF site have been tested and are free of PCBs, and there are no asbestos issues at the site (U.S. Navy 2017).

PMRF uses gasoline and diesel fuels to power range trucks and equipment (U.S. Navy 2017). Aircraft at PMRF use jet fuel and Jet-A. Jet-A is available at the fuel farm near the airfield. Both aircraft fuels are delivered to the flight line in refuelers (U.S. Navy 2017).

Pollution Prevention

PMRF has a pollution prevention plan in place for the Main Base and all sites on Kauai, which follows CHRIMP procedures for controlling, tracking, and reducing hazardous materials use and waste generation. PMRF/Main Base currently has three hazardous waste elimination programs in place. These involve recycling toner cartridges, mercury from mercury lamps, and acid/lead batteries (U.S. Navy 2017).

Existing Environmental Contamination

PMRF currently has one environmental restoration site that requires further action (Disposal Area 7, located south of KTF) and five sites that are recommended for no further action with concurrence status pending as of publication of this EA/OEA.

3.1.4.1 Regulatory Setting

Hazardous materials are defined by 49 CFR section 171.8 as "hazardous substances, hazardous wastes, marine pollutants, elevated temperature materials, materials designated as hazardous in the Hazardous Materials Table, and materials that meet the defining criteria for hazard classes and divisions" in 49 CFR part 173. Transportation of hazardous materials is regulated by the U.S.

DOT regulations. Hazardous material handling, storage, and disposal are federally regulated by the USEPA in accordance with the Federal Water Pollution Control Act; CWA; TSCA; Resource Conservation and Recovery Act (RCRA); CERCLA; and CAA.

Hazardous wastes are defined by RCRA, as amended by the Hazardous and Solid Waste Amendments, as: “a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may (A) cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or (B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.”

TSCA (40 CFR Parts 700-766) represented an effort by the federal Government to address those chemical substances and mixtures for which it was recognized that the manufacture, processing, distribution, use, or disposal may present unreasonable risk of personal injury or health of the environment, and to effectively regulate these substances and mixtures in interstate commerce. The TSCA Chemical Substances Inventory lists information on more than 62,000 chemicals and substances. Asbestos and lead are among the toxic chemical substances regulated by the USEPA under TSCA; the most common forms are found in buildings, namely asbestos containing material and lead based paint. Asbestos-containing material includes materials that contain more than 1% asbestos and are categorized as either friable or non-friable. Lead based paint includes paint having lead levels equal to or exceeding 0.5% by weight. In addition to asbestos and lead, renovation/demolition activities have the potential to disturb mercury and PCBs. Buildings may contain liquid mercury in thermostats and thermometers. Fluorescent lighting fixtures typically contain elemental mercury in the fluorescent light bulb; compact fluorescent lamps also contain mercury. In addition, fluorescent lighting fixture ballasts have the potential to contain PCBs.

The DOD established the Defense Environmental Restoration Program to facilitate thorough investigation and cleanup of contaminated sites on military installations (active installations, installations subject to Base Realignment and Closure, and formerly used defense sites). The Installation Restoration Program and the Military Munitions Response Program are components of the Defense Environmental Restoration Program. The Installation Restoration Program requires each DOD installation to identify, investigate, and clean up hazardous waste disposal or release sites. The Military Munitions Response Program addresses nonoperational rangelands that are suspected or known to contain unexploded ordnance, discarded military munitions, or munitions constituent contamination.

3.1.4.2 Region of Influence

The ROI for hazardous materials and hazardous waste would be limited to areas of PMRF, including KTF, to be used for launch preparation, launch, and post-launch activities and in areas where hazardous materials are stored and handled.

3.2 Wallops Flight Facility

This section includes detailed descriptions of cultural resources, biological resources, public health and safety, and hazardous materials and wastes.

The potential impacts to the following resource areas within this geographical area are considered to be negligible or non-existent so they were not analyzed in detail in this EA/OEA:

Air Quality: The Site-wide Programmatic EIS (PEIS) (NASA 2019; Section 3.2, Pages 3-25 through 3-38), the Environmental Resources Document (NASA 2017; Section 2, Pages 2-1 through 2-5), and the Atlantic Fleet Testing and Training EIS/OEIS (U.S. Navy 2018b; Section 3.1, Pages 3.1-1 through 3.1-12) all describe in detail the air quality conditions that have existed at WFF for approximately the past 3 years. Based on an estimation of the JFC flight test emissions and in comparison to all the aforementioned NEPA air quality analyses previously made, and regulations specific to WFF, it was decided that any impacts to air quality from the JFC flight tests would not exceed the air quality standards at WFF or in the local region. No impact to air quality would be expected as a result of the Proposed Action.

Airspace: The JFC flight tests would be similar to the FE-2 flight test, and the parameters described in the WFF Site-wide PEIS and the Atlantic Fleet Testing and Training EIS. The potential impacts on controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, and airports and airfields would be similar to that described for missile launches in previous environmental documentation (U.S. Navy 2019a, NASA 2019, U.S. Navy 2018b). WFF would issue NOTAMs and NTMs ahead of any JFC flight test, in accordance with range safety and FAA requirements. No changes to current airspace management would be required to perform the JFC flight tests. A slight increase in air traffic due to arriving components and mission personnel would be expected but would not overwhelm or change current airspace management. Modification of the MSS on the existing launch pad would not affect airspace management or use. Around the Main Base airfield, WFF operates controlled Class D airspace, NASA controls restricted airspace R-6604 A/B/C/D/E, and the Navy Fleet and Area Control VACAPES controls and schedules the offshore warning areas, including W-386 (U.S. Navy 2019a). Advanced planning and coordination with the FAA and U.S. Navy Fleet and Area Control VACAPES regarding scheduling of special use airspace, and coordination of the proposed JFC flight test relative to en route airways and jet routes, would result in no impacts on airspace within the WFF ROI.

Water Resources: The Site-wide PEIS (NASA 2019; Section 3.5, Pages 3-64 through 3-82), the Environmental Resources Document (NASA 2017; Section 3, Pages 3-1 through 3-30), and the Atlantic Fleet Testing and Training EIS/OEIS (U.S. Navy 2018b; Section 3.2, Pages 3.2-1 through 3.2-70) all describe in detail the water resources and quality that have existed at WFF for approximately the past 3 years. Based on an estimation of the JFC flight tests potential releases, current regulations and infrastructure specific to WFF, it was decided that any impacts to water resources from the JFC flight tests would not have adverse impacts on hydrologic function or quality at WFF. No impact to water resources would be expected as a result of the Proposed Action.

Geological Resources: The Site-wide PEIS (NASA 2019; Section 3.7, Pages 3-110 through 3-115), the Environmental Resources Document (NASA 2017; Section 4, Pages 4-32 through 4-37), and the Atlantic Fleet Testing and Training EIS/OEIS (U.S. Navy 2018b; Section 3.2, Pages 3.2-1 through 3.2-26) all describe in detail the geological resources that have existed at WFF for approximately the past 3 years. The JFC flight test may require ground-disturbing activities at WFF to modify the MSS at an existing WFF launch pad. While unlikely, there could be a need for trenching in previously disturbed areas to install additional power and communication lines. Grounding rods to arrest lightning and static electricity may be required. Any ground-disturbing activities are not expected to remove vegetation or earth as the MSS modification would be designed on existing man-made structures. There would be no mining or quarrying. No impacts to geological resources would be expected as a result of the Proposed Action.

Land Use: The Site-wide PEIS (NASA 2019; Section 3.6, Pages 3-102 through 3-108), and the Environmental Resources Document (NASA 2017; Section 4.7, Pages 4-37 through 4-40), describe in detail the land uses at WFF. The JFC flight test represents activities that are consistent with the mission and well within the limits of current operations of WFF. No impacts to land use resources would be expected as a result of the Proposed Action.

Noise: The Site-wide PEIS (NASA 2019; Section 3.1, Pages 3-5 through 3-14), and the Environmental Resources Document (NASA 2017; Section 10, Pages 10-5 through 10-16) describe in detail the noise environments that exist at WFF. Empirical data on sound pressure of JFC vehicle launch have not yet been collected, but modeling indicates that initial liftoff of the launch vehicle would result in peak sound pressures of approximately 145 dB in-air (re 20 µPa) at approximately 30 m (100 ft) from the launch site (Kahle et al. 2021). After launch, the vehicle would ascend quickly, and sound pressures are expected to remain elevated above ambient sound levels for less than 60 seconds (Kahle et al. 2021). The JFC launch acoustics model used several conservative assumptions and did not account for atmospheric absorption, ground interference, or atmospheric conditions (Kahle et al. 2021); therefore, these sound pressure estimates should be considered maximum possible sound pressures from launch. There is a potential for a sonic boom to result from the JFC launch tests; however, the sonic boom should occur over the Atlantic Ocean and leave land-based receptors unaffected. Potential noise impacts on wildlife receptors at WFF are discussed in Biological Resources (**Section 4.2.2**). The JFC flight tests would result in a short-term noise event during the liftoff of the vehicle, but the noise would be well within the limits analyzed in the PEIS, and only minor short-term impacts to the noise environment would occur. No long-term impacts to noise would be expected as a result of the Proposed Action.

Infrastructure: The Site-wide PEIS (NASA 2019; Section 3.14, Pages 3-199 through 3-202), and the Environmental Resources Document (NASA 2017; Section 1.3, Pages 1-5 through 1-21), describe in detail the infrastructure at WFF. The JFC flight test may require ground-disturbing activities at WFF to modify the MSS at an existing WFF launch pad. While unlikely, there could be a need for trenching in previously disturbed areas to install additional power and communication lines. Grounding rods to arrest lightning and static electricity may be required. Any ground-disturbing activities are not expected to remove vegetation or earth as the MSS modifications would be designed on existing man-made structures. The Proposed Action is not expected to impact WFF's infrastructure resources beyond the limits of current operations. No impacts to infrastructure resources would be expected as a result of the Proposed Action.

Socioeconomics: The Site-wide PEIS (NASA 2019; Section 3.15, Pages 3-204 through 3-210), the Environmental Resources Document (NASA 2017; Section 12, Pages 12-1 through 12-7), and the Atlantic Fleet Testing and Training EIS/OEIS (U.S. Navy 2018b; Section 3.11, Pages 3.11-1 through 3.11-59) all describe in detail the socioeconomic resources that have existed at WFF for approximately the past 3 years. There would be a temporary increase in personnel at WFF due to the JFC flight test. No impacts to socioeconomic resources would be expected as a result of the Proposed Action.

Environmental Justice: The Site-wide PEIS (NASA 2019; Section 3.16, Pages 3-212 through 3-217), and the Environmental Resources Document (NASA 2017; Section 12.2, Page 12-2) describe in detail the environmental justice conditions that exist at WFF. The EPA's Environmental Justice Screening and Mapping Tool, known as EJSCREEN, is a publicly available dataset that combines environmental and demographic indicators into 11 EJ indexes. For more information about EJSCREEN visit https://www.epa.gov/ejscreen. At WFF, the highest percentile EJ index is the Lead Paint Indicator, at 62% national percentile. This models the percentage of occupied housing units built before 1960 as an indicator of having significant lead-based paint hazards at WFF. The JFC flight test includes a launch trajectory, range safety regulations and procedures, and dispersing of noise over a wide area that averts disproportionate impacts to minority populations and low-income populations under EO 12898, and to child populations under EO 13045. No impacts to environmental justice would be expected as a result of the Proposed Action.

Aesthetics/Visual Resources: The Site-wide PEIS (NASA 2019; Section 3.17, Pages 3-221 through 3-222) describes in detail the aesthetics/visual resources that exist at WFF. The JFC flight test may require ground-disturbing activities at WFF to modify the MSS at an existing WFF launch pad. While unlikely, there could be a need for trenching in previously disturbed areas to install additional power and communication lines. Grounding rods to arrest lightning and static electricity may be required. Any ground-disturbing activities are not expected to remove vegetation or earth as the MSS would modify existing man-made structures. No impacts to aesthetics/visual resources would be expected as a result of the Proposed Action.

Marine Sediments: The JFC flight tests do not require any offshore construction and the marine sediments of WFF would not be changed. No effects to marine sediments at WFF would be expected as a result of the Proposed Action because no expended material would be expected in the ROI.

3.2.1 Cultural Resources (WFF)

3.2.1.1 Regulatory Setting

The NHPA protects cultural resources in the United States. Section 106 of the NHPA requires a federal agency to consider the effects of the Proposed Action on historic properties. Compliance with Section 106 requires consultation with the Virginia SHPO at the Virginia Department of Historical Resources.

In accordance with Sections 106 and 110 of the NHPA, NASA developed a Programmatic Agreement with the Virginia SHPO and Advisory Council on Historic Preservation to outline how WFF will manage its cultural resources as an integral part of its operations and missions (NASA 2019). The Programmatic Agreement establishes the parameters for managing cultural resources at WFF including roles and responsibilities, updates and requirements for the WFF Integrated Cultural Resources Management Plan, activities not requiring review, review process for potential impacts including professional qualifications, documentation, curation, etc., requirements for the treatment of the Wallops Beach Lifesaving Station, resolution of adverse effects and disputes, and Emergency actions (NASA 2019).

Since the Programmatic Agreement was executed in November 2014, the following seven tribes have received federal recognition: Pamunkey Indian Tribe, Chickahominy Indian Tribe, Chickahominy Tribe Eastern Division, Monacan Indian Nation, Nansemond Tribe, Rappahannock Tribe, and Upper Mattaponi Indian Tribe (NASA 2019).

3.2.1.2 Region of Influence

The ROI for potential impacts includes work areas associated with JFC flight test launch operations, including payload processing, transport, and launch.

The Site-wide PEIS (NASA 2019; Section 3.18, Pages 3-224 through 3-231), the Environmental Resources Document (NASA 2017; Section 11, Pages 11-17 through 11-25), and the Atlantic Fleet Testing and Training EIS/OEIS (U.S. Navy 2018b; Section 3.10, Pages 3.10-1 through 3.10-28) all describe in detail the cultural resources that have existed at WFF for approximately the past 3 years.

Over the years, several studies have been conducted identifying and evaluating cultural resources at WFF. Currently, 11 archaeological sites have been identified on WFF (NASA 2019, Table 3.18-3). Four of the sites have been recommended as ineligible for listing on the National Register of Historic Places. Three of the sites have not been the subject of further archaeological inquiry as these sites are located in protected areas not planned for development (NASA 2019).

WFF does not possess or manage Native American collections or cultural items, Native American remains, or Native American sacred sites or traditional cultural properties (NASA 2019). The installation is not located within the lands of any state or federally recognized Native American tribe (NASA 2019).

As documented in Appendix G of the Programmatic Agreement, WFF, the SHPO, and Advisory Council on Historic Preservation, determined that the following NASA WFF activities have limited potential to affect historic resources and do not require review under the Agreement (NASA 2019):

Launch Operations:

- Launch and flight of orbital and suborbital rockets, missiles, projectiles, targets, or tethered or free-floating balloons from the WFF Launch Range on Wallops Island or from the Main Base airfield.
- Jettison of flight hardware (e.g., spent rocket motor, scientific payload, nosecone, etc.) into the Atlantic Ocean and subsequent recovery (if warranted).

Aircraft (Manned and Unmanned) Operations:

- Flight of manned fixed or rotary wing aircraft from either of the WFF Main Base runways.
- Flight of unmanned fixed or rotary wing aerial systems from either the WFF Main Base runways or the North Wallops Island UAS airstrip.

3.2.2 Biological Resources (WFF)

Biological resources on and near WFF are defined as in **Section 3.1.2**.

3.2.2.1 Regulatory Setting

The regulatory setting under the ESA, MMPA, and MBTA is described in detail in **Section 3.1.2.1** including relevant definitions under these Acts. The MSA as described in **Section 3.1.2.1** also applies to territorial waters offshore of WFF, and resources regulated by this Act are discussed below.

Bald and Golden Eagle Protection Act (BGEPA). This Act protects both bald and golden eagles (*Haliaeetus leucocephalus* and *Aquila chrysaetos*) by prohibiting taking of eagles including disturbing eagles or habitat alterations that would impact eagles (16 USC §§ 668-668c). Under the BGEPA, disturbing eagles is defined as agitating or bothering a bald or golden eagle to a degree that causes or is likely to cause injury to an eagle or is likely to decrease productivity or cause nest abandonment by interfering with breeding, feeding, or sheltering behavior. Any take, including incidental take that is associated with an activity, must be authorized by a permit under the BGEPA (50 CFR § 22.26).

3.2.2.2 Region of Influence

The ROI for biological resources at WFF includes the areas subject to effects of the Proposed Action as described in **Chapter 2.0** including:

- The locations of the launch pad and test support facilities at WFF to be used for the Proposed Action (**Figure 2-4**);
- The over-ocean flight corridor over U.S. territorial waters (within 22 km [12 nm] of shore) near WFF; and
- Terrestrial and marine areas in the vicinity of these sites which may be subject to effects of the Proposed Action including elevated noise levels.

Launch of the JFC vehicle would take place on the Wallops Island area of WFF. Wallops Island is a barrier island on the Virginia Coast which includes beach, maritime grassland, maritime scrub, maritime forest, and wetland habitats along with managed/maintained areas (NASA 2017).

The biological resources at WFF were recently described in an Environmental Resource Document (NASA 2017). The purpose of the Environmental Resource Document is to provide a baseline description of environmental conditions at WFF against which the effects of proposed actions may be evaluated (NASA 2017). Biological resources were also recently evaluated for impacts of current operations at WFF (including rocket launches) and proposed new operations in the Final WFF Site-wide PEIS (NASA 2019) and the FE-2 EA/OEA (U.S. Navy 2019a). The affected environment for biological resources at WFF remains the same as that described in the WFF PEIS (NASA 2019) and the FE-2 EA/OEA (U.S. Navy 2019a); therefore, this section provides a summary of biological resources in the ROI but more detailed descriptions are incorporated by reference to these documents.

Terrestrial Vegetation

Wallops Island is dominated by estuarine emergent wetland habitats. These include both non-tidal wetlands in the island interior and tidal wetlands on the western edge (NASA 2017). Predominant vegetation in low marsh tidal wetlands is saltmarsh cordgrass (*Spartina alterniflora*), while high marsh habitats are predominantly saltmeadow cordgrass (*Spartina patens*), salt grass (*Distichlis spicata*), common reed (*Phragmites australis*), and groundsel tree (*Baccharis halimifolia*) (NASA 2017).

Habitat in the vicinity of the launch facilities at WFF is primarily managed/maintained and estuarine wetland habitats but also includes some scrub-shrub wetlands and maritime grassland habitats (NASA 2017). Managed/maintained areas include meadows of bushy bluestem (*Andropogon glomeratus*), little bluestem (*Schizachyrium scoparium*), thoroughworts and bonesets (*Eupatorium* spp.), and goldenrods (*Solidago* sp.) as well as lawns and roadsides dominated by invasive and introduced plant species (NASA 2017). Vegetation in the maritime grasslands of Wallops Island is dominated by American beachgrass (*Ammophila breviligulata*), saltmeadow cordgrass, beach panic grass (*Panicum amarum*), and seaside goldenrod (*Solidago* *sempervirens*) (NASA 2017). Maritime scrub habitats include these maritime grassland species as well as bayberry (*Morella cerifera*), marsh elder (*Iva frutescens*), poison ivy (*Toxicodendron radicans*), winged sumac (*Rhus copallina*), groundsel tree, stunted black cherry (*Prunus serotina*), and stunted loblolly pine (*Pinus taeda*) (NASA 2017).

The only special-status plant species known to occur near WFF is seabeach amaranth (*Amaranthus pumilus*), which occurs on barrier islands and beaches (NASA 2017). Seabeach amaranth is not known to occur on WFF but has been documented on Assateague Island to the north of WFF (NASA 2019).

Terrestrial Wildlife

The terrestrial habitats at WFF support a highly diverse assemblage of terrestrial wildlife including mammals, birds, reptiles, amphibians, and invertebrates. The common wildlife species found on Wallops Island are discussed below as well as special-status species known to occur at WFF.

Mammals. Mammals such as raccoon (*Procyon lotor*), red fox (*Vulpes fulva*), white-footed mouse (*Peromyscus leucopus*), meadow vole (*Microtus pennsylvanicus*), rice rat (*Oryzomys palustris*), white-tailed deer (*Odocoileus virginianus*), and Eastern cottontail rabbit (*Sylvilagus floridanus*) are all common in the dune and backdune habitats of WFF (NASA 2017).

The only special-status terrestrial mammal species with the potential to occur in the ROI is the northern long-eared bat (*Myotis septentrionalis*) (**Table 3-2**). This species roosts underneath the bark or in cavities or crevices of trees in the summer and emerges at dusk to feed on insects (NASA 2017). While presence of the northern long-eared bat has not been confirmed on WFF, there have been acoustic detections of bats in the *Myotis* genus at WFF, and it is assumed this species could occur in the vicinity of WFF (NASA 2017).

Birds. Many migratory and resident native bird species are known to occur on WFF. These native bird species are protected under the MBTA and include some BCC species (complete list available in NASA 2017). Several species of shorebirds, marsh birds, grassland birds, and shrub-land birds occur on Wallops Island. Some of the most common shorebirds found on Wallops Island beaches include the sanderling, semi-palmated plover (*Charadrius semipalmatus*), short-billed dowitcher (*Limnodromus griseus*), dunlin (*Calidris alpina*), willet (*C. semipalmatus*), royal tern (*Sterna maxima*), least tern (*S. antillarum*), common tern (*S. hirundo*), Forester's tern (*S. foresteri*), laughing gull (*Larus atricilla*), herring gull (*L. argentatus*), and great black-backed gull (*L. marinus*) (NASA 2017). Common shrub habitat birds include several sparrow species, red-winged blackbirds (*Agelaius phoeniceus*), boat-tailed grackles (*Quiscalus major*), fish crows (*Corvus ossifragus*), song sparrows (*Melospiza melodia*), gray catbirds (*Dumetella carolinensis*), yellowthroats (*Geothlypis trichas*), and mourning doves (*Zenaida macroura*) (NASA 2017).

Table 3-2. ESA and State of Virginia Listed Species with the Potential to Occur in the WFF ROI.

Common Name	Scientific Name	U.S. ESA Listing Status	State Listing Status	Area of Occurrence at WFF
Terrestrial Mammals				
Northern long-eared bat	*Myotis septentrionalis*	T	T	Potentially at WFF
Marine Mammals				
Fin whale	*Balaenoptera physalus*	E	E	Nearshore Waters
Humpback whale	*Megaptera novaeangliae*	E	E	Nearshore Waters
West Indian manatee	*Trichechus manatus*	T	E	Nearshore Waters
Birds				
Upland sandpiper	*Bartramia longicauda*	-	T	Wallops Island
Red knot	*Calidris canutus rufus*	T	T	Wallops Island
Piping plover	*Charadrius melodus*	T	T	Wallops Island
Wilson's plover	*C. wilsonia*	-	E	Nearby Islands
Peregrine falcon	*Falco peregrinus*	-	T	Wallops Island
Gull-billed tern	*Gelochelidon nilotica*	-	T	Nearby Islands
Bald eagle	*Haliaeetus leucocephalus*	-	T	Wallops Island
Loggerhead shrike	*Lanius ludovicianus*	-	T	Potential in Area
Eastern black rail	*Laterallus iamaicensis*	T	E	Potentially at WFF
Roseate tern	*Sterna dougallii*	T	T	Offshore Waters
Sea Turtles				
Loggerhead turtle	*Caretta caretta*	T	T	Nest at Wallops Island Nearshore Waters
Green turtle	*Chelonia mydas*	T	T	Nearshore Waters
Leatherback turtle	*Dermochelys coriacea*	E	E	Mostly Offshore
Kemp's ridley turtle	*Lepidochelys kempii*	E	E	Nearshore Waters
Fish				
Atlantic sturgeon	*Acipenser oxyrinchus oxyrinchus*	E	SGCN	Nearshore Waters
Oceanic whitetip shark	*Carcharhinus longimanus*	T	-	Mostly Offshore
Giant manta ray	*Manta birostris*	T	-	Mostly Offshore

Source: Table 35-5 in NASA 2017, NASA 2019
Abbreviations: E = endangered, T =threatened, SGCN = Species of Greatest Conservation Need, WFF – Wallops Flight Facility, "-" = not listed.

Three bird species listed under the ESA have the potential to occur in the WFF ROI: the red knot (*Calidris canutus rufus*), piping plover (*Charadrius melodus*), and eastern black rail (*Laterallus jamaicensis*) (**Table 3-2**) (NASA 2019). Red knots are known to occur on Wallops Island beaches during spring migration (NASA 2017). These birds occur mostly during the second half of May when flocks of hundreds to thousands of individuals feed on small mollusks (NASA 2017). Piping plovers use beach and dune habitats and are known to nest on Wallops Island (NASA 2017). These birds feed on invertebrates on beaches and nest in sand or cobbles in low vegetation dune areas (NASA 2017). Piping plovers have been recorded nesting on the north end of Wallops Island since at least 2009 (NASA 2017). Eastern black rails are suspected to nest in the wetlands along the west side of Wallops Island.

Several species listed as threatened or endangered by the State of Virginia are also known to occur at or near WFF (**Table 3-2**). Bald eagles, which are no longer listed under the ESA but are still protected under the BGEPA, nest on Wallops Island and other areas of WFF.

Reptiles and Amphibians. Common reptiles in the shrub habitats of Wallops Island include the black rat snake (*Elaphe obsoleta*), hognose snake (*Heterodon platyrhinos*), snapping turtle (*Chelydra serpentina*), box turtle (*Terrapene carolina*), and northern fence lizard (*Sceloporus undulatus*) (NASA 2017). Diamondback terrapins (*Malaclemys terrapin*) are also known to use the saltmarsh estuaries and tidal flats at WFF (NASA 2017). Amphibian species which are known to use terrestrial and freshwater habitats on Wallops Island include Fowler's toads (*Bufo woodhousei*) and green tree frogs (*Hyla cinerea*) (NASA 2017).

Only one sea turtle species is known to nest at WFF, the loggerhead turtle (*Caretta caretta*). However, no loggerhead turtle nests have been recorded on the beaches of Wallops Island since 2013 (NASA 2020).

Invertebrates. The tidal marshes of Wallops Island support a diversity and abundance of invertebrate species from arthropods such as salt marsh grasshoppers (*Orchelimum fidicinium*), plant hoppers (*Megamelus* spp.), flies, wasps, spiders, and mites to mollusks such as periwinkle snails (*Littorina irrorata*) and mud snails (*Ilyanassa obsoleta*) (NASA 2017). The most common insects at WFF are salt marsh mosquitoes (*Ochlerotatus sollicitans*) and greenhead flies (*Tabanus nigrovittatus*) (NASA 2017). Coastal habitats at WFF support a variety of crabs including ghost crabs (*Ocypode quadrata*), calico crabs (*Ovalipes ocellatus*), and fiddler crabs (*Uca* spp.), as well as sand shrimp (*Crangon septemspinosa*) and coffee bean snails (*Melampus bidentatus*) (NASA 2017).

Marine Wildlife

For the purposes of this EA/OEA, discussion of marine biological resources in the WFF ROI is limited to biological resources in nearshore habitats offshore of Wallops Island.

Marine Mammals. All marine mammals are protected under the MMPA and as such are considered special-status species. Six marine mammal species are known to occur in Wallops Island nearshore waters including three ESA-listed species (**Table 3-2**); the fin whale (*Balaenoptera physalus*), humpback whale, and West Indian manatee (*Trichechus manatus*) (NASA 2017). Fin whales are primarily found in deep offshore waters; however, these whales may be found in continental shelf waters and have been documented as close as 2 km (1 nm) offshore (NASA 2017). Humpback whales are primarily found in the North Atlantic during the summer months where they forage on plankton in shallow waters (NASA 2017). Humpback whales may be found in the nearshore waters off Wallops Island, and a juvenile whale was found stranded on north Wallops Island in 2012 (NASA 2017). Manatees are known to range north into the mid-Atlantic during the summer and fall where they feed on seagrass and other aquatic vegetation, primarily in rivers and creeks (NASA 2017). Manatees have been observed in nearshore waters in the vicinity of WFF, with the nearest record approximately 12.1 km (6.5 nm) southwest of Wallops Island (NASA 2017).

In addition to the ESA-listed species, harbor seals (*Phoca vitulina*), harbor porpoises (*Phocoena phocoena*), and bottlenose dolphins, all protected under the MMPA, are found in nearshore waters of the WFF ROI.

<u>Sea Turtles</u>. Four sea turtle species have the potential to occur in Wallops Island nearshore waters (**Table 3-2**) (NASA 2017). All four sea turtle species are listed under the ESA and by the State of Virginia. Loggerhead turtles are the most common turtle species in the nearshore waters of WFF (NASA 2017). These turtles forage in offshore and coastal waters where they feed primarily on jellies, crabs, shrimp, sea urchins, sponges, and fish (Bjorndal 1997). Loggerhead turtles are known to nest on the beaches of Wallops Island (NASA 2017), and therefore are likely to be found in nearshore waters. Atlantic green turtles are known to occur in the waters off WFF (NASA 2017). Green turtles forage seasonally on sea grasses and algae in coastal waters and are most likely to be found in the ROI in the summer months (NASA 2017). Leatherback turtles (*Dermochelys coriacea*) forage mainly in offshore waters but are known to forage in coastal waters (NASA 2017). While leatherbacks have not been observed in WFF nearshore waters, a leatherback was found washed up on Wallops Island in 2006 (NASA 2017). The Kemp's ridley turtle (*Lepidochelys kempii*) has never been observed in nearshore waters of WFF (NASA 2017). This turtle has the potential to occur in shallow waters (less than 49 m or 160 ft deep) in the region (NASA 2017).

<u>Fish</u>. The nearshore waters of WFF provide a variety of coastal and estuarine habitats for fish. Common fish near Wallops Island include the Atlantic croaker (*Micropogonias undulatus*), sand shark (*Carcharias taurus*), smooth dogfish (*Mustelus canis*), smooth butterfly ray (*Gymnura micrura*), bluefish (*Pomatomidae saltatrix*), spot (*Leiostomus xanthurus*), and summer flounder (*Paralichthys dentatus*) (NASA 2017).

One special-status fish, the Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*), has the potential to occur in nearshore waters of WFF (NASA 2017). This species spawns in freshwater rivers in the spring, but they spend the majority of their lives in estuarine and marine waters where they feed on benthic invertebrates (NASA 2017). Atlantic sturgeon are known to occur in the deeper waters off WFF (NASA 2019) and are most likely to be found in waters less than 50 m (164 ft) deep (NASA 2019).

Two other special-status fish species, the oceanic whitetip shark (*Carcharhinus longimanus*) and giant manta ray (*Manta birostris*), have the potential to occur in the offshore waters of WFF (NASA 2019). Whitetip sharks are found in warm tropical and subtropical waters worldwide, between 20° North and 20° South latitude. During the summer months, they may be found up to 30° North and South latitudes (NASA 2019). The giant manta ray is found worldwide and has been documented as far north as New Jersey on the U.S. east coast (NASA 2019). The oceanic whitetip shark and giant manta ray are mostly found in open ocean waters well offshore (NASA 2019).

Environmentally Sensitive Habitats

Critical Habitat. No designated critical habitat occurs in the WFF ROI.

Essential Fish Habitat. EFH has been designated for many species in the vicinity of WFF by the Greater Atlantic Regional Field Office. The JFC flight path would cross over waters designated as EFH in the U.S. EEZ near WFF; however, no Proposed Action activities would impact EFH in the WFF ROI (within territorial waters). EFH in the offshore booster drop zone is discussed in **Section 3.6.2.3**.

3.2.3 Public Health and Safety (WFF)

See **Section 3.1.3** for a basic discussion on the focus of public health and safety.

Wallops Main Base is separated from Mainland/Wallops Island by approximately 11.2 km (7 mi) of public roadway. The Chincoteague National Wildlife Refuge is under the jurisdiction of the USFWS and is located 9.6 km (6 mi) to the northeast of WFF. It includes more than 14,000 acres (21.8 square miles [mi^2]) of beach, dunes, marsh, and maritime forest, and due to its proximity to millions of people is one of the most visited wildlife refuges in the United States. Assateague Island National Seashore is under the jurisdiction of the National Park Service and is located north of Chincoteague National Wildlife Refuge. Assateague Island National Seashore has 24 km (15 mi) of undeveloped shoreline in Virginia and Maryland. There are two entrances to Assateague Island National Seashore. The closest entrance is approximately 9.6 km (6 mi) northeast of WFF. Recreational activities such as camping, fishing, crabbing, clamming, canoeing, birding, wildlife viewing, hiking, swimming, off road vehicle use and hunting are available.

The WFF Safety Office plans, develops, and provides functional management of policies and procedures for safety and establishes and approves safety procedures for the protection of property and the public. The health and safety analyses at WFF include consideration of potential hazards associated with operations and maintenance activities such as fueling, handling, assembly, and checkout for all launch activities; occupational hazards; facility fire, crash, and rescue; and risks to the public, NASA personnel, contractors, and civilians from potentially hazardous activities such as flight operations, flight trajectory and dispersion, and launch failures at WFF (U.S. Navy 2019a [FE-2 EA]).

A common safety practice at WFF is to establish restricted-access hazard arcs around the location of these activities to separate the hazardous procedures from other operations and from the general public. A hazard arc's size is calculated based on the potential hazards of that vehicle (e.g., the types and quantities of propellant onboard, rocket reliability, flight trajectory, and types of debris expected if the flight were terminated) around the launch pad (U.S. Navy 2019a). Operational controls (e.g., evacuation areas, temporary road closures, etc.) are established within and at the perimeter of the hazard arc to minimize the potential hazards associated with the operations of the launch range. The WFF Safety Office typically reopens a hazard area within 2 to 3 hours following a nominal launch. However, in the case of a launch incident or failure, it may be days before the WFF Safety Office deems the area safe enough for personnel to enter.

A flight trajectory analysis is completed prior to each flight to define the flight safety limits for guided and unguided systems. Launch vehicles with flight termination systems are terminated by destruction of the vehicle if the flight is deemed erratic or crosses the established destruct boundary. All stages are required to be equipped with flight termination systems unless the maximum range of the vehicle is within established launch range boundaries or the vehicle is determined to be inherently safe. Flight termination boundaries are designed to protect the public and personnel by ensuring that vehicle destruction occurs within a predetermined safety zone.

Prior to a hazardous operation proceeding, the range is determined to be cleared using inputs from ship sensors, visual surveillance of the range from aircraft and range safety boats, radar data, and acoustic information from a comprehensive system of sensors and surveillance from shore (U.S. Navy 2019a).

Safety considerations for launch vehicle launches also include toxic materials dispersion, and distance focusing overpressure considerations. Toxics include a variety of hazardous materials that could be transported through the atmosphere from either a normal or terminated flight and may include rocket exhaust products such as hydrogen chloride and carbon monoxide, or propellants such as hydrazine and oxides of nitrogen. The effects of toxic materials cannot be contained within a certain predefined hazard area as they are dictated by atmospheric conditions. Distance focusing overpressure analyses determine the risk to the public given the potential for a shock wave to strengthen in the far field after reflecting off temperature gradients in the atmosphere. As such, the effects of these hazards are analyzed real-time during launch countdown using industry accepted computer models. As the extent of potential hazard could change with the weather, the areas requiring clearance are also subject to change.

While not under the Safety Office, the Protective Services Division ensures the safety of personnel, property, and the public (NASA 2019). WFF maintains a security force that is responsible for the internal security of the base and provides 24-hour per day protection services (NASA 2019). Entry onto the Main Base is restricted through entry control points at the main entrance gate to WFF, an entrance gate to NOAA Wallops Command and Data Acquisition Station, and an entrance gate to the U.S. Navy controlled property at WFF (NASA 2019). These gates are used to control and monitor daily employee and visitor traffic. One entrance gate serves as the single entry control and monitoring point for the Mainland and Wallops Island (NASA 2019). Other services provided by the security force include security patrols, employee and visitor identification, afterhours security checks, maintaining mission driven safety cordons, and police services (NASA 2019). Badges are provided to all WFF personnel, contractors, range users, tenants, and visitors. Only persons authorized by the WFF Safety Office are permitted to enter potentially hazardous areas of the facility (NASA 2019).

The NASA Protective Services Fire Department has a Mutual Aid Agreement with the Accomack Northampton Fireman's Association for any outside assistance needed at WFF (U.S. Navy 2019a). The local fire companies closest to WFF are in the towns of Atlantic, Chincoteague, and New Church, Virginia. First responders to a mishap consider such factors as rescue, evacuation, fire suppression, safety and security of the area, and other actions immediately necessary to prevent loss of life or further property damage. NASA Protective Services Fire Department personnel are housed in two buildings on the facility, one on Wallops Island and one on the Main Base. There are 24-hour fire and protection services on the Main Base and 7:00 a.m. to 7:00 p.m. or on a project specific basis on Wallops Island, and personnel are also trained as first responders for hazardous materials, waste, and oil spills (U.S. Navy 2019a). All are Emergency Medical Technicians, and at least two employees per shift are Advanced Life Support certified. Rescue vehicles include structural engines, aircraft firefighting vehicles, ambulances, hazardous material (HAZMAT) trucks and trailers, technical rescue trailers, utility pickup trucks, and tracked all-terrain vehicles (U.S. Navy 2019a).

3.2.3.1 Regulatory Setting

The WFF Safety Office is responsible for the application of safety policies, principles, and techniques to assure the safety and integrity of the public, workforce, and infrastructure. The WFF Safety Office has the responsibility to ensure safe mission activities from preparation through operation and post-operations, both for missions launched from the WFF Range and those supported off range. WFF coordinates all operations with the FAA, U.S. Navy, Coast Guard, and other organizations as required in order to clear potential hazard areas. In addition, WFF requires all range users to submit formal documentation pertaining to their proposed operations for safety review. Mission specific safety plans are prepared by the WFF Safety Office and address all potential ground hazards related to a given mission in accordance with the WFF Range Safety Manual (U.S. Navy 2019a). The Protective Services Division manages the NASA Protective Services Fire Department, which provides crash, fire, and rescue response to the facility along with emergency services to the neighboring community. All personnel involved with operational programs at WFF follow appropriate safety protocols, including Occupational Safety and Health Administration (OSHA) regulations and training requirements.

NASA has established mission specific ground safety guidelines. These guidelines outline ground safety requirements, range user and tenant/partner responsibilities, and safety data requirements to which all range users must comply (U.S. Navy 2019a). Risk criteria have been established by

NASA in order to protect the public, mission essential and critical operations personnel, and property from risks associated with operations. These criteria are consistent with the National Range Commanders Council guidelines, RCC 321 (U.S. Navy 2019a).

The Ground Safety Plan outlines controls for minimizing risks to human health and specifically addresses topics such as hazard arcs; hazardous materials handling; explosive safety; personal protective equipment; health and safety monitoring; and training (U.S. Navy 2019a).

The WFF Office of Communications regularly distributes both electronic and faxed notices of launch-related hazard areas to a group of more than 100 recipients that includes local watermen, marinas, and marine transportation companies (U.S. Navy 2019a). Tracking and data systems operations must be within the accepted levels for human exposure to radio frequency electromagnetic fields and comply with all Institute of Electrical and Electronics Engineers standards (U.S. Navy 2019a).

At WFF's request the USACE amended an existing permanent danger zone in the waters of the Atlantic Ocean off Wallops Island and Chincoteague Inlet that protects the public from hazards associated with rocket launching operations. The amendment increases the danger zone to a 56 km (30 nm) boundary (U.S. Navy 2019a).

3.2.3.2 Region of Influence

The ROI for WFF is the WFF Range and offshore areas supported by the WFF Safety Office.

3.2.4 Hazardous Materials and Wastes (WFF)

This section only discusses the affected environment at WFF for hazardous materials and wastes. Refer to **Section 3.1.4** for the definitions and types of regulated hazardous materials and wastes.

Inspections were performed at WFF for suspect asbestos containing material in 2007, 2008, and 2009 (NASA 2019). An additional survey for potential lead based paint was conducted during the 2007 effort (NASA 2019). Results of the 2007 Main Base inventory indicate the known presence of asbestos containing material in Building E-107 and suspected asbestos containing material in Buildings D-049, D-101, E-002, E-106, and D-107 (NASA 2019). The 2008 Mainland and Wallops Island inventory noted suspected asbestos containing material in Buildings X-091 and X-115 (NASA 2019). Lead based paint, mercury, and PCB inspections were conducted on Building E-106 in 2009. The results of those inspections indicate the presence of asbestos containing material, lead based paint, and mercury-containing fluorescent lighting.

As the Main Base and Mainland/Wallops Island are not contiguous, each has been assigned its own USEPA hazardous waste generator number (VA8800010763 and VA7800020888) (NASA 2019). The Main Base and Mainland/Wallops Island areas are both classified as Large Quantity Generators; each area has the potential to generate more than 1,000 kg (2,205 lb) of hazardous waste and/or 1 kg (2.2 lb) of acute hazardous waste per month (NASA 2019).

WFF, and specified partners, own and operate 40 aboveground storage tanks and 6 underground storage tanks of various sizes located throughout the facility. Due to the size of the facility and constant change in operations, the total gallons of oil frequently changes. The current maximum storage capacity of the aboveground storage tanks is approximately 880,000 liters (232,350 gallons) of petroleum. The maximum storage capacity of the underground storage tanks is approximately 91,000 liters (24,000 gallons) of #2 fuel oil and ultra-low sulfur diesel fuel.

WFF has an active and ongoing project to reduce the number of petroleum storage tanks on the facility. WFF (and specified partners/tenants) own and operate 44 aboveground storage tanks and 7 underground storage tanks of various sizes with a maximum aboveground storage tank storage capacity of 796,810 liters (210,495 gal) and maximum underground storage tank storage capacity of 102,000 liters (27,000 gal) (NASA 2019).

3.2.4.1 Regulatory Setting

The WFF Integrated Contingency Plan, developed by NASA to meet the requirements of 40 CFR Part 112 (Oil Pollution Prevention and Response), 40 CFR Part 265 Subparts C and D (Hazardous Waste Contingency Plan), and 9 VAC 25-91-10 (Oil Discharge Contingency Plan), serves as the facility's primary guidance document for the prevention and management of oil, hazardous material, and hazardous waste releases (NASA 2019).

The WFF Environmental Compliance and Restoration Program is responsible for the planning, implementation, and oversight of the investigation of past site activities to ensure the protection of human health and the environment in accordance with all applicable federal and state requirements and the WFF Integrated Contingency Plan. Projects include former NASA sites and U.S. Navy sites related to past operations and are prioritized to ensure sites with the highest priority are assessed first (NASA 2019). As part of the 2004 Administrative Agreement on Consent, NASA, USEPA, and the Virginia Department of Environmental Quality (VDEQ) have agreed that investigation, response, and remedial activities for sites resulting from former U.S. Navy activities at WFF (prior to NASA ownership) will be addressed as Formerly Used Defense Sites (FUDS). The FUDS program authorizes the USACE as the lead DOD agency for the environmental restoration of properties that were formerly under DOD control. In February 2015, NASA and the Department of the Army signed a Memorandum of Agreement which divided responsibilities for response actions between NASA and USACE and authorized NASA to manage the FUDS program at WFF on behalf of the USACE (NASA 2019). In 2020, NASA and USEPA finalized an Administrative Agreement and Order on Consent, which defined responsibilities for the management and restoration of impacted areas on WFF from FUDS. All FUDS and NASA sites are managed under a comprehensive Site Management Plan, which serves as a tool for planning, reviewing, and prioritizing the investigation and remedial activities at WFF.

All personnel involved with operational programs at WFF follow appropriate safety protocols, including OSHA regulations and training requirements. The handling, processing, storage, and disposal of hazardous materials or hazardous wastes from operations and maintenance activities are accomplished in accordance with all applicable federal and state requirements. Hazardous materials used at WFF may include ammonium perchlorate/aluminum (AP/Al), nitrocellulose/ nitroglycerin, hydrazine, cutting fluids, solvents, flammables, paint thinners, and laboratory reagents (NASA 2019). With respect to liquid propellants such as petroleum, cryogenic, and hypergolic propellants, the propellant, and oxidizer are stored in separate tanks per WFF's Range Safety Manual (NASA 2019). Storage and handling of all three types of liquid propellants adheres to WFF procedures.

To facilitate the transportation of rocket motors declared hazardous waste from the Main Base to Wallops Island, NASA has its own hazardous waste transporter license (VA8800010763). However, NASA uses licensed hazardous waste transporters to transport hazardous waste off site to licensed treatment, storage, and disposal facilities.

In a 2018, VDEQ reissued a treatment, storage, and disposal facility permit to WFF under RCRA for Open Burning treatment of waste solid rocket motors. WFF operates the Open Burning Area at the south end of Wallops Island. Once properly secured, the waste motors are ignited to burn off the solid propellant. Once the burn is complete, and the casings have cooled, the rocket motor casings are recycled as scrap metal (NASA 2019).

3.2.4.2 Region of Influence

The ROI for hazardous materials and hazardous waste would be limited to areas of WFF to be used for launch preparation, launch, and post-launch activities and in areas where hazardous materials are stored and handled.

3.3 Vandenberg Space Force Base

This section includes detailed descriptions of air quality, cultural resources, biological resources, public health and safety, and hazardous materials and wastes.

The potential impacts to the following resource areas within this geographical area are considered to be negligible or non-existent so they were not analyzed in detail in this EA/OEA:

Airspace: The JFC flight tests would be similar to but smaller than most previous missile tests including Minuteman III and numerous other missiles launched at VSFB. The potential impacts on controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, and airports and airfields would be similar to that described for missile launches in previous environmental documentation (USAF 2004, USAF 2006a, USASMDC/ARSTRAT 2013). VSFB would issue NOTAMs and NTMs ahead of any JFC flight test, in accordance with range safety and FAA requirements. No changes to current airspace management would be required to perform the JFC flight tests. A slight increase in air traffic due to arriving components and mission personnel would be expected but would not overwhelm or change current airspace management. Advanced planning and coordination with the FAA regarding scheduling of special use airspace, and coordination of the proposed JFC flight test relative to en route airways and jet routes, would result in no impacts on airspace within the VSFB ROI.

Water Resources: The GBSD EA/OEA (USAF 2021b; Section 3.2.13, Pages 3-92 through 3-94) describes in detail all the water resources and quality that exist at VSFB. Based on an estimation of the JFC flight tests potential releases, current regulations and infrastructure specific to VSFB, it was decided that any impacts to water resources from the JFC flight tests would not have large scale adverse impacts on hydrologic function at VSFB. No impact to water resources would be expected as a result of the Proposed Action.

Geological Resources: The GBSD EA/OEA (USAF 2021b; Section 3.2.6, Pages 3-76 through 3-77) describes in detail the geological resources that existed at VSFB. The JFC flight test would not require ground-disturbing activities at VSFB. There would be no mining or quarrying. No impacts to geological resources would be expected as a result of the Proposed Action.

Land Use: The Programmatic Assessment for the 2011-2015 INRMP, Vandenberg Air Force Base (VAFB 2011; Section 3.9, Pages 3-15 through 3-16) describes in detail the land uses at VSFB. The JFC flight test represents activities that are consistent with the mission and well within the limits of current operations of VSFB. No impacts to land use resources would be expected as a result of the Proposed Action.

Noise: The GBSD EA/OEA (USAF 2021b; Section 3.2.10, Pages 3-86 through 3-87) and the Programmatic Assessment for the 2011-2015 INRMP, Vandenberg Air Force Base (VAFB 2011; Section 3.10, Pages 3-16 through 3-17) describe in detail the noise environments that exist at VSFB. Empirical data on sound pressure of JFC vehicle launch have not yet been collected, but modeling indicates that initial liftoff of the launch vehicle would result in peak sound pressures of approximately 145 dB in-air (re 20 µPa) at approximately 30 m (100 ft) from the launch site (Kahle et al. 2021). After launch, the vehicle would ascend quickly, and sound pressures are expected to remain elevated above ambient sound levels for less than 60 seconds (Kahle et al. 2021). The JFC launch acoustics model used several conservative assumptions and did not account for atmospheric absorption, ground interference, or atmospheric conditions (Kahle et al. 2021); therefore, these sound pressure estimates should be considered maximum possible sound pressures from launch. There is a potential for a sonic boom to result from the JFC launch tests; however, the sonic boom should occur over the Pacific Ocean and leave land-based receptors unaffected. Potential noise impacts on wildlife receptors at VSFB are discussed in Biological Resources (**Section 3.3.3**). The JFC flight tests would result in a short-term noise event during the liftoff of the vehicle, but the noise would be well within the limits analyzed in the GBSD FEA/OEA, and only minor short-term impacts to the noise environment would occur. No long-term impacts to noise would be expected as a result of the Proposed Action.

Infrastructure: The GBSD EA/OEA (USAF 2021b; Section 3.2.9, Pages 3-83 through 3-86) and the Programmatic Assessment for the 2011-2015 INRMP, Vandenberg Air Force Base (VAFB 2011; Section 3.11, Pages 3-17 through 3-18; Section 3.14, Pages 3-19 through 3-20; and Section 3.15, Pages 3-20 through 3-21) describe in detail the infrastructure that exists at VSFB. VSFB has the existing infrastructure to support the JFC flight test. Many missile and space launches have occurred from VSFB. These include Minuteman III, Delta IV l Minotaur-C, Atlas V, OBV Interceptor, North Base, South Base, Falcon 9, and Delta IV launches, among others (USAF 2021b). The JFC Flight Tests are not expected to impact the VSFB’s infrastructure resources beyond the limits of current operations. No impacts to infrastructure resources would be expected as a result of the Proposed Action.

Socioeconomics: The GBSD EA/OEA (USAF 2021b; Section 3.2.11, Pages 3-87 through 3-88) describes in detail the socioeconomic resources that exist at VSFB. There would be a temporary increase in personnel at VSFB due to the JFC flight test. No impacts to socioeconomic resources would be expected as a result of the Proposed Action.

Environmental Justice: The GBSD EA/OEA (USAF 2021b; Section 3.2.11, Pages 3-87 through 3-88) describes in detail the environmental justice setting that exists at VSFB. The EPA’s Environmental Justice Screening and Mapping Tool, known as EJSCREEN, is a publicly available dataset that combines environmental and demographic indicators into 11 EJ indexes. For more information about EJSCREEN visit https://www.epa.gov/ejscreen. At VSFB, the highest percentile EJ index is the Superfund Proximity, at 76% national percentile. This models the count of sites proposed and listed on the National Priorities List at VSFB. The JFC flight test includes a launch trajectory, range safety regulations and procedures, and dispersing of noise over a wide area that averts disproportionate impacts to minority populations and low-income populations under EO 12898, and to child populations under EO 13045. No impacts to environmental justice would be expected as a result of the Proposed Action.

Aesthetics/Visual Resources: The Programmatic Assessment for the 2011-2015 INRMP, Vandenberg Air Force Base (VAFB 2011; Section 3.16, Page 3-21) describes in detail the aesthetics/visual resources at VSFB. The JFC flight test does not require any new construction at VSFB, and the visual aesthetics of VSFB would not be changed. No impacts to aesthetics/visual resources would be expected as a result of the Proposed Action.

Marine Sediments: The JFC flight tests do not require any offshore construction and the marine sediments of VSFB would not be changed. No effects to marine sediments at VSFB would be expected as a result of the Proposed Action because no expended material would be expected in the ROI.

3.3.1 Air Quality (VSFB)

This discussion of air quality includes criteria pollutants, standards, sources, permitting and greenhouse gases. Air quality in a location is defined by the concentration of various pollutants in the atmosphere. A region's air quality is influenced by many factors including the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions. Most air pollutants originate from human-made sources, including mobile sources (e.g., cars, trucks, buses) and stationary sources (e.g., factories, refineries, power plants), as well as indoor sources (e.g., some building materials and cleaning solvents). Air pollutants are also released from natural sources such as volcanic eruptions and forest fires.

3.3.1.1 Regulatory Setting

Criteria Pollutants and National Ambient Air Quality Standards

The principal pollutants defining the air quality, called "criteria pollutants," include carbon monoxide, sulfur dioxide, nitrogen dioxide, ozone, suspended particulate matter less than or equal to 10 microns in diameter (PM_{10}), fine particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$), and lead. carbon monoxide, sulfur dioxide, lead, and some particulates are emitted directly into the atmosphere from emissions sources. Ozone, nitrogen dioxide, and some particulates are formed through atmospheric chemical reactions that are influenced by weather, ultraviolet light, and other atmospheric processes.

Under the Clean Air Act, the USEPA has established National Ambient Air Quality Standards (NAAQS) (40 CFR Part 50) for these pollutants. NAAQS are classified as primary or secondary. Primary standards protect against adverse health effects; secondary standards protect against welfare effects, such as damage to farm crops and vegetation and damage to buildings. Some pollutants have long-term and short-term standards. Short-term standards are designed to protect against acute, or short-term, health effects, while long-term standards were established to protect against chronic health effects. See **Table 3-3**.

Table 3-3. National Ambient Air Quality Standards

Pollutant		Primary/ Secondary	Averaging Time	Level	Form
Carbon monoxide		Primary	8 hours	9 ppm	Not to be exceeded more than once per year
			1 hour	35 ppm	
Lead		Primary and Secondary	Rolling 3-month average	0.15 μg/m^3 (1)	Not to be exceeded
Nitrogen dioxide		Primary	1 hour	100 ppb	98th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Primary and Secondary	1 year	53 ppb (2)	Annual mean
Ozone		Primary and Secondary	8 hours	0.070 ppm (3)	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years
Particulate Matter	$PM_{2.5}$	Primary	1 year	12.0 μg/m^3	Annual mean, averaged over 3 years
		Secondary	1 year	15.0 μg/m^3	Annual mean, averaged over 3 years
		Primary and Secondary	24 hours	35 μg/m^3	98th percentile, averaged over 3 years
	PM_{10}	Primary and Secondary	24 hours	150 μg/m^3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide		Primary	1 hour	75 ppb (4)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years

Source: FAA 2020.

Notes: mg/m^3 = milligrams per cubic meter; μg/m^3 = micrograms per cubic meter; ppb = parts per billion; ppm = parts per million; PM_{10} = particulate matter less than or equal to 10 microns in diameter; $PM_{2.5}$ = fine particulate matter 2.5 microns or less in diameter

(1) In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 μg/m^3 as a calendar quarter average) also remain in effect.

(2) The level of the annual NO_2 standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.

(3) Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) ozone standards additionally remain in effect in some areas. Revocation of the previous (2008) ozone standards and transitioning to the current (2015) standards will be addressed in the implementation rule for the current standards.

(4) The previous SO_2 standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: (1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and (2) any area for which implementation plans providing for attainment of the current (2010) standard have not been submitted and approved and which is designated nonattainment under the previous SO_2 standards or is not meeting the requirements of a SIP call under the previous SO_2 standards (40 CFR 50.4(3)), A SIP call is an EPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the required NAAQS.

Areas that are in compliance with the NAAQS are designated as attainment areas. Areas that violate a federal air quality standard are designated as nonattainment areas. Areas that have transitioned from nonattainment to attainment are designated as maintenance areas and are required to adhere to maintenance plans to ensure continued attainment.

The Clean Air Act requires states to develop a general plan to attain and maintain the NAAQS in all areas of the country and a specific plan to attain the standards for each area designated nonattainment for a NAAQS. These plans, known as State Implementation Plans, are developed by state and local air quality management agencies and submitted to USEPA for approval.

In addition to the NAAQS for criteria pollutants, national standards exist for hazardous air pollutants (HAPs), which are regulated under Section 112(b) of the 1990 Clean Air Act Amendments. The *National Emission Standards for Hazardous Air Pollutants* regulate HAP emissions from stationary sources (40 CFR Part 61).

Mobile Sources

HAPs emitted from mobile sources are called Mobile Source Air Toxics (MSATs). MSATs are compounds emitted from highway vehicles and non-road equipment that are known or suspected to cause cancer or other serious health and environmental effects. In 2001, USEPA issued its first MSAT Rule, which identified 201 compounds as being HAPs that require regulation. A subset of six of the MSAT compounds was identified as having the greatest influence on health and included benzene, butadiene, formaldehyde, acrolein, acetaldehyde, and diesel particulate matter. More recently, USEPA issued a second MSAT Rule in February 2007, which generally supported the findings in the first rule and provided additional recommendations of compounds having the greatest impact on health. The rule identified several engine emission certification standards that must be implemented (40 CFR Parts 59, 80, 85, and 86; Federal Register Volume 72, No. 37, pp. 8427–8570, 2007). Unlike the criteria pollutants, there are no NAAQS for benzene and other HAPs. The primary control methodologies for these pollutants for mobile sources involves reducing their content in fuel and altering the engine operating characteristics to reduce the volume of pollutant generated during combustion.

General Conformity

The USEPA General Conformity Rule applies to federal actions occurring in nonattainment or maintenance areas when the total direct and indirect emissions of nonattainment pollutants (or their precursors) exceed specified thresholds. The emissions thresholds that trigger requirements for a conformity analysis are called *de minimis* levels. *De minimis* levels (in tons per year [tpy]) vary by pollutant and depend on the severity of the nonattainment status for the air quality management area in question. De minimis threshold emissions are presented in **Table 3-4**.

Table 3-4. General Conformity De minimis Levels

Pollutant	Area Type	TPY
Ozone (VOC or nitrogen oxides)	Serious nonattainment	50
	Severe nonattainment	25
	Extreme nonattainment	10
	Other areas outside an ozone transport region	100
Ozone (nitrogen oxides)	Marginal and moderate nonattainment inside an ozone transport region	100
	Maintenance	100
Ozone (VOC)	Marginal and moderate nonattainment inside an ozone transport region	50
	Maintenance within an ozone transport region	50
	Maintenance outside an ozone transport region	100
Carbon monoxide, sulfur dioxide, and nitrogen dioxide	All nonattainment and maintenance	100
PM_{10}	Serious nonattainment	70
	Moderate nonattainment and maintenance	100
$PM_{2.5}$ Direct emissions, sulfur dioxide, nitrogen oxides (unless determined not to be a significant precursor), VOC or ammonia (if determined to be significant precursors)	All nonattainment and maintenance	100
Lead (Pb)	All nonattainment and maintenance	25

Source: U.S. Navy 2019a.
Abbreviations: tpy = tons per year, VOC = volatile organic compounds

Permitting

The Title V Operating Permit Program consolidates all Clean Air Act requirements applicable to the operation of a source, including requirements from the State Implementation Plan, preconstruction permits, and the air toxics program. It applies to stationary sources of air pollution that exceed the major stationary source emission thresholds, as well as other non-major sources specified in a particular regulation. Navy installations subject to Title V permitting shall comply with the requirements of the Title V Operating Permit Program, which are detailed in 40 CFR Part 70 and all specific requirements contained in their individual permits.

Greenhouse Gases

Greenhouse gases (GHGs) are gas emissions that trap heat in the atmosphere. These emissions occur from natural processes and human activities. Scientific evidence indicates a trend of increasing global temperature over the past century due to an increase in GHG emissions from human activities. The climate change associated with this global warming is predicted to produce negative economic and social consequences across the globe.

On February 2, 2021 the CEQ rescinded the CEQ's 2019 Draft GHG Guidance regarding how federal agencies should consider GHG emissions and climate change in NEPA analyses. At the time of publication of this EA/OEA, the CEQ has not issued a revised version of its 2016 GHG Guidance. As stated in the 2016 Guidance, a projection of a proposed action's direct and reasonably foreseeable indirect GHG emissions may be used as a proxy for assessing potential climate effects. Because the JFC AUR is an experimental vehicle, and GHG impacts will be analyzed qualitatively by comparison to previous flight test launches.

The USEPA issued the *Final Mandatory Reporting of Greenhouse Gases Rule* on September 22, 2009. GHGs covered under the *Final Mandatory Reporting of Greenhouse Gases Rule* and subsequent revisions are carbon dioxide, methane, nitrogen oxides, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and other fluorinated gases including nitrogen trifluoride and hydrofluorinated ethers. Each GHG is assigned a global warming potential. The global warming potential is the ability of a gas or aerosol to trap heat in the atmosphere. The global warming potential rating system is standardized to carbon dioxide, which has a value of one. The equivalent carbon dioxide rate is calculated by multiplying the emissions of each GHG by its global warming potential and adding the results together to produce a single, combined emissions rate representing all GHGs. Under the rule, suppliers of fossil fuels or industrial GHGs, manufacturers of mobile sources and engines, and facilities that emit 25,000 metric tons or more per year of GHG emissions as carbon dioxide equivalent are required to submit annual reports to USEPA.

According to the NOAA 2019 Global Climate Summary, the combined land and ocean temperature has increased at an average rate of 0.07 degrees Celsius (°C; 0.13 degrees Fahrenheit [°F]) per decade since 1880; however, the average rate of increase since 1981 (0.17°C [0.32°F]) is more than twice as great (USAF 2021a). The warmest global average temperatures on record have all occurred within the past 20 years, with the warmest years being (in order) 2016, 2019, 2017, and 2018 (USAF 2021a). NOAA has reported that 2020 had the second highest August temperatures after 2016, and projects that 2020 will be ranked among the top five warmest years before the end of the year (USAF 2021a).

State Regulations

The California Air Resources Board. The California Air Resources Board focuses on California's unique air quality challenges by setting the state's own stricter emissions standards for a range of statewide pollution sources including vehicles, fuels, and consumer products (USAF 2021b). The board also monitors levels of criteria pollutants at representative sites throughout CA.

The California Ambient Air Quality Standards (CAAQS). CAAQS includes additional standards for the federally-identified criteria pollutants, as well as sulfates, visibility reducing particles, hydrogen sulfide, and vinyl chloride (chloroethene). California law continues to mandate CAAQS, although attainment of the NAAQS has precedence over attainment of the CAAQS due to federal penalties for failure to meet federal attainment deadlines (USAF 2021b).

Local Regulation

County of Santa Barbara. In conjunction with the USEPA and the California Air Resources Board, the Santa Barbara County Air Pollution Control District regulates air quality in Santa Barbara County and at VSFB. The Santa Barbara County Air Pollution Control District maintains a comprehensive inventory of air pollutants released within the county. This inventory accounts for types and amounts of pollutants emitted from a wide variety of sources, including on-road motor vehicles, fuel combustion at industrial facilities, solvent and surface coating usage, consumer product usage, and emissions from natural sources. The emission inventory is used to describe and compare contributions from air pollution sources, evaluate control measures, schedule rule adoptions, forecast future pollution, and prepare clean air plans (USAF 2021b). In 2018, there were 17 monitoring stations operating in Santa Barbara County (USAF 2021b). The four stations in nearest proximity of VSFB are Vandenberg South Base, Lompoc H Street, Lompoc North, and Santa Maria (USAF 2021b).

3.3.1.2 Region of Influence

The ROI for potential impacts related to air quality is the perimeter of VSFB and surrounding areas, which are located in the South Central Coast Intrastate Air Quality Control Region (AQCR 032) (40 CFR 81.166) within the Santa Barbara County Air Pollution Control District. TP-01 would be the area of greatest air emissions from the launch of the JFC AUR; however, because of the rapid acceleration of the vehicle, the majority of vehicle exhaust products are expected to enter the atmosphere above the mixing layer where they would disperse quickly, reducing ground-level impacts. The state coastal boundaries are part of the same air quality jurisdiction area as the contiguous land area.

Criteria Pollutants and National Ambient Air Quality Standards

Emissions of criteria air pollutants are inventoried by the state Air Resources Board by stationary, area-wide, mobile, and natural sources. In 2018, Santa Barbara County met the federal ambient air quality standards for all measured pollutants except PM_{10} (USAF 2021b). Countywide, there were no exceedances of the federal or state ozone standard and all other areas within Santa Barbara County were below the federal and state ambient air quality standards during 2018 (USAF 2021b). See **Table 3-5** and **Table 3-6** for Santa Barbara County emissions for calendar year 2019 (the most recent year of data).

Table 3-5. Estimated Annual Average Emissions – Santa Barbara County, California (Tons per Year[1])

Source Type	CO	NO_X	SO_X	PM_{10}	$PM_{2.5}$	VOC	CO_2e	HAPs
Stationary	1,759	828	77	128	75	1,035	192,678	187
Area	2,862	1,196	106	4,206	902	5,636	N/A	445
On-Road	9,354	2,408	17	258	124	1,284	1,837,357	349
Nonroad	6,217	855	0	64	55	665	200,739	22
Total	20,245	5,287	200	4,656	1,155	8,619	2,230,774	1,208

Source: USEPA 2020

Notes: CO = carbon monoxide, NO_x = oxides of nitrogen, SO_x = oxides of sulfur, 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, VOC = volatile organic compound, CO_2e = carbon dioxide equivalent, HAP = hazardous air pollutant

(1) Emissions are based on ton/day x 365 days per year; rounded to nearest tenth.

Table 3-6. Estimated Ozone Precursor[1] for Santa Barbara County, California

CO	NOx	VOC[2]
51,613	42,210	35,369

Source: California EPA Air Resources Board 2019

Notes: CO = carbon monoxide, NOx = oxides of nitrogen, VOC = volatile organic compound

(1) Ozone precursors are associated with gas formation from NOx, CO, and VOCs. (UCAR 2020)

(2) Reported as Reactive Organic Gas (ROG)

Mobile Sources

Emissions sources on VSFB include both point and area sources. The sources are divided into 20 subcategories. On-base mobile sources of air emissions include various aircraft, missile and spacecraft launches, and numerous Government and personal motor vehicles. **Table 3-7** summarizes overall emissions for VSFB (based on most recent year of data).

Table 3-7. Criteria Pollutant and HAP Emissions Attributable to VSFB (Tons per Year)

Source	VOC	PM_{10}	$PM_{2.5}$	SO_x	NO_x	CO	Lead	HAP	CO_2e
VSFB Stationary & Mobile	39.90	6.86	–	3.51	82.74	212.73	0.0	0.71	11,456
Santa Barbara County	8,619	4,656	–	200	5,287	20,245	0.0	1,208	2,230,774
VSFB Emission % of Santa Barbara County Emissions	0.5%	0.2%	–	1.8%	1.6%	1.1%	0.0	006%	0.51%

Source: VAFB 2018b

Notes: VOC = volatile organic compound, 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 = oxides of sulfur, NO_x = oxides of nitrogen, CO = carbon monoxide, HAP = hazardous air pollutant, CO_2e = carbon dioxide equivalent

(1) Reactive organic compound (ROC) equals Volatile Organic Compound

(2) A dash (–) indicates that the pollutant is not measured at this location.

General Conformity

Table 3-8 summarizes the Attainment Status for Santa Barbara County based on the CAAQS and NAAQS. Because VSFB is federally-owned land, and there are existing federal penalties for failure to meet federal attainment deadlines, the NAAQS have precedence over attainment of the CAAQS at VSFB.

Table 3-8. Attainment Status for Santa Barbara County, California

Pollutant	California Designation	Federal Designation
Ozone	Nonattainment-Transitional	Unclassified/Attainment
PM_{10}	Nonattainment	Attainment
$PM_{2.5}$	Unclassified	Unclassified/Attainment
CO	Attainment	Attainment
NO_2	Attainment	Unclassified/Attainment
SO_2	Attainment	Unclassified/Attainment
Sulfates	Attainment	Unclassified/Attainment
Lead	Attainment	Attainment
Hydrogen Sulfide	Attainment	Unclassified/Attainment
Vinyl Chloride	Attainment/Unclassified	Attainment/Unclassified
Visibility Reducing Particles	Attainment	Unclassified/Attainment

Note: 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, CO = carbon monoxide, NO_2 = nitrogen dioxide, SO_2 = sulfur dioxide

Source: Santa Barbara County-Air Pollution Control District 2019

According to **Table 3-8**, Santa Barbara County is considered in attainment under NAAQS (40 CFR 93; SBCAPCD Rule 702). Conformity determinations are not required for this Proposed Action since TP-01 is located within a NAAQS attainment area for all regulated criteria pollutants.

Permitting

No new air emission permits would be required for this Proposed Action, since no new stationary sources of air pollution would be introduced (i.e., generators, etc.). No changes to existing VSFB air emission permits would be necessary for this Proposed Action.

Greenhouse Gases

Because VSFB is along the coast, the base would be impacted by global sea level rise. Sea level is likely to rise between 0.3 and 1.2 m (1 and 4 ft) in the next century (USAF 2021b). According to a recent 2019 DoD report, VSFB is currently, and has the potential to be impacted by recurrent flooding, drought, and wildfires due to the effects of a changing climate (USAF 2021b).

According to GHG emissions tracked by Santa Barbara County, transportation sources are the largest contributor of GHG, followed by building energy use, agriculture, solid waste and water and wastewater (USAF 2021b). The latest VSFB GHG emissions report indicates that the total carbon dioxide equivalent (CO_2e) produced at VSFB for calendar year 2019 11,456 tons/year (**Table 3-9).**

Table 3-9. Greenhouse Gas Emissions for VSFB (Tons per Year)

Source Category	CO_2e
Nitrous Oxide	9.4
Carbon Dioxide	11,416.3
Methane	28.4
Carbon Tetrachloride	0.0139
1,1,1-Trichloroethane	0.0007
HCFC-22	0.0187
Fluorotrichloromethane	0.041
Dichlorodifluoromethane	1.58
Total	11,455.75

Source: USAF 2021b

Note: CO_2e = carbon dioxide equivalent

3.3.2 Cultural Resources (VSFB)

3.3.2.1 Regulatory Setting

The NHPA protects cultural resources in the United States. Section 106 of the NHPA requires a federal agency to consider the effects of the Proposed Action on historic properties. Compliance with Section 106 requires consultation with the California State Historic Preservation Officer.

3.3.2.2 Region of Influence

The ROI for potential impacts includes work areas associated with JFC flight test launch operations, including payload processing, transport, and launch.

The GBSD FEA/OEA (USAF 2021b; Section 3.2.5, Pages 3-39 through 3-44) describes in detail the cultural resources that exist at VSFB.

VSFB contains a multitude of cultural resources, and an Integrated Cultural Resources Management Plan has been prepared by the USAF to address the management and preservation of these resources. There are over 2,500 cultural resources across VSFB (VAFB 2019). This total includes approximately 2,200 archaeological sites, of which about 1,900 are prehistoric and 300 are historic (VAFB 2019). The remainder includes 140 Native American traditional cultural sites, 110 early historic structures, 72 potentially eligible Cold War structures, several historic roads and trails, five paleontological sites, and a few potentially historic landscapes (VAFB 2019). A total of 188 of the archaeological sites were determined to be eligible for the National Register of Historic Places (VAFB 2019). Federal law prohibits the collection of artifacts or disturbance of such sites on VSFB and all other federal property, except for permitted scientific purposes.

VSFB has an agreement with the Santa Ynez Band of Chumash Indians that formalizes the process for identification, recovery, analysis, and reburial of Native American remains and associated grave goods, in accordance with the Native American Graves Protection and Repatriation Act (VAFB 2019). As an SOP for all new projects, review by the VSFB Installation Management Flight (30 CES/CEI) and base archaeologist is required to determine the impact proposed development may have on the various cultural resources, and whether sufficient mitigation can be accomplished to allow development to proceed (VAFB 2019).

According to the GBSD FEA/OEA, TP-01 has no National Register of Historic Places eligibility (USAF 2021b). Three ineligible archaeological resources (CA-SBA-1155, CA-SBA-1181, and CA-SBA-1687) are located nearby; however, these resources do not constitute historic properties (USAF 2021b).

During preparation of this EA/OEA, VSFB (30 CES/CEI) representatives alerted the JFC Project Team Management that "Proposed federal action Alternative 3 (at [VSFB]) is not subject to compliance with Section 106 of the NHPA."

3.3.3 Biological Resources (VSFB)

Biological resources on and near VSFB are defined as in **Section 3.1.2**.

3.3.3.1 Regulatory Setting

The regulatory setting under the ESA, MMPA, and MBTA is described in detail in **Section 3.1.2.1** including relevant definitions under these Acts, and the BGEPA is described in **Section 3.2.2.1**. The MSA as described in **Section 3.1.2.1** also applies to waters offshore of VSFB.

3.3.3.2 Region of Influence

The ROI for biological resources at VSFB includes the areas subject to effects of the Proposed Action as described in **Chapter 2.0** including:

- The locations of the launch pad and test support facilities at VSFB to be used for the Proposed Action (see **Figure 3-2**);
- The over-ocean flight corridor over U.S. territorial waters (within 12 nm of shore) near VSFB; and
- Terrestrial and marine areas in the vicinity of these sites which may be subject to effects of the Proposed Action including elevated noise levels.

VSFB includes a variety of terrestrial habitats from sea level to 640 m (2,100 ft) elevation. Located in a dry subtropical climate zone, VSFB includes pine forest, oak forest, woodland, riparian, wetland, maritime chaparral, coastal scrub, coastal strand, salt marsh, freshwater marsh, and grassland habitats (USAF 2011). Biological resources in the VSFB ROI include terrestrial and marine vegetation as well as terrestrial and marine wildlife. The ROI is the area within VSFB boundaries, as well as adjacent areas that may be affected by elevated sound levels, deposition of hazardous materials, and increased human activity.

Biological resources at VSFB are currently managed under the installation's INRMP (USAF 2011) which includes a Wildland Fire Management Plan, Bird/Wildlife Aircraft Strike Hazard Plan, Fish and Wildlife Management Plan, Wetlands and Riparian Habitats Management Plan, Coastal and Riparian Habitats Management Plan, Threatened and Endangered Species Management Plan, and Integrated Pest Management Plan. Biological resources at VSFB were recently evaluated for the effects of test launch operations in the GBSD EA/OEA (USAF 2021b), the Minuteman III Modification and Fuze Modernization SEA (USAF 2020a), and the Conventional Strike Missile Demonstration EA (SMSC 2010). The affected environment for biological resources at VSFB remains the same as that described in the GBSD EA/OEA (USAF 2021b), Minuteman III SEA (USAF 2020a); and Conventional Strike Missile Demonstration EA (SMSC 2010); therefore, this section provides a summary of biological resources in the ROI but more detailed descriptions are incorporated by reference to these documents. Biological resources within the affected environment for the Proposed Action are described with the purpose of evaluating the effects of the Proposed Action and in proportion to the magnitude of potential effects.

Terrestrial Vegetation

A wide variety of vegetation types occur on VSFB as described in detail in the GBSD Test Program EA/OEA (USAF 2021b) and the VSFB INRMP (USAF 2011). The VSFB main cantonment area consists of highly disturbed urban and industrial areas dominated by landscaped and maintained vegetation. Vegetation immediately surrounding the existing launch pad proposed for JFC use (TP-01) is regularly maintained as firebreak and is considered disturbed vegetation (USAF 2021b, USAF 2011). Other vegetation types near the existing launch pad include central dune scrub and central coastal scrub habitats (ManTech SRS Technologies Inc. 2020, USAF 2020c, USAF 2011).

Five ESA-listed plant species occur on VSFB including Gaviota tarplant (*Deinandra increscens ssp. villosa*), Vandenberg monkey flower (*Diplacus vandenbergensis*), Lompoc yerba santa (*Eriodictyon capitatum*), beach layia (*Layia carnosa*), and Gambel's watercress (*Nasturtium gambellii*) (USAF 2011). Numerous surveys for ESA-listed plants have been conducted on VSFB (USAF 2010) and the area surrounding TP-01 was surveyed prior to the Conventional Strike Missile Demonstration EA (SMSC 2010). No ESA-listed species were found in the area near TP-01 and none are expected to occur there. The closest reported occurrence of Gaviota tarplant was 2.6 km (1.6 mi) from TP-01 (SMSC 2010) and the closest reported occurrence of beach layia was approximately 2.2 km (1.4 mi) from TP-01, both outside the ROI for the Proposed Action.

Major threats to native vegetative communities in the ROI include invasive nonnative species, wildfire, and human development (USAF 2011). Invasive plant species such as iceplants (Family Aizoaceae), veldt grass (*Ehrharta calycina*), European beachgrass (*Ammophila arenaria*), and jubata grass (*Cortaderia jubata*) threaten dune and chaparral plant communities on VSFB (USAF 2011). While several vegetation types at VSFB are fire-adapted, unnatural fire intensity or interval may lead to invasion by exotic plant species (USAF 2011).

Terrestrial Wildlife

The variety of habitats at VSFB provide for a wide diversity of terrestrial and freshwater animal species. A comprehensive list of these species can be found in Appendix A of the VSFB INRMP (USAF 2011) and is incorporated here by reference. This section focuses on important, rare, and special-status wildlife species in the ROI as well as on species which may be sensitive to the effects of the Proposed Action.

Mammals. At least 53 mammal species occur on VSFB and in adjacent nearshore waters (USAF 2011). Typical terrestrial mammal species in the ROI include Virginia opossum (*Didelphis virginiana*), desert cottontail (*Sylvilagus audubonii*), brush rabbit (*Sylvilagus bachmani*), California ground squirrel (*Spermophilus beecheyi*), coyote (*Canis latrans*), gray fox (*Urocyon cinereoargenteus*), badger (*Taxidea taxus*), raccoon, striped skunk (*Mephitis mephitis*), mule deer

(*Odocoileus hemionus*), deer mouse (*Peromyscus maniculatus*), agile kangaroo rats (*Dipodomys agilis*), and dusky-footed woodrats (*Neotoma fuscipes*) among others (USAF 2021b, USAF 2011). Several bat species occur on VSFB and have the potential to occur in the ROI, including three State of California Species of Special Concern: the pallid bat (*Antrozous pallidus*), Townsend's big-eared bat (*Corynorhinus townsendii*), and the western mastiffbat (*Eumops perotis californicus*) (USAF 2011).

Birds. At least 315 bird species have been documented on VSFB and in nearshore environments, 115 of these species have been known to breed on the installation (USAF 2011). These species include a diversity of seabirds, shorebirds, waterfowl, marshbirds, landfowl, raptors, owls, woodpeckers, hummingbirds, and passerines (perching birds including songbirds) (USAF 2011). A complete list of bird species known to occur on VSFB can be found in the VSFB INRMP Fish and Wildlife Management Plan (USAF 2011) and is incorporated here by reference. All native migratory bird species present in the ROI are protected under the MBTA.

Several special-status bird species also occur in the ROI (**Table 3-10**) which includes areas that would be exposed to elevated noise levels from launches. Many seabirds and shorebirds occur along the coast and in nearshore waters including some BCC species (i.e., ashy storm-petrel, black oystercatcher, long-billed curlew, and black skimmer) and State of California Species of Special Concern (i.e., common loon, ashy storm-petrel, and black skimmer) (USAF 2011). Three ESA-listed bird species occur in the ROI; Western snowy plovers (*Charadrius nivosus*), California least terns (*Sterna antillarum browni*), and marbled murrelets (*Brachyramphus marmoratus*) (USAF 2011). Bald eagles are occasionally observed flying over VSFB (USAF 2011) but are considered rare in the ROI.

Western snowy plovers occur on VSFB beaches and dunes year-round with both resident and migrant birds (USAF 2011). Western snowy plover habitat occurs within the ROI for launch noise at VSFB (**Figure 3-2**). In the ROI, snowy plovers breed from March through September (USAF 2011) with peak nesting from mid-April to mid-June (USFWS 2007). VSFB is also an important wintering area for snowy plovers and in 2004, VSFB supported approximately 22% of the California population (USAF 2011).

California least terns are found along the Pacific Coast of California where they nest in colonies from mid-April through August (USAF 2011). The distribution of nesting California least terns in the ROI is limited. With the exception of two nests on San Antonio Beach in 2002, least terns have only nested at a colony at Purisima Point since 1998 (USAF 2011). The tern colony at Purisima Point is over 6 km (4 mi) from TP-01 (**Figure 3-2**).

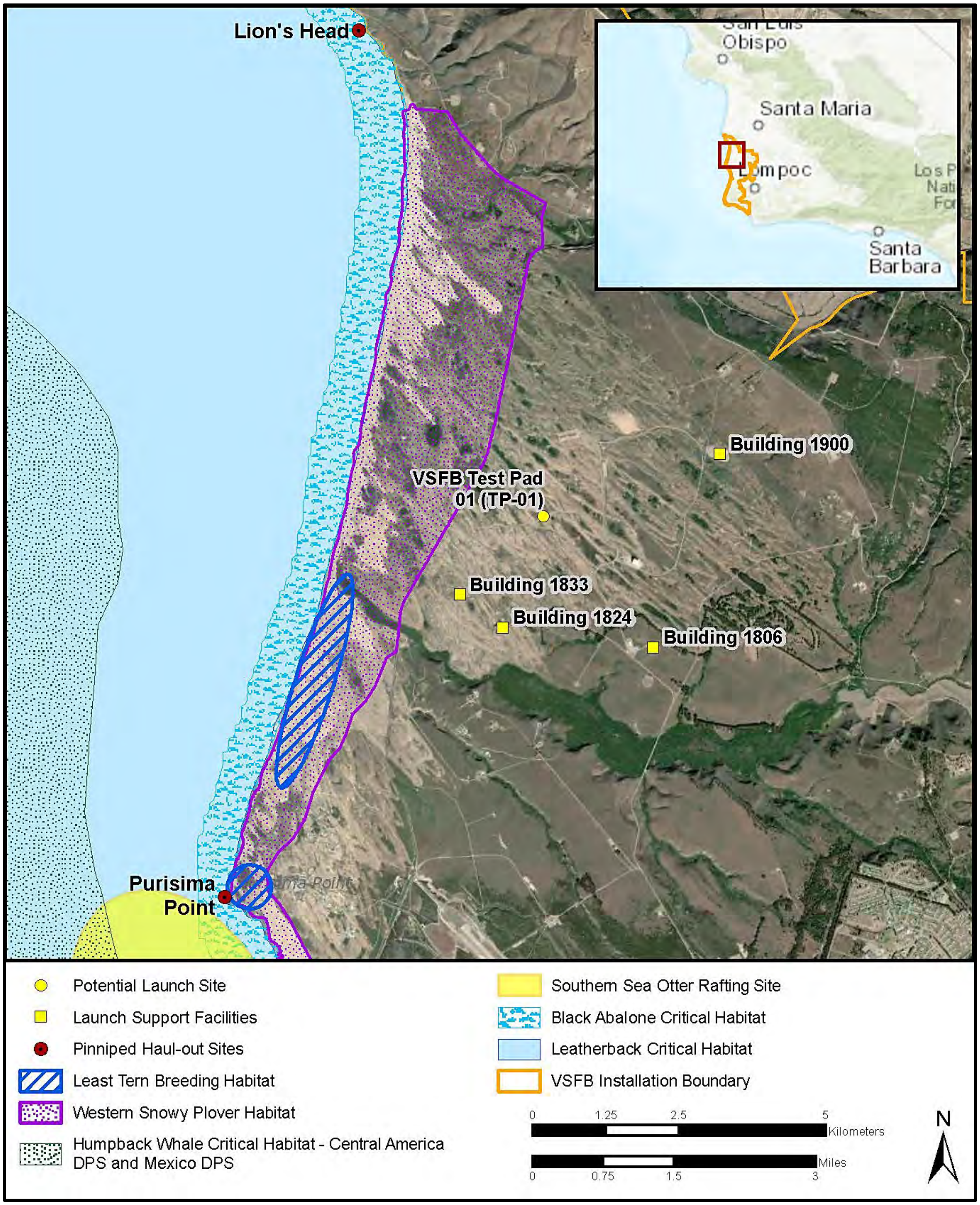

Figure 3-2. Designated Critical Habitat and other Important Wildlife Habitat near VSFB.

Table 3-10. ESA and State of California Listed Species with the Potential to Occur in the VSFB ROI.

Common Name	Scientific Name	Federal Listing Status	State Listing Status	Area of Occurrence at VSFB
Mammals				
Southern sea otter	*Enhydra lutris nereis*	T	-	Nearshore marine
Birds				
Marbled murrelet	*Brachyramphus marmoratus*	T	E	Nearshore marine
Western snowy plover	*Charadrius nivosus nivosus*	T	-	Coastal sandy beaches and dunes
Bald eagle	*Haliaeetus leucocephalus*	-	E	Rarely observed flying
California least tern	*Sterna antillarum browni*	E	E	Coastal beaches and dunes. Nesting at Purisima Point.
Invertebrates				
Vernal pool fairy shrimp	*Branchinecta lynchi*	T	-	Vernal pools
Reptiles and Amphibians				
California red-legged frog	*Rana draytonii*	T	-	Wetlands

Sources: USAF 2011, USAF 2021b

Abbreviations: E= Endangered, T = Threatened, VSFB = Vandenberg Space Force Base, “-“ = not listed.

Marbled murrelets occur only at-sea in the ROI; no suitable breeding or nesting habitat for this species occurs on VSFB. These birds are considered rare in nearshore waters off VSFB (USAF 2011) but have the potential to occur at-sea in the launch corridor.

Reptiles and Amphibians. California red-legged frogs (*Rana draytonii*) are listed as threatened under the ESA and occur in nearly all permanent streams and ponds on VSFB as well as in some seasonal wetlands (USAF 2011). While these frogs breed in waterbodies, juvenile and adult frogs may disperse long distances from breeding sites and have been found up to 120 m (400 ft) from breeding sites in adjacent dense riparian habitats (USFWS 2015). All aquatic and riparian areas within the range of the species are considered suitable habitat for this species as well as any landscape features that provide cover and moisture (USFWS 2015).

Invertebrates. The ESA-listed vernal pool fairy shrimp (*Branchinecta lynchi*) is a small freshwater crustacean that occurs in vernal pool habitats on VSFB (USAF 2011, USFWS 2015). The USAF has surveyed for fairy shrimp in many vernal pools on VSFB and has also evaluated the suitability of vernal pools for fairy shrimp as part of their management of this species (USAF 2011). The closest known vernal pool fairy shrimp habitat is approximately 3 km (1.9 mi) from TP-01; therefore, this species is not likely to occur in the ROI.

Buckwheat blue butterflies (undescribed *Euphilotes* sp.) occur in coastal scrub habitats where they are closely dependent on their host plant, seacliff buckwheat (*Eriogonum parvifolium*). Until 2020, the buckwheat blue butterfly found on VSFB was thought to be the federally endangered El Segundo blue butterfly (*Euphilotes battoides allyni*) (USAF 2021b). However, recent genetic evidence has indicated that blue butterfly populations on VSFB are genetically distinct from the El Segundo blue butterfly and likely represents a unique species (USAF 2021b, Dupuis et al. 2020). The buckwheat blue butterfly and its host plant are known to occur near TP-01 and at the western end of the access road to the launch pad, Rhea Road (USAF 2021b).

Marine Wildlife

Nearshore marine habitats off the coast of VSFB include saltwater lagoons, estuaries, intertidal habitats, subtidal benthic habitats, and relatively shallow neritic waters (USAF 2011, CDFW 2015). The intertidal zone provides a diversity of habitats including rocky areas, sandy beaches, seagrass beds, and saltwater wetlands (CDFW 2015). These intertidal habitats support a wide diversity of marine algae; numerous sponge, crustacean, mollusk, echinoderm, and other invertebrate species; and a diversity of fish, mammal, and marine bird species (CDFW 2015). The nearshore subtidal benthic and pelagic habitats are relatively shallow (up to approximately 30 m [98 ft] deep) and include seagrass beds, kelp forests, subtidal reefs, muddy or sandy substrate areas, and open water (CDFW 2015). These subtidal habitats also support a wide diversity of algae, plankton, mollusks, and fish, as well as providing an abundant food for many marine mammals and birds (CDFW 2015).

The potential impacts of the Proposed Action in nearshore marine areas (within territorial waters) are limited to elevated noise levels and disturbance due to vehicle overflight. Therefore, there is limited potential for impact to marine wildlife in the VSFB ROI and marine resources are only briefly summarized here with focus on special-status species that might be affected. Other special-status marine wildlife may occur in nearshore waters such as some ESA-listed salmonids, sea turtles, pinnipeds, and potentially other marine mammals that use nearshore habitats (see USAF 2011 for a complete list). However, the Proposed Action activities at VSFB are not expected to result in stressors to these species in this portion of the ROI and these species are not discussed further. More detailed descriptions of marine resources offshore of VSFB can be found in the VSFB INRMP (USAF 2011).

<u>Marine Mammals</u>. Four marine mammal species are known to haul out or breed on VSFB beaches and rocky outcrops: Steller sea lion (*Eumetopias jubatus*), northern elephant seals (*Mirounga angustirostris*), Pacific harbor seals (*Phoca vitulina ruchardii*), and California sea lions (*Zalophus californianus*) (USAF 2011). All of these pinnipeds are protected under the MMPA. With the exception of harbor seals and northern elephant seals, these pinnipeds haul out on the base seasonally but do not breed there. California sea lions haul out seasonally at Point Sal and South Rocky Point (USAF 2011). Northern elephant seals have used VSFB for reproduction since 2017 and have also been observed hauled out near Rocky Point.

Pacific harbor seals are known to breed on VSFB (USAF 2011). These seals haul out on base year-round at Purisima Point, just south of Purisima Point (referred to as Spur Road haul-out site) (**Figure 3-2**), and from near the boat dock at the Vandenberg Harbor north to South Rocky Point (USAF 2011). The South Rocky Point haul-out area is the main harbor seal pupping and breeding site, with peak breeding and pupping from February through May (USAF 2011). The Purisima Point pinniped haul-out site is closest to TP-01 and is within the ROI for proposed testing activities (**Figure 3-2**).

One ESA-listed mammal, the Southern sea otter *(Enhydra lutris nereis),* occurs in nearshore marine habitats of the ROI where they feed primarily on abalones, sea urchins, crabs, and clams (USAF 2011). Sea otters spend a significant portion of their time at the water surface and are usually found rafting in kelp beds (USAF 2011). One primary rafting area for the sea otter breeding colonies offshore of VSFB occurs near Purisima Point.

Fish. Some important marine fish in the ROI include game fish such as surfperch species, rockfish (*Sebastes* spp.), cod (*Ophiodon elongatus*), cabezon (*Scorpaenichthys marmoratus*), and kelp bass (*Paralabrax clathratus*) (USAF 2011). The only special-status fish species with the potential to occur in nearshore habitats of the ROI is the southern steelhead (*Oncorhynchus mykiss*) (USAF 2011). Proposed Action activities at VSFB are not expected to result in stressors to this species and it is not considered further.

Invertebrates. Important marine invertebrates in coastal habitats include California spiny lobster (*Panulirus interruptus*), rock crabs (*Cancer* spp.), and three abalone species (*Haliotis* spp.) (USAF 2011). One ESA-listed invertebrate is known to occur in nearshore habitats off the coast of VSFB, the black abalone (*Haliotis cracherodii*); however, Proposed Action activities at VSFB are not expected to result in stressors to this species and it is not considered further in this EA.

Environmentally Sensitive Habitats

Critical Habitat. There is no designated critical habitat on VSFB. Designated critical habitat for several terrestrial and freshwater ESA-listed species occur near VSFB including Vandenberg monkey flower, La Graciosa thistle (*Cirsium loncholepis*), California red-legged frog, and Southern California DPS of steelhead. However, the Proposed Action would have no impact on designated critical habitat for these terrestrial or freshwater species and is not discussed or analyzed further in this EA/OEA.

Critical habitat for black abalone occurs in nearshore marine waters off VSFB (see **Figure 3-2**). Black abalone critical habitat includes approximately 360 square kilometers (km^2, 139 mi^2) of rocky intertidal and subtidal marine habitats from the mean high-water line to a depth of 6 m (20 ft) along the California coast as well as several islands. Primary constituent elements essential for the conservation of black abalone include rocky substrate, food resources (bacterial and diatom films, coralline algae, and a source of detrital macroalgae), juvenile settlement habitat, (rocky intertidal and subtidal habitat), suitable water quality, and suitable nearshore circulation (76 FR 66806 [October 27, 2011]).

Leatherback sea turtle critical habitat was designated along the U.S. West Coast in 2012 (77 FR 4170 [January 26, 2012]) (see **Figure 3-2**). The designation covers approximately 43,798 km^2 (16,910 mi^2) of waters along the California coast and includes waters from the surface down to a maximum of 80 m (262 ft) from the shoreline out to the 3,000 m (9,840 ft) depth contour (77 FR 4170 [January 26, 2012]). The primary constituent element essential for conservation of leatherback sea turtles identified in the final rule is "the occurrence of prey species, primarily scyphomedusae of the order Semaeostomeae (e.g., Chrysaora, Aurelia, Phacellophora, and Cyanea), of sufficient condition, distribution, diversity, abundance and density necessary to support individual as well as population growth, reproduction, and development of leatherbacks" (77 FR 4170 [January 26, 2012]).

Designated critical habitat for both the Central America DPS and Mexico DPS of humpback whales occurs offshore of VSFB (see **Figure 3-2**). These designated critical habitat areas include waters which serve as seasonal feeding habitat for these DPSs and contain the essential biological feature of humpback whale prey (86 FR 21082 [April 21, 2021]). The physical and biological features essential to the conservation of both humpback whale DPSs are prey species, primarily euphausiids and small pelagic schooling fishes, of sufficient quality, abundance, and accessibility within humpback whale feeding areas to support feeding and population growth (86 FR 21082 [April 21, 2021]).

Essential Fish Habitat. The Pacific Fishery Management Council (PFMC) has authority over the fisheries and EFH designation in and surrounding the State of California. The JFC flight path would cross over waters designated as EFH in the U.S. EEZ near VSFB; however, no Proposed Action activities would impact EFH in the VSFB ROI (within territorial waters). EFH in the offshore booster drop zone is discussed in **Section 3.5.2.4**.

California Coastal National Monument. Established in 2000 and expanded in 2014, the California Coastal National Monument protects offshore islands, rocks, exposed reefs, and pinnacles owned or controlled by the U.S. Government within 22 km (12 nm) of the California shoreline (3 CFR 9089 [March 11, 2014]). The California Coastal National Monument comprises approximately 1,000 acres of offshore rocks and islands as well as 7,924 acres onshore (BLM 2019). The monument includes the feeding and nesting habitat for an estimated 200,000 breeding seabirds as well as foraging and breeding habitat for California sea lions, harbor seals, elephant seals, and southern sea otters (3 CFR 9089 [March 11, 2014]). The Monument occurs along the entire coastline of California, including all onshore coastal areas of VSFB and coastal features offshore of VSFB.

Vandenberg State Marine Reserve. Designated and managed by the California Department of Fish and Wildlife, the Vandenberg State Marine Reserve is 85.5 km^2 (33 mi^2) in area and spans

22.5 km (14 mi) of shoreline (CDFW 2020) starting south of Purisima Point and extending southward. The potential effects of the Proposed Action would not extend into Vandenberg State Marine Reserve; therefore, it is not in the ROI and is not considered further in this EA/OEA.

3.3.4 Public Health and Safety (VSFB)

See **Section 3.1.3** for a basic discussion on the focus of public health and safety.

3.3.4.1 Regulatory Setting

Establishing and managing the overall safety program is the responsibility of the Space Launch Delta 30 Safety Office, which ensures safety during launch operations and other mission activities (USASMDC 2020). Final responsibility and authority for the safe conduct of ballistic and space vehicle operations lies with the Space Launch Delta 30 Commander (USASMDC 2020).

Prior to conducting launches, launch operations are evaluated by the Space Launch Delta 30 Safety Office to ensure populated areas, critical range assets, and civilian property susceptible to damage are outside predicted impact/debris limits. Flight safety plans prepared for each mission include the evaluation of risks to inhabitants and property near the flight path, calculated trajectory and debris areas, and specific range clearance and notification procedures. Criteria used at VSFB to determine debris hazard risks are outlined in RCC Standard 321-17 (USAF 2021b).

Numerous federal and state regulatory requirements have been enacted for the well-being of workers and the general population. Regulations established by the federal OSHA (29 CFR) and USEPA ensure safe working and living conditions through enforcing standards and training requirements. DoDI 6055.01 (*DoD Safety and Occupational Health Program*) and DoDI 6055.05 (*Occupational and Environmental Health*), as well USAF-specific regulations Air Force Policy Directive 91-2 (*Safety Programs*), AFI 91-203 (*Air Force Consolidated Occupational Safety Instruction*), AFI 91-202 (*U.S. Air Force Mishap Prevention Program*), and the Air Force Global Strike Command Supplement to AFI 91-202 are designed to meet these federal standards. These documents establish range safety policies, and define requirements and procedures, for ballistic and space vehicle operations at VSFB and along downrange (over-ocean) trajectories. At the state level, the California Occupational Safety and Health Program enacted in 1973 ensures safe and healthful working conditions for all workers in California (USASMDC 2020).

For the storage, handling, maintenance, and transportation of missile systems, propellants, and related explosive materials at VSFB the following regulations and procedures are applied: 49 CFR Parts 171-177, Chapter I (Pipeline and Hazardous Materials Safety Administration), Subchapter C (Hazardous Materials Regulations); DOD Directive 6055.09E, Explosives Safety Management, Defense Explosives Safety Regulation 6055.09, Edition 1; AFMAN 91-201, Explosives Safety Standards; and Air Force Space Command (AFSPC) Supplement to AFMAN 91-201, Explosive Safety Standards.

For minimizing risks when conducting launch operations at VSFB, the following standards and procedures are applied: DoDI 4540.01, Use of International Airspace by U.S. Military Aircraft and for Missile and Projectile Firings; RCC Standard 321-17 (or the current version), Common Risk Criteria Standards for National Test Ranges; AFI 91-217, Space Safety and Mishap Prevention Program; AFSPC Manual 91-710, Range Safety User Requirements Manual, Volumes 1–7.

In accordance with SWI 13-210 (*Evacuating or Sheltering of Personnel on Offshore Oil Rigs*), USAF notifies oilrig companies of an upcoming launch event 10 to 15 days in advance of a launch operation (USASMDC 2020). The USAF's notification, provided through the Department of the Interior's Minerals Management Service, requests that the oilrigs located in the path of the launch vehicle overflight temporarily suspend operations and evacuate or shelter their personnel (USASMDC 2020).

VSFB has its own emergency services that include the fire department, disaster control group, and security police force, in addition to contract support for the handling of accidental releases of propellants and other hazardous substances (USAF 2021b). Fire department resources are pre-positioned during launch operations to expedite response in the event of a launch anomaly (USAF 2021b). Fire breaks are established or maintained on a regular basis at all launch facilities (USAF 2021b).

The 30th Medical Group's Family Health Clinic, Pediatric Clinic, and Space Missile Medicine Clinic are the primary military medical facilities at VSFB (USAF 2021b). Several other clinics and hospitals are off-installation in the cities of Lompoc and Santa Maria. These facilities include the Lompoc Valley Medical Center and Marian Regional Medical Center (USAF 2021b).

Similar to PMRF and WFF (See **Section 3.1.3** and **3.2.3**), VSFB will publish and circulate NOTAMs and NTMs several days prior to launch to warn personnel and members of the public about potential impact areas within the ROI, international waters, and airspace. Radar, ground roving security forces, and/or helicopter support are used prior to operations to ensure evacuation of non-critical personnel (USAF 2021b).

3.3.4.2 Region of Influence

The ROI for potential impacts related to the health and safety of workers includes work areas associated with JFC flight test launch operations. The population of concern includes the workers employed at VSFB, but also other personnel directly involved with range operation and training activities currently occurring at VSFB. The ROI for potential impact related to public health and safety also includes the areas of Santa Barbara County adjacent to VSFB which include military personnel, contractors and the general public that could be affected by the proposed launch.

3.3.5 Hazardous Materials and Wastes (VSFB)

See **Section 3.1.4** for a discussion on the definition of hazardous materials and wastes.

The amount of hazardous waste generated annually at VSFB is large enough to require that the base be designated a hazardous waste facility under RCRA (VAFB 2019). Hazardous waste operations at VSFB are authorized by the California Department of Toxic Substances Control under the RCRA Part B permit (VAFB 2019).

Solid waste is sent to a municipal landfill operated by the City of Santa Maria, and transportation is conducted by Waste Management (VAFB 2019). Recycling is handled on VSFB at a recycling center operated by two civilian personnel and provides a source of revenue for VSFB (VAFB 2019).

VSFB maintained a landfill on base until submitting closure plans to the Santa Barbara County Environmental Health Services in July 2017, and closure plans were approved in May 2018 (VAFB 2019).

The use of pesticides on VSFB is strictly controlled. Pesticide applicators must adhere to the rules and regulations contained in AFI 32-1053, Pest Management Program, and VSFB's Integrated Pest Management Plan (which is a component of the INRMP) (VAFB 2011). Specifically, pesticide applicators must hold the appropriate California Department of Pesticide Regulation licenses, all pesticide users must follow label recommendations for application, storage, and mixing, and pesticides used on base must be on a DOD approved list (VAFB 2011).

The federal Installation Restoration Program (IRP) was implemented at DOD facilities to identify, characterize, and restore hazardous substance release sites. As of October 2005, there were 146 IRP sites throughout VSFB (USAF 2021b). In addition to IRP sites, there are also identified areas of concern where potential hazardous material releases are suspected and defined as areas with the potential for use or presence of a hazardous waste (VAFB 2011). Various contaminants could be present in surface and subsurface soils, groundwater, or surface water at these IRP sites or areas of concern, including trichloroethylene (TCE), PCBs, volatile organic compounds, total petroleum hydrocarbons, and other hazardous contaminants (VAFB 2011).

The VSFB Environmental Restoration Program includes the IRP and the Military Munitions Response Program. The primary remediation sites at VSFB are former launch sites, storage tanks, landfills, fire training areas, inactive bombing ranges, inactive artillery and armor training areas, and waste disposal pits. Currently 107 sites are evaluated through a 10-year performance-based restoration contract. (VAFB 2018a)

There are several support facilities in this EA/OEA that are within IRP sites. Most of IRP sites are closed, except IRP Site SD015. SD015 is located on the San Antonio Terrace in the North Base portion of VSFB. SD015 included a control center (Building 1823), a water pump station (Building

1830), a maintenance facility building (Building 1824), and three launch pads (Pads 1, 2, and 3) and associated building structures (Buildings 1833, 1835, 1825, and 1820, respectively). This site is undergoing remediation due to groundwater contamination. Any construction within IRP Site SD015 must be coordinated with the Air Force Civilian Engineer Center/Environmental Operations Division West Region Program Manager. (VAFB 2018a)

3.3.5.1 Regulatory Setting

See **Section 3.1.4.1** for a discussion on the federal regulatory environment of hazardous materials and wastes. CERCLA, TSCA, RCRA, and Title 22 of the California Code of Regulations ensure that necessary actions are taken for the prevention, management, and abatement of environmental pollution from hazardous materials or wastes caused by federal facilities, like VSFB.

The HazMart is the responsible party for managing VSFB's hazardous materials (USASMDC 2020). It is the sole requisitioner, reviewer, distributor, issuer, and reissuer of hazardous materials (USASMDC 2020). VSFB's hazardous waste is managed and tracked under a multitude of plans, which incorporate appropriate federal, state, local, and USAF requirements. These include, but are not limited to: Air Force Manual 32-7002 (AFMAN 32-7002); Hazardous Materials Management (AFI 32-7086 [AFSPC Supplement 1]); Hazardous Waste Management Plan (30 SW Plan 32-7043-A); Wastewater Management Plan (30 SW Plan 32-7041-A); Hazardous Materials Emergency Response Plan (30 SW Plan 32-4002-A); Spill Prevention, Control and Countermeasures Plan (30 SW 32-4002-C); Lead-Based Paint Management Plan (30 SW Plan 32-1002); Asbestos Management Plan (30 SW Plan 32-1052-A); and Asbestos Operating Plan (32-1052-B). (USASMDC 2020)

3.3.5.2 Region of Influence

The ROI for hazardous materials and wastes would be limited to facilities and test areas of VSFB to be used for JFC launch preparation, launch, and post-launch activities and in areas where JFC hazardous materials are generated, stored, and handled on a short-term basis.

3.4 Cape Canaveral Space Force Station

This section includes detailed descriptions of air quality, cultural resources, biological resources, public health and safety, hazardous materials and wastes, infrastructure, and transportation.

The potential impacts to the following resource areas within this geographical area are considered to be negligible or non-existent so they were not analyzed in detail in this EA/OEA:

Airspace: The JFC flight tests would be similar to previous launches including Falcon and Minotaur IV launches out of CCSFS and tests described in the Atlantic Fleet Testing and Training EIS. The potential impacts on controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, and airports and airfields would be similar to that described for missile launches in previous environmental documentation (FAA 2020, U.S. Navy 2018b, USAF 2017, USAF 2013, USAF 2007). CCSFS would issue NOTAMs and NTMs ahead of any JFC flight test, in accordance with range safety and FAA requirements. No changes to current airspace management would be required to perform the JFC flight tests. A slight increase in air traffic due to arriving components and mission personnel would be expected but would not overwhelm or change current airspace management. Modification of the MSS on the existing launch pad would not affect airspace management or use. Advanced planning and coordination with the FAA regarding scheduling of special use airspace, and coordination of the proposed JFC flight test relative to en route airways and jet routes, would result in no impacts on airspace within the CCSFS ROI.

Water Resources: The 2020 U.S. Air Force INRMP (USAF 2020b; Section 2.2.4, Pages 52 through 55; Section 2.3.5, Pages 80 through 90; Section 7.5, Pages 136 through 143; Section 7.6, Pages 143 through 145; Section 7.13, Pages 169 through 176); the Atlantic Fleet Testing and Training EIS/OEIS (U.S. Navy 2018b; Section 3.2.1.1.2, Pages 3.2-4 through 3.2-8); the SEA to the December 2014 EA for SpaceX Vertical Landing of Falcon 9 at LC-13 (USAF 2017; Section 3.8, Pages 3-20 through 3-22); and the EA for Space Florida Launch Site Operator License at LC-46 (FAA 2008; Section 5.0, Pages 29 through 31) all describe in detail the water resources that have existed at CCSFS for at least the last 12 years. The JFC AUR is still in development, so its potential to impact the water resources described above was compared to similar tests that have launched from CCSFS. Previous launches including Falcon and Minotaur IV launches out of CCSFS, as well as the tests described in the Atlantic Fleet Testing and Training EIS, were used as a comparison for effects on water resources in the ROI, since the testing of the JFC vehicles at the same site would produce similar potential environmental impacts. Based on an estimation of the JFC flight tests potential releases, current regulations and infrastructure specific to CCSFS, it was determined that any impacts to water resources from the JFC flight tests would not have adverse impacts on hydrologic function or quality at CCSFS. No impact to water resources would be expected as a result of the Proposed Action.

Geological Resources: The Atlantic Fleet Testing and Training EIS/OEIS (U.S. Navy 2018b; Section 3.2, Pages 3.2-1 through 3.2-26) and the SEA to the December 2014 EA for SpaceX

Vertical Landing of Falcon 9 at LC-13 (USAF 2017; Section 3.9, Page 3-22) both describe in detail the geological resources that have existed at CCSFS for at least the last 3 years. The JFC flight test may require ground-disturbing activities at CCSFS to modify the MSS at an existing CCSFS launch pad. While unlikely, there could be a need for trenching in previously disturbed areas to install additional power and communication lines. Grounding rods to arrest lightning and static electricity may be required. Any ground-disturbing activities are not expected to remove vegetation or earth as the MSS would modify existing man-made structures. There would be no mining or quarrying. No impacts to geological resources would be expected as a result of the Proposed Action.

Land Use: The SEA to the December 2014 EA for SpaceX Vertical Landing of Falcon 9 at LC-13 (USAF 2017; Section 3.1, Pages 3-1 through 3-2) describes in detail the land uses at CCSFS. The JFC flight test represents activities that are consistent with the mission and well within the limits of current operations of CCSFS. No impacts to land use resources would be expected as a result of the Proposed Action.

Noise: The SEA to the December 2014 EA for SpaceX Vertical Landing of Falcon 9 at LC-13 (USAF 2017; Section 3.2, Pages 3-2 through 3-5) describes in detail the noise environments that exist at CCSFS. Empirical data on sound pressure of JFC vehicle launch have not yet been collected, but modeling indicates that initial liftoff of the launch vehicle would result in peak sound pressures of approximately 145 dB in-air (re 20 μPa) at approximately 30 m (100 ft) from the launch site (Kahle et al. 2021). After launch, the vehicle would ascend quickly, and sound pressures are expected to remain elevated above ambient sound levels for less than 60 seconds (Kahle et al. 2021). The JFC launch acoustics model used several conservative assumptions and did not account for atmospheric absorption, ground interference, or atmospheric conditions (Kahle et al. 2021); therefore, these sound pressure estimates should be considered maximum possible sound pressures from launch. There is a potential for a sonic boom to result from the JFC launch tests; however, the sonic boom should occur over the Atlantic Ocean and leave land-based receptors unaffected. Potential noise impacts on wildlife receptors at CCSFS are discussed in the Biological Resources section (**Section 3.4.3**). The JFC flight tests would result in a short-term noise event during the liftoff of the vehicle, but the noise would be well within the limits analyzed in the SEA, and only minor short-term impacts to the noise environment would occur. No long-term impacts to noise would be expected as a result of the Proposed Action.

Socioeconomics: The Atlantic Fleet Testing and Training EIS/OEIS (U.S. Navy 2018b; Section 3.11, Pages 3.11-1 through 3.11-45) and the SEA to the December 2014 EA for SpaceX Vertical Landing of Falcon 9 at LC-13 (USAF 2017; Section 3.13, Page 3-24) both describe in detail the socioeconomic resources that have existed at CCSFS for at least the past 3 years. There would be a temporary, short-term increase in personnel (less than 100) at CCSFS due to the JFC flight test. No impacts to socioeconomic resources would be expected as a result of the Proposed Action.

Environmental Justice: The SEA to the December 2014 EA for SpaceX Vertical Landing of Falcon 9 at LC-13 (USAF 2017; Section 3.14, Page 3-25) describes in detail the environmental justice conditions that exist at CCSFS. The EPA's Environmental Justice Screening and Mapping Tool, known as EJSCREEN, is a publicly available dataset that combines environmental and demographic indicators into 11 EJ indexes. For more information about EJSCREEN visit https://www.epa.gov/ejscreen. At CCSFS, the highest percentile EJ index is the Wastewater Discharge Indicator, at 73% national percentile. This models the stream proximity and toxicity-weighted concentration at CCSFS. The JFC flight test includes a launch trajectory, range safety regulations and procedures, and dispersing of noise over a wide area that averts disproportionate impacts to minority populations and low-income populations under EO 12898, and to child populations under EO 13045. No impacts to environmental justice would be expected as a result of the Proposed Action.

Aesthetics/Visual Resources: The SEA to the December 2014 EA for SpaceX Vertical Landing of Falcon 9 at LC-13 (USAF 2017; Section 3.1, Pages 3-1 through 3-2) describes in detail the aesthetics/visual resources that exist at CCSFS. The JFC flight test may require ground-disturbing activities at CCSFS to modify the MSS at an existing CCSFS launch pad. While unlikely, there could be a need for trenching in previously disturbed areas to install additional power and communication lines. Grounding rods to arrest lightning and static electricity may be required. Any ground-disturbing activities are not expected to remove vegetation or earth as the MSS would modify existing man-made structures. No impacts to aesthetics/visual resources would be expected as a result of the Proposed Action.

Marine Sediments: The JFC flight tests do not require any offshore construction and the marine sediments of CCSFS would not be changed. No effects to marine sediments at CCSFS would be expected as a result of the Proposed Action because no expended material would be expected in the ROI.

3.4.1 Air Quality (CCSFS)

See **Section 3.3.1** (VSFB) for a basic discussion on the definition of air quality.

3.4.1.1 Regulatory Setting

See **Section 3.3.1** (VSFB) for a basic discussion on the definition of applicable federal air quality regulations.

State Regulations

Air quality at CCSFS is regulated under the Clean Air Act regulations (40 CFR Parts 50 through 99) and Florida Administrative Code (FAC) Chapters 62-200 through 62-299. The Florida Department of Environmental Protection has exclusively adopted the federal NAAQS.

3.4.1.2 Region of Influence

The ROI for potential impacts related to air quality is the perimeter of CCSFS and surrounding areas of Brevard County, Florida. LC-46 would be the area of greatest air emissions from the launch of the JFC AUR; however, because of the rapid acceleration of the vehicle, the majority of vehicle exhaust products is expected to enter the atmosphere above the mixing layer where they would disperse quickly, reducing ground-level-impacts. The state coastal boundaries are part of the same air quality jurisdiction area as the contiguous land area.

Criteria Pollutants and National Ambient Air Quality Standards

Atmospheric monitoring for chemicals at CCSFS occurs within the atmospheric boundary layer where people live and work. Florida's air monitoring effort is concentrated on the six criteria pollutants. In 2016, Florida continued to be in attainment for all criteria pollutants, with the exception of Tampa's nonattainment designation for lead and sulfur dioxide nonattainment areas in Hillsborough County and Nassau County (FAA 2020). According to the USEPA, Brevard County is in attainment for all criteria pollutants (FAA 2020).

Mobile Sources

The National Emission Standards regulate 187 HAPs based on available control technologies (40 CFR Parts 61 and 63). The majority of HAPs are volatile organic compounds. Mobile sources of air emissions include launch vehicles, commercial ships, recreational boats, cruise ships, and aircraft. MSATs would be the primary HAPs emitted by mobile sources during pad launch activity and recovery operations.

The ambient air quality at CCSFS is predominantly influenced by daily operations such as vehicle traffic, utilities, fuel combustion, and standard refurbishment and maintenance operations. Other operations occurring infrequently throughout the year, including launches and prescribed fires, also play a role in the quality of air as episodic events.

All emissions types that would occur under the Proposed Action are exempt from air permitting requirements pursuant to FAC Rule 62-210.300(3)(a), Categorical and Conditional Exemptions (FAA 2020). These types of categorically excluded emissions units or activities are considered to produce "insignificant" emissions pursuant to FAC Rule 62-213.430(6) (FAA 2020).

Table 3-11 summarizes for years 2009 through 2016 the CCSFS Air Emissions Inventory Reports of actual tons per year of the criteria pollutants and total HAPs that are included in the current General Permit. The CCSFS General Permit is for emissions from internal combustion engines.

Table 3-11. CCSFS History of Actual Emissions (Tons per Year)

Pollutant	2016	2015	2014	2013	2012	2011	2010	2009
CO	11.66	10.75	9.83	10.95	19.47	17.87	22.72	17.50
HAPs	0.02	0.03	0.03	0.03	0.15	0.15	0.22	0.22
NO_X	42.21	36.28	33.56	35.79	73.58	63.76	73.80	60.89
PM	3.00	2.59	2.66	2.63	5.20	4.84	5.41	4.56
PM_{10}	2.76	2.31	2.215	2.29	5.03	4.36	4.91	4.18
SO_2	2.52	2.08	1.95	2.15	4.92	3.96	4.47	3.74
VOC	3.35	2.86	2.69	2.84	6.22	5.17	6.02	5.21

Source: FAA 2020.

General Conformity

The Clean Air Act defines conformity as the upholding of a set of air quality goals by eliminating or reducing violations of the NAAQS and achieving attainment of these standards. A summary of ambient air quality measurement data for 2013–2017 for the local region shows that ground-level concentrations of criteria pollutants in the study area are within the NAAQS (FAA 2020). Conformity determinations are not required for this Proposed Action since LC-46 is located within a NAAQS attainment area for all regulated criteria pollutants.

Permitting

CCSFS had operated under a Title V Air Operation Permit by designation until recently. Following a USAF review which indicated that over the past several years criteria air pollutants and HAPs emitted annually did not warrant having a Title V permit, CCSFS surrendered the Title V Permit back to the Florida Department of Environmental Protection and requested a General Permit. The USAF at CCSFS was issued a General Permit (62-210.310, FAC) on May 5, 2017. The General Permit covers internal combustion engines and generators.

Greenhouse Gases

The highest observed water level at CCSFS was 7.9 m (25.9 ft) on September 26, 2004 (FAA 2020). According to the International Panel on Climate Change, global mean sea level continues to rise due to thermal expansion of the oceans in addition to the loss of mass from glaciers, ice caps, and the Greenland and Antarctic Ice Sheets (FAA 2020). At CCSFS, the average air temperature for the 30-year climate baseline period is 72°F (FAA 2020). Climate forecasts indicate that average temperatures will increase by as much as 6°F during the latter part of the century. Emissions of carbon dioxide at CCSFS are primarily associated with vehicle traffic, ground support operations, and launch events.

Table 3-12 summarizes GHG emissions for all activities at CCSFS (FAA 2020). While more recent data are not available, the CCSFS landfill was the primary methane emission source for all GHG. The landfill was closed in 2013 and a decision was made by the USAF that residual methane emissions would be negligible. Therefore, methane emission can be taken as zero for 2014 and beyond (FAA 2020).

Table 3-12. Summary of Greenhouse Gases Emissions for CCSFS (Years 2011 through 2013)

GHG	GHG Emissions for 2011		
	Ton (Short)	Ton (Metric)	$MtCO_2e$
CO_2	3,160.034	2,866.735	2,866.735
N_2O	0.052	0.047	14.624
CH_4	122.215	110.872	2,328.303
		TOTAL REPORTABLE GHG for 2011	5,209.662
GHG	GHG Emissions for 2012		
	Ton (Short)	Ton (Metric)	$MtCO_2e$
CO_2	2,827.90	2,565.43	2,565.42
N_2O	0.05	0.04	13.21
CH_4	211.41	191.79	4,027.65
		TOTAL REPORTABLE GHG for 2012	6,606.28
GHG	GHG Emissions for 2013		
	Ton (Short)	Ton (Metric)	$MtCO_2e$
CO_2	6,148.266	5,577.651	5,577.651
N_2O	227.900	206.500	61,153.000
CH_4	241.542	219.085	5,433.214
R-22	0.085	0.077	0.004
R-123	0.076	0.069	0.002
		TOTAL REPORTABLE GHG for 2013	72,547.870

Source: FAA 2020.

Note: $MtCO_2e$ = Metric Ton Carbon Dioxide Equivalent – describes greenhouse gases in a common unit. For any quantity and type of greenhouse gas, CO_2e denotes the amount of CO_2 which would have the equivalent global warming impact. R-22 = Chlorodifluoromethane or difluoromonochloromethane is a hydrochlorofluorocarbon (HCFC-22) refrigerant beingphased out, R-123= 2,2-Dichloro-1,1,1-trifluoroethane or HCFC-123 is a replacement refrigerant being phased in.

3.4.2 Cultural Resources (CCSFS)

3.4.2.1 Regulatory Setting

The NHPA protects cultural resources in the United States. Section 106 of the NHPA requires a federal agency to consider the effects of the Proposed Action on historic properties. Compliance with Section 106 requires consultation with the State Historic Preservation Office, which within the State of Florida is subsumed by the Florida State Clearinghouse. The action proponents coordinated with the Florida State Clearinghouse and State Historic Preservation Office on June 10, 2021.

3.4.2.2 Region of Influence

The ROI for potential impacts includes work areas associated with JFC flight test launch operations, including payload processing, transport, and launch.

The Atlantic Fleet Testing and Training EIS/OEIS (U.S. Navy 2018b; Section 3.10, Pages 3.10-1 through 3.10-15); the SEA to the December 2014 EA for SpaceX Vertical Landing of Falcon 9 at LC-13 (USAF 2017; Section 3.5, Pages 3-12 through 3-13); and the Integrated Cultural Resource Management Plan 2015-2019: Volume 1. Cape Canaveral Air Force Station, Patrick Air Force Base, Malabar Transmitter Annex, and Jonathan Dickinson Missile Tracking; all describe the cultural resources present throughout CCSFS.

LC-46 was established in 1954 as a firefighter training area and utilized for this purpose until 1965 (Space Florida 2013). From 1987-1989 the U.S. Navy used LC-46 to launch ground-based Trident II ballistic missiles (Space Florida 2013). Space Florida supported two Athena launches from LC-46 in 1998 and 1999 (Space Florida 2013).

In 2008, an FAA EA analyzed a new operator license for Space Florida to launch at LC-46. It stated that the facilities to be used are not listed or eligible for listing on the National Register of Historic Places (FAA 2008). LC-46 does not contain a historic or tribal site of significance (FAA 2008).

The USAF has stewardship responsibility for managing the cultural resources on USAF-owned lands and facilities and has developed an Integrated Cultural Resource Management Plan that reflects its commitments to the protection of significant cultural resources at CCSFS. A designated Historic Preservation Officer at CCSFS manages the Integrated Cultural Resource Management Plan. It is also a goal at CCSFS to balance historic preservation considerations with the USAF's missions and avoid conflict with ongoing operational requirements.

3.4.3 Biological Resources (CCSFS)

Biological resources on and near CCSFS are defined as in **Section 3.1.2**.

3.4.3.1 Regulatory Setting

The regulatory setting under the ESA, MMPA, MBTA, and BGEPA is described in detail in **Section 3.1.2.1** and **Section 3.2.2.1** including relevant definitions under these Acts. The MSA as described in **Section 3.1.2.1** also applies to waters offshore of CCSFS, and resources regulated by this Act are discussed below.

3.4.3.2 Region of Influence

The ROI for biological resources at CCSFS includes the areas subject to effects of the Proposed Action as described in **Chapter 2.0** including:

- The locations of the launch pad and test support facilities at CCSFS to be used for the Proposed Action (see **Figure 3-3**);
- The over-ocean flight corridor over U.S. territorial waters (within 22 km [12 nm] of shore) near CCSFS; and
- Terrestrial and marine areas in the vicinity of these sites which may be subject to effects of the Proposed Action including elevated noise levels.

Launch of the JFC vehicle would take place on the Cape Canaveral Island area of CCSFS. Cape Canaveral is a barrier island on Florida's east coast which includes beach, scrub habitat, riverine hammock, maritime hammock, and managed/maintained areas (USAF 2020b).

The biological resources at CCSFS were recently evaluated in an INRMP for 45th Space Wing Installations (USAF 2020b) as well as in the EAs for a range of launch program activities (FAA 2020, Space X and USAF 2013, NASA 2011, FAA 2010). The biological resources described in this section are those within the affected environment at CCSFS, specifically those areas subject to JFC pre- and post-launch operations as well as launch activities.

Terrestrial Vegetation

Cape Canaveral is located on the east coast of Florida within the transitional area where temperate and tropical zones converge, creating a large diversity of plant communities and floral species (USAF 2020b). CCSFS is dominated by scrub habitat with small patches of riverine hammock and maritime hammock vegetation types (USAF 2020b). Much of the natural landscape on CCSFS has been fragmented by roads, buildings, space launch complexes, sight lines, ditches, and an aircraft runway. Additionally, fire exclusion, hydrology alterations, and the introduction of invasive vegetation have further altered the vegetative communities on CCSFS (USAF 2020b). No threatened or endangered plant species have been observed on CCSFS and no critical habitat for plants has been designated on CCSFS.

Terrestrial Wildlife

The terrestrial habitats at CCSFS support a highly diverse assemblage of terrestrial wildlife including mammals, birds, reptiles, amphibians, and invertebrates. The common wildlife species found at Cape Canaveral are discussed below as well as special-status species known to occur at CCSFS.

Mammals. More than 25 mammal species are known to occur on CCSFS (USAF 2020b). Common species include white-tailed deer, armadillos (*Dasypus novemcinctus*), bobcats (*Lynx* *rufus*), feral pigs, raccoons, long-tail weasels (*Mustela frenata*), cotton rats (*Sigmodon hispidus*) and round-tail muskrats (*Neofiber alleni*) (FAA 2010). The Southeastern beach mouse (*Peromyscus polionotus niveiventris*) is the only strictly terrestrial ESA-listed mammal species found at CCSFS (**Table 3-13**). Historically, beach mice populations occurred along Florida's east coast and have been limited to coastal strand and coastal dune communities (USAF 2020b). Extirpation of the beach mouse from much of its range has resulted from human modification of the coastal barrier islands (USAF 2020b). Federal lands now hold the most viable populations of beach mice, including CCSFS (USAF 2020b). On CCSFS, beach mice typically inhabit disturbed oak scrub and coastal dune/strand communities. Beach mouse habitat occurs outside the perimeter fence at LC-46 and beach mice have been documented in the area east of the launch complex. Primary threats to the Southeastern beach mouse are urbanization and coastal erosion, both resulting in loss and alteration of coastal dune habitat (USAF 2020b).

Birds. More than 200 bird species occur at or near CCSFS (USAF 2020b). These include a diversity of seabirds, shorebirds, grassland birds, and wetland birds, as well as species of scrub habitats and urban areas. Almost all of these birds are protected under the MBTA and a number are BCC species.

Six ESA-listed bird species have the potential to occur in the CCSFS ROI (**Table 3-13**). The threatened Florida scrub-jay (*Aphelocoma coerulescens*) is found in scrubby flatwoods and xeric scrub communities at CCSFS (USAF 2020b). Approximately half of the estimated Florida scrub-jay population (7,000 – 11,000 birds) occurs in the CCSFS, KSC, and Merritt Island National Wildlife Refuge area (USAF 2020b). Scrub-jays primarily eat insects, especially during the nesting season (late February to early July), and acorns make up their essential and primary plant food throughout the year (USAF 2020b). Primary threats to the Florida scrub-jay are habitat loss, fragmentation, and degradation caused by urbanization and fire suppression (USAF 2020b).

Other federally listed birds known to occur on CCSFS include the red knot, piping plover, wood stork (*Mycteria americana*), roseate tern, and Audubon's crested caracara (*Polyborus plancus audubonii*) (USAF 2020b). No nesting behavior or nests for any of these species have been observed on CCSFS; however, these species do use CCSFS for foraging and resting (USAF 2020b).

Table 3-13. ESA Listed Species with the Potential to Occur in the CCSFS ROI.

Common Name	Scientific Name	U.S. ESA Listing Status	Area of Occurrence at CCSFS
Terrestrial Mammals			
Southeastern beach mouse	*Peromyscus polionotus niveiventris*	T	Coastal dune/strand and disturbed oak scrub
Marine Mammals			
North Atlantic right whale	*Eubalaena glacialis*	E	Nearshore waters
West Indian manatee	*Trichechus manatus*	E	Nearshore waters
Birds			
Florida scrub-jay	*Aphelocoma coerulescens*	T	Scrub habitats
Red knot	*Calidris canutus rufus*	T	Beach strand
Piping plover	*Charadrius melodus*	T	Beach strand
Wood stork	*Mycteria americana*	T	Shallow water habitats
Audubon's crested caracara	*Polyborus plancus audubonii*	T	Scrub and grassland
Roseate tern	*Sterna dougallii*	T	Nearshore waters
Reptiles			
American alligator	*Alligator mississippiensis*	T	Wetlands
Loggerhead sea turtle	*Caretta caretta*	T	Beach/Nearshore waters
Green sea turtle	*Chelonia mydas*	T	Beach/Nearshore waters
Leatherback sea turtle	*Dermochelys coriacea*	E	Beach/Nearshore waters
Eastern indigo snake	*Drymarchon couperi*	T	Various habitats
Hawksbill sea turtle	*Eretmochelys imbricata*	E	Nearshore waters
Gopher tortoise	*Gopherus polyphemus*	C	Dry upland habitats
Kemp's ridley turtle	*Lepidochelys kempii*	E	Beach/Nearshore waters
Fish			
Atlantic sturgeon	*Acipenser oxyrinchus oxyrinchus*	E	Nearshore waters
Nassau grouper	*Epinephelus striatus*	T	Nearshore waters
Oceanic whitetip shark	*Carcharhinus longimanus*	T	Nearshore waters
Oceanic giant manta ray	*Manta birostris*	T	Nearshore waters
Smalltooth sawfish	*Pristis pectinate*	E	Nearshore waters

Source: USAF 2020b
Abbreviations: CCSFS = Cape Canaveral Space Force Station, C = candidate for listing, E = endangered, T =threatened

Reptiles and Amphibians. At least 50 amphibian and reptile species occur on CCSFS (USAF 2020b). These include the Florida pine snake and a number of ESA-listed species (**Table 3-13**). The American alligator (*Alligator mississippiensis*) is treated as threatened under the ESA due to its similar appearance to the federally endangered American crocodile (USAF 2020b). American alligators typically inhabit lakes, ponds, rivers, bayous, swamps, and marshes (USAF 2020b).

Five sea turtle species potentially occur within the nearshore and offshore waters of CCSFS. Green, leatherback, and loggerhead sea turtles regularly nest on the beaches of CCSFS, between March and October (USAF 2020b). Two Kemp's ridley sea turtle nests were documented on CCSFS in 2015 but Kemp's ridley nesting is considered rare on the installation (USAF 2020b). Since 1986, the 45th Space Wing has implemented a sea turtle plan which employs preservation techniques such as exterior light management, predator control, rescue and release of hatchlings, nest relocation, daily nest surveys, salvage and stranding activities, and taking part in the State of Florida Index Nesting Beach Survey (USAF 2020b).

The gopher tortoise (*Gopherus polyphemus*) is a candidate for listing under the ESA and is listed as threatened by the State of Florida. The gopher tortoise is typically found in pine flatwoods, scrub, sandhill, and other dry upland habitats (USAF 2020b). Gopher tortoises dig deep burrows for protection from predators, fire, and weather. These burrows provide refuge for over 300 other animal species, which is why the gopher tortoise is considered a keystone species. CCSFS contains medium to high quality habitat for the gopher tortoise (USAF 2020b). The major threats to this species include habitat loss and degradation (USAF 2020b).

The Eastern indigo snake (*Drymarchon couperi*) has the potential to be present at CCSFS due to the presence of gopher tortoise burrows; however, no evidence of this species has been observed at CCSFS or any other 45 SW properties in over 5 years (USAF 2020b). The nearest observation of an Eastern indigo snake occurred in 2018 when a snake was killed by a vehicle on a roadway approximately 0.4 km (0.3 mi) north of the CCSFS north boundary (USAF 2020b).

Marine Wildlife

Discussion of marine biological resources in the CCSFS ROI is limited to biological resources in nearshore habitats (within territorial waters) of Cape Canaveral.

Marine Mammals. A number of marine mammals have the potential to occur in nearshore waters of the CCSFS ROI including bottlenose dolphins, spotted dolphins, and two ESA-listed species (**Table 3-13**); North Atlantic right whales (*Eubalaena glacialis*) and West Indian manatees. North Atlantic right whales migrate along the east coast of the United States, wintering and calving off the southeastern coast before moving to New England for summer feeding and nursing (USAF 2020b). Occurrence of right whales near CCSFS is seasonal, with the highest chance of occurrence during the winter calving period (NOAA 2018a). Critical habitat for right whales occurs adjacent to CCSFS, running from south of Cape Canaveral north to Cape Fear, North Carolina (NOAA 2018a). The biggest threats to North Atlantic right whales are hunting, entanglement with fishing nets, collisions with ships, and habitat degradation (USAF 2020b).

West Indian manatees can be found in the Southeastern United States, Gulf of Mexico, Caribbean Sea, Northern South America, and the Bahamas, inhabiting the brackish, marine, and freshwater systems in riverine and coastal areas. Just west of CCSFS, the West Indian manatee inhabits the Banana River, which has been designated as critical habitat (USAF 2020b). A particularly high concentration of manatees occurs west of the CCSFS facility Hangar AF in the turning basin (USAF 2020b).

Sea Turtles. Five sea turtle species have the potential to occur in Cape Canaveral nearshore waters (**Table 3-13**) (USAF 2020b), all are ESA-listed. As discussed above, four sea turtle species (green, loggerhead, leatherback, and Kemp's ridley) nest on the shores of CCSFS, with the loggerhead sea turtle being the most common (USAF 2020b). While no designated critical habitat occurs on land at CCSFS, in-water critical habitat for loggerhead sea turtles occurs adjacent to CCSFS (USAF 2020b). The 45th Space Wing implements a sea turtle management plan that benefits the conservation of nesting sea turtles on the shores of CCSFS (USAF 2020b). The primary threats to all these sea turtles are entanglement in fishing gear and marine debris, degradation and loss of nesting habitat, and vessel strikes (NOAA 2018a).

Fish. A high diversity of fish species occur in nearshore waters of the CCSFS ROI including a number of special-status species. Five ESA-listed fish species have the potential to occur in nearshore waters of the ROI (**Table 3-13**). Atlantic sturgeon inhabit both freshwater and saltwater habitats, with some migrating into salt and brackish water in the fall, and then into freshwater rivers in the spring, while some stay in the ocean year-round (USAF 2020b). The Nassau grouper (*Epinephelus striatus*) is uncommon in nearshore waters off CCSFS (USAF 2020b) but has the potential to occur in the ROI. In the U.S., smalltooth sawfish (*Pristis pectinate*) often occur off the southwest coast of Florida from Charlotte Harbor to the Everglades. According to the 45th Space Wing INRMP, there are no documented reports of smalltooth sawfish on any 45th Space Wing properties (USAF 2020b). Both the oceanic whitetip shark and giant manta ray are mostly found in open ocean waters well offshore (USAF 2020b); however, both have the potential to occur in CCSFS nearshore waters. The primary threat to protected fish species in the ROI is bycatch in recreational and commercial fisheries (USAF 2020b). Proposed Action activities at CCSFS are not expected to result in stressors to these listed fish species and they are not considered further.

Environmentally Sensitive Habitats

Critical Habitat. No federally designated critical habitat exists on CCSFS; however, the waters adjacent to the installation do contain federally designated critical habitat for West Indian manatees, North Atlantic right whales, and loggerhead sea turtles (**Figure 3-3**).

Near CCSFS, designated critical habitat for the West Indian manatee includes the inland waters of the Banana River as well as all waters between the Banana and Indian Rivers (**Figure 3-3**) (USAF 2020b). Nearly all the waters of the Banana River adjacent to CCSFS have had restricted public power boat access since 1990, due to increased use of the region by manatees (USAF 2020b). The area of critical habitat west of CCSFS facility Hangar AF, known as the turning basin, has an especially high concentration of West Indian manatees (USAF 2020b).

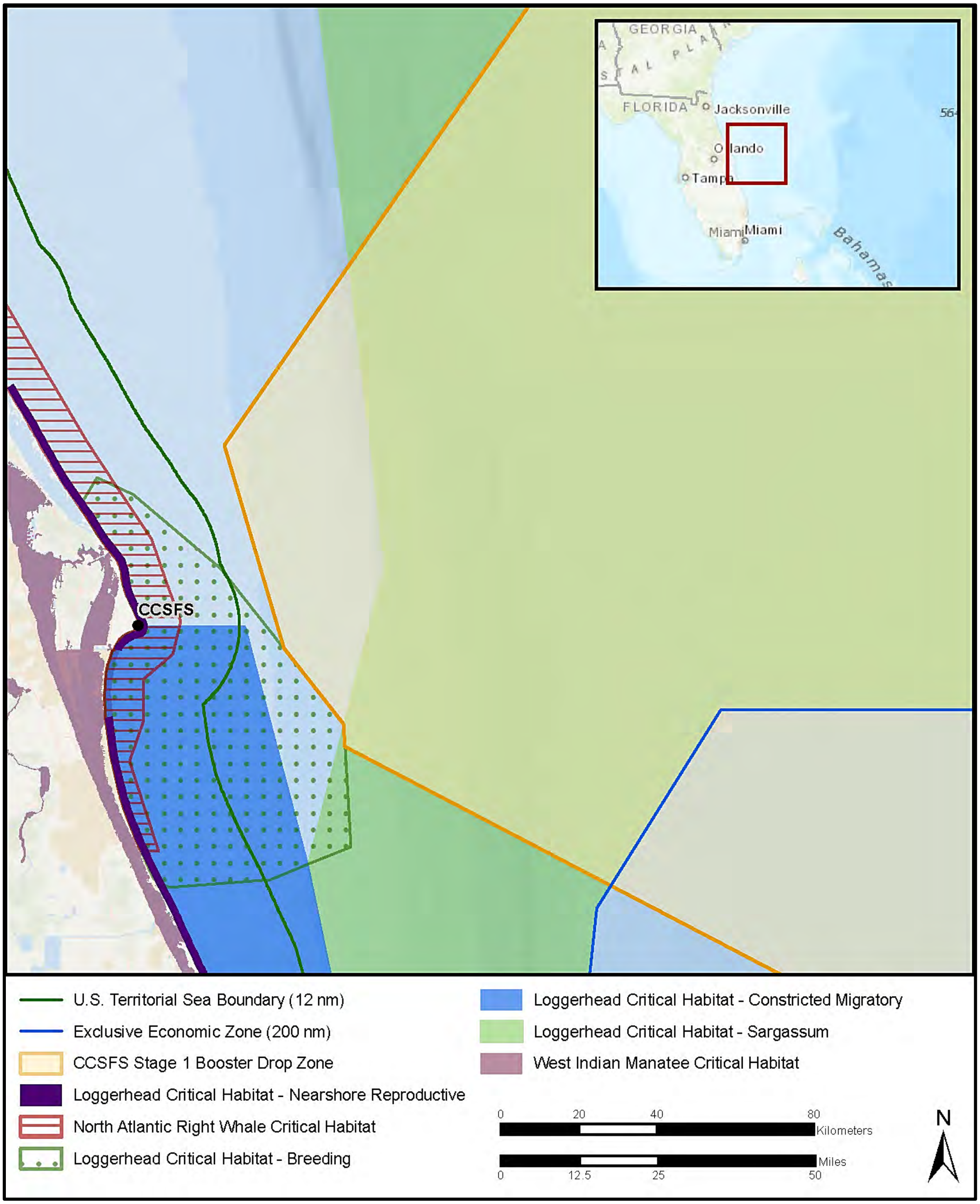

Figure 3-3. Designated Critical Habitat near CCSFS.

North Atlantic right whale designated critical habitat covers an area of approximately 102,084 km^2 (39,415 mi^2) and is divided into two units (81 FR 4837 [February 26, 2016]). Right whale critical habitat adjacent to CCSFS is part of unit 2, which extends from Cape Fear, North Carolina south to about 50 km (27 nm) past Cape Canaveral, Florida (**Figure 3-3**). This area contains important wintering and calving grounds for North Atlantic right whales (81 FR 4837 [February 26, 2016]).

Loggerhead sea turtle critical habitat for the Northwest Atlantic Ocean DPS includes the entire Atlantic coast of CCSFS and extends outward approximately 1.6 km (0.9 nm) from the coast (**Figure 3-3**) (79 FR 39855 [August 11, 2014]). Loggerhead sea turtles are the most common sea turtle to nest on the beaches of CCSFS (USAF 2020b). The USAF was granted exemption from having critical habitat designation on land at CCSFS due to their management plan which benefits the conservation of loggerheads and other sea turtles (USAF 2020b). Critical in-water habitat was designated for possessing one or a combination of habitat types such as breeding areas, winter area, nearshore reproductive habitat, *Sargassum* habitat, and/or constricted migratory corridors (79 FR 39855 [August 11, 2014]).

Essential Fish Habitat. The primary managing body for the marine area surrounding CCSFS is the South Atlantic Fishery Management Council (SAFMC). Currently, the SAFMC manages EFH for several species including the dolphinfish (*Coryphaena hippurus*) and wahoo (*Acanthocybium solanderi*) fishery, South Atlantic snapper-grouper fishery, South Atlantic shrimp, highly migratory species, coastal migratory pelagic species, golden crab (*Chaceon fenneri*), spiny lobster (*Panulirus marginatus*); live/hardbottom habitats, coral, and coral reefs; and *Sargassum* spp. (USAF 2020b). The JFC flight path would cross over waters designated as EFH in the U.S. EEZ near CCSFS; however, no Proposed Action activities would impact EFH in the CCSFS ROI (within territorial waters). EFH in the offshore booster drop zone is discussed in **Section 3.6.2.4**.

3.4.4 Public Health and Safety (CCSFS)

See **Section 3.1.3** for a basic discussion on the focus of public health and safety.

The greatest potential for training or testing activities to impact the public is in nearshore areas, because public activities are concentrated in those areas (U.S. Navy 2018b). Important factors considered include the ability to control access to an area; schedule (time of day, day of week); frequency, duration, and intensity of activities; range safety procedures; operational control of activities; and safety history (U.S. Navy 2018b). Requirements for public health and safety were derived from federal regulations and DOD directives, which provide specifications for mission planning and execution. Inability to obtain a “clear range” could result in the delay, cancellation, or relocation of an event. This approach ensures public safety during activities that otherwise could harm non-participants.

The 45th Space Wing has prepared detailed procedures to be used to control toxic gas hazards. Atmospheric dispersion computer models are run to predict toxic hazard corridors for both nominal and aborted launches, as well as spills or releases of toxic materials from storage tanks or that could occur during loading or unloading of tanks (USAF 2013). Range Safety uses the toxic hazard corridors to reduce the risk of exposure of CCSFS/KSC personnel and the general public to toxic materials, including toxic gases (USAF 2013).

ESQD criteria established by DOD and USAF Explosive Safety Standards are used to determine safe distances from launch complexes and associated support facilities to non-related facilities and roadways (USAF 2013).

CCSFS, KSC, the City of Cape Canaveral, and Brevard County have a mutual-aid agreement in the event of an on- or off-station emergency. During launch activities, CCSFS maintains communication with KSC, Brevard County Emergency Management, the Florida Marine Patrol, the U.S. Coast Guard, and the state warning point, Division of Emergency Management (USAF 2007).

Fire protection, alarm, and fire suppression systems must be provided for all fuel holding areas and support facilities (USAF 2007). Flame detectors in the fuel holding areas would activate both the area deluge water system and alarms to the Air Force Fire Department (USAF 2007).

3.4.4.1 Regulatory Setting

CCSFS is responsible for protecting worker health and safety in accordance with OSHA regulations (29 CFR) (USAF 2017). Range Control is responsible for hazard area surveillance and clearance and the control of all range operational areas. The objective of the range safety program is to ensure that the general public, launch area personnel, foreign land masses, and launch area resources are provided an acceptable level of safety, and that all aspects of prelaunch and launch operations adhere to public laws (USAF 2013). Range Control coordinates the real-time control of ranges in coordination with the FAA and other military users and communicates with the operations conductors and all participants entering and leaving the range areas (U.S. Navy 2018b). The FAA and the USCG issue NOTAM and NTM, respectively (U.S. Navy 2018b). Range safety organizations review, approve, monitor, and impose safety holds, when necessary, on all pre-launch and launch operations in accordance with Air Force Space Command Manual (AFSPCMAN) 91-710 (USAF 2013).

In accordance with 33 CFR part 72 (Aids to Navigation), the U.S. Coast Guard informs private and commercial vessels about temporary closures via NTMs. Broadcast notices on maritime frequency radio, weekly publications by the appropriate U.S. Coast Guard Navigation Center, and global positioning system navigation charts disseminate these navigational warnings (U.S. Navy 2018b).

Per AFSPCMAN 91-710, all facilities including launch complexes used to store, handle, or process ordnance items or propellants shall be properly sited and approved in accordance with DOD quantity distance criteria and explosives safety standards, as specified in DOD 6055.9-STD and implemented in AFMAN 91-201 (USAF 2013).

3.4.4.2 Region of Influence

The ROI for potential impacts related to the health and safety of workers includes work areas associated with JFC flight test launch operations, including payload processing, transport, and launch. The population of concern includes the workers employed at CCSFS but also other personnel directly involved with range operation and training activities currently occurring at CCSFS.

3.4.5 Hazardous Materials and Wastes (CCSFS)

See **Section 3.1.4** for a discussion on the definition of hazardous materials and wastes.

Every mission at CCSFS is required to do a program-specific Toxic Hazard Assessment to determine launch vehicle, payload, ground-support equipment, and facility toxic materials usage (USAF 2007). The Toxic Hazard Assessment is used to develop Toxic Hazard Zones for each launch, decide on safety clear areas for the storage, handling, and transfer of propellants, as well as provide for protection of workers and the general public during vehicle processing and launch operations (USAF 2007).

Numerous types of hazardous materials are used to support the missions and general maintenance operations at CCSFS. Typical material includes petroleum products, oils, lubricants, volatile organic compounds, corrosives, refrigerants, adhesives, sealants, epoxies, and propellants (USAF 2017). CCSFS has a pollution prevention program to prevent and reduce discharges or emissions by using fewer toxic inputs, redesigning products, altering manufacturing/ maintenance processes, and conserving energy (FAA 2020).

Solid Waste Management Units and Potential Release Locations are generally concentrated in operational areas such as the Vehicle Assembly Building, LC-39, Industrial Area, and facilities on CCSFS currently or formerly operated by NASA (FAA 2020). The most prevalent soil contaminants are petroleum hydrocarbons, RCRA metals, and PCBs (FAA 2020). The most prevalent groundwater contaminants are chlorinated solvents and associated degradation products (FAA 2020). These sites are managed under KSC's Remediation Program. The groundwater is monitored regularly at the various Solid Waste Management Units, and details can be found at the 45th Space Wing Installation Restoration Program Office or in the 45th Space Wing Land Use Controls Management Plan (FAA 2020).

Security requirements for launch sites, an integral component of project safety, are contained in SWI 31-101, AFI 31-101, and DOD Manual 5220.22-M (USAF 2007). Site security requirements would include security lighting and an intrusion detection system (USAF 2007).

Solid waste consists of everyday items such as product packaging, grass clippings, furniture, clothing, bottles, food scraps, newspapers, appliances, paint, and batteries. General solid waste at CCSFS is collected under franchise agreement by a private contractor called Waste Pro, Inc.

and disposed of off-site at the Brevard County Landfill, a Class I landfill located at 2250 Adamson Road in the in the City of Cocoa, or at other appropriate and permitted facilities (USAF 2017). The USAF 45th Space Wing also manages a recycling program for appropriate waste material from various CCSFS sites.

3.4.5.1 Regulatory Setting

See **Section 3.1.4.1** for a discussion on the federal regulatory environment of hazardous materials and wastes.

Hazardous waste management at CCSFS is regulated under RCRA (40 CFR 260-282), Florida Administrative Code Chapter 62-730, and the 45th Space Wing Hazardous Waste Management Plan (USAF 2013). CCSFS manages all hazardous waste generated from its operations in accordance with all local, state, and federal regulations and maintains their own hazardous waste satellite accumulation points and 90-day hazardous waste accumulation areas (USAF 2013).

The CCSFS Hazardous Materials Emergency Response Plan is in place to provide emergency spill response, but each mission has a specific Emergency Response Plan, which includes a Spill Prevention Control and Countermeasure Plan (KSC-PLN-1920) (USAF 2017).

The USAF IRP was initiated at CCSFS in 1984 and is conducted in parallel with the programs at PSFB, USEPA, the Florida Department of Environmental Protection, and NASA (USAF 2017). CCSFS is not a National Priorities List (NPL) site, and the IRP sites are being evaluated and remediated under RCRA authority while meeting the CERCLA regulations (USAF 2017).

3.4.5.2 Region of Influence

The ROI for hazardous materials and hazardous wastes would be limited to areas of CCSFS to be used for launch preparation, launch, and post-launch activities and in areas where hazardous materials are stored and handled.

3.4.6 Infrastructure (CCSFS)

Infrastructure consists of the systems and associated structures, and the utilities that provide public services to enable a population in a specified area to function. Infrastructure is wholly man-made, with a high correlation between the type and extent of infrastructure and the degree to which an area is characterized as "urban" or developed. The availability of infrastructure and its capacity to support growth are generally regarded as essential to the economic growth of an area. The infrastructure and utilities addressed in this analysis include electrical power, potable water management, wastewater, and stormwater drainage.

Much of the information for this section was taken from the Vulcan Centaur Program Operations and Launch on Cape Canaveral Air Force Station Draft Final Environmental Assessment prepared for United Launch Alliance and the 45th Space Wing (PAFB 2019).

3.4.6.1 Regulatory Setting

Infrastructure and utilities are governed by various federal, state, and local laws, regulations, and ordinances. NASA, the USAF, and the State of Florida via Space Florida work in tandem to operate the Cape Canaveral Spaceport. While CCSFS is federal land, Space Florida has been granted development rights and the right to permit others to develop sites and projects under numerous property agreements with NASA at KSC and the USAF at CCSFS (Space Florida 2016). Space Florida's powers are detailed in Sec. 331.305 of the Florida Statutes.

The Florida Department of Transportation (FDOT) and Space Florida work closely to plan and facilitate space transportation services on CCSFS. The FDOT 2018 Spaceport Improvement Program Project Handbook details the processes used to fund and manage spaceport capital projects (FDOT 2018). It also describes how projects are identified, analyzed, prioritized, approved for funding, and guidance for managing funded projects.

The Cape Canaveral Spaceport Development Manual (Space Florida 2016) provides Space Florida's tenants and contractors with the criteria for development of infrastructure and facility projects according to the standards and processes required by agreements between Space Florida, NASA, and the USAF (Space Florida 2016).

The Cape Canaveral Spaceport Master Plan (Space Florida 2017) defines the roles and responsibilities of the landowners, managers, operators, and regulators at CCSFS; and provides an up-to-date physical inventory of capabilities and supporting infrastructure (Space Florida 2017).

Utilities at CCSFS are not operated under a single entity (Space Florida 2017). Despite interconnection of the water, wastewater, electrical, and communication systems, NASA and USAF typically operate their utilities separately (Space Florida 2017).

3.4.6.2 Region of Influence

The ROI for infrastructure and utilities at CCSFS includes the areas to be used for launch preparation, launch, and post-launch activities.

NASA and the U.S. Air Force have some of the most unique facilities and infrastructure in the world at Cape Canaveral, including the Shuttle Landing Facility, the Vehicle Assembly Building, launch pads, the Space Station Processing Facility, and the Eastern Range (Space Florida 2013). With the completion of the Shuttle Program and the maturing of the Air Force launch programs, both NASA and the Air Force are reducing their footprint and leasing/licensing facilities to commercial operators (Space Florida 2013).

Electrical Power

CCSFS receives 115 kilovolt power from the Florida Power and Light transmission system at the North, South, and Titan substations. The substations convert the 115 kilovolt power to 13.2 kilovolt for the feeders, load break switches, and vacuum fault interrupters that make up the CCSFS-owned distribution system. Individual unit substations convert the 13.2 kilovolt distribution system to user level 480 or 208 volt power.

Potable Water

The City of Cocoa's municipal potable water distribution system supplies water under a single long-term contract with the U.S. Government to CCSFS, KSC, and PSFB. CCSFS recovers a portion of the costs through its contracts with commercial contractors operating on-site. A total of 6.5 million gallons per day, 17.5% of the City's capacity, is allocated for all three sites. Total water consumption for all three sites averages 3.7 million gallons per day historically. Water is used at CCSFS for both potable and non-potable purposes. Non-potable use includes fire protection, limited irrigation and launch-related consumption. Launch pad use of non-potable water includes noise abatement, cooling and shock wave attenuation associated with the deluge system and pre- and post-launch testing.

Wastewater Management

The regional wastewater treatment plant, Facility 54730 located on CCSFS, services all of CCSFS and KSC. Lift stations across CCSFS and KSC pump sewage through underground sewers from facilities to the wastewater treatment plant. The Florida Department of Environmental Protection also regulates industrial wastewater discharges to the environment and groundwater quality impacts from deluge wastewaters that are approved to go to grade.

Stormwater Drainage

The St. Johns River Water Management District regulates stormwater discharges through Rule 40C-4, Florida Administrative Code. The St. Johns River Water Management District issues Environmental Resource Permits for all proposed work in, on, or over wetlands or other surface waters. The Florida Department of Environmental Protection grants National Pollutant Discharge Elimination System (NPDES) construction stormwater permits for sites that disturb one or more acres.

3.4.7 Transportation (CCSFS)

Transportation/traffic addresses impacts on roadway networks consisting of streets, highways, and intersections; the operation and flow of vehicular traffic within roadway networks and at installation access control points (i.e., gates); the availability of vehicle parking; and traffic safety from a proposed action.

Much of the information for this section was taken from the Vulcan Centaur Program Operations and Launch on Cape Canaveral Air Force Station Draft Final Environmental Assessment prepared for United Launch Alliance and the 45th Space Wing (PAFB 2019).

3.4.7.1 Regulatory Setting

At CCSFS, off-installation street and highway operations are regulated primarily by the Florida Department of Transportation. Off-installation local street operations and maintenance are managed by the local county and city municipalities. On-installation roadway operations and maintenance are managed by CCSFS, KSC, and NASA.

3.4.7.2 Region of Influence

The transportation ROI consists of the on-installation and off-installation roadways, parking areas, and access control points leading to the areas to be used for launch preparation, launch, and post-launch activities.

On-installation Roadways and Gates

The majority of the employees and other related support services providers for CCSFS reside within the unincorporated areas of north and central Brevard County and in the cities of Cape Canaveral, Cocoa, Cocoa Beach, and Rockledge, which are all within 32 km (20 mi) of the CCSFS south Gate 1 (PAFB 2019). The key roads providing access to CCSFS from the local communities include State Road (SR) A1A, SR 520, SR 528, SR 401, SR 3, and SR 405. The NASA Causeway (SR 405), Beach Road, and SR 528 connect CCSFS with KSC, the inner barrier islands, and the mainland. Access roads include:

- Northern access into CCSFS through Gate 4 and Gate 6 at KSC from SR 3.
- Beach Road provides access to Gate 4 and Gate 6 from the west. Beach Road becomes SR 401 as it approaches CCSFS and subsequently turns into Samuel C. Phillips Parkway.
- Southern access into CCSFS occurs through Gate 1. Gate 1 is accessed by SR 401 via SR A1A, SR 520, and SR 528.
- SR 401 becomes Samuel C. Phillips Parkway as it approaches Gate 1 and is a 5-lane road that narrows to become a 4-lane divided road.
- SR A1A is a north-south, 4-lane divided highway to the south of CCSFS that connects SR 401 and Gate 1 with the cities of Cape Canaveral, Cocoa Beach, and PSFB to the south.
- Western access onto CCSFS is provided by SR 3 and SR 405.
- SR 3 is a north-south highway located on the south side of KSC that provides access to Gate 2. It becomes Kennedy Parkway once on KSC property.
- SR 405 is a 4-lane road providing access to CCSFS from the west. It turns into the NASA Causeway after entering KSC at Gate 3, just before crossing the Indian River Lagoon. After continuing through KSC, SR 405 crosses the Banana River, entering CCSFS and intersecting SR 401 (Samuel Phillips Parkway).

SR 520 is a 4-lane/6-lane, east-west urban roadway that crosses the Banana River and the Indian River Lagoon and connects SR A1A, US 1 and Interstate 95 as well as the City of Cocoa to Merritt Island.

SR 528 is a 4-lane, limited-access toll road that connects the Orlando urban area to the coast. It intersects the southern portion of CCSFS from the west, connecting the mainland to Merritt Island and the barrier islands. The road is used extensively by KSC personnel. SR 528 and SR A1A merge into SR 401 just south of CCSFS.

Off-installation Roadways

The CCSFS area can be accessed from Daytona Beach to the north via US Highway 1 or Interstate 95; from Orlando approximately 80 km (50 mi) to the west via SR 528; and from Miami approximately 300 km (187 mi) to the south via US 1 or Interstate 95.

Port Canaveral

The CCSFS Wharf is also used by the U.S. Navy, the U.S. Coast Guard, and other commercial space launch recovery vessels. The CCSFS Wharf is part of Port Canaveral. A significant amount of ocean-going transportation goes through Port Canaveral, including commercial shipping, cruise lines, commercial and private fishing, and pleasure boats.

3.5 Pacific Ocean Flight Corridors and Booster Drop/Payload Impact Zones

This section includes air quality and biological resources within the Pacific BOA along the over-ocean flight corridor for the JFC flight tests. This includes the areas shown on **Figure 1-1** for launches from PMRF and **Figure 1-3** for launches from VSFB.

The potential impacts to the following resource areas are considered to be negligible or non-existent so they were not analyzed in detail in this EA/OEA:

Water Resources: There are no groundwater or surface water resources along the over-ocean flight corridor that would be affected by the JFC flight test. There would be no disturbance to ocean waters beyond the settling of the individual booster stages hundreds of kilometers (miles) apart as they come to rest on the sea floor after splashing into the ocean along the flight path and slowly sinking thousands of meters (feet). No impacts would occur to water resources within the over-ocean flight corridor from the JFC flight test.

Geological Resources: There would be no drilling, mining, or construction in the open ocean and no sediment disturbance beyond the settling of the individual rocket booster stages hundreds of kilometers (miles) apart as they come to rest on the sea floor after splashing into the ocean along the flight path and slowly sinking thousands of meters (feet). There would be no impacts to geological resources in the over-ocean flight corridor from the JFC flight test.

Cultural Resources: There are no identified cultural resources along the flight path within the over-ocean flight corridor; therefore, there would be no impacts to cultural resources within that area from the JFC flight test.

Land Use: The JFC flight path would avoid populated land masses with their associated assigned land uses. There would be no changes, and therefore, no impacts, from the JFC flight test to land use along the flight path over the over-ocean flight corridor.

Airspace: The over-ocean flight corridor is located over international airspace and, therefore, has no formal airspace restrictions governing it. Over-ocean flight tests must comply with DOD Instruction 4540.01, *Use of International Airspace by US Military Aircraft and for Missile/Projectile Firings*. Commercial and private aircraft would be notified through NOTAMs issued through the FAA in advance of the JFC flight test launch at the request of PMRF and VSFB as part of their routine operations. Test flight operations would be conducted in accordance with Western Range procedures and would not expand or alter currently controlled airspace. There would be no impacts to airspace from the JFC flight test.

Noise: The JFC flight would occur at high altitude where it would be generally undetected by aircraft or vessels at the ocean's surface. Sonic booms are generated following launch and during terminal flight and impact. Noise impacts to biological receptors are discussed in **Section 3.5.2**.

There are no expected sensitive noise receptors within the over-ocean flight corridor. Therefore, aside from the potential noise impacts to biological receptors discussed in **Section 3.5.2**, there would be no impacts to noise receptors within the over-ocean flight corridor from the JFC flight test.

Infrastructure: No changes would occur to infrastructure in the over-ocean flight corridor from the JFC flight test; therefore, there would be no impacts to infrastructure in the over-ocean flight corridor.

Transportation: Transportation services would be unaffected by the JFC flight test over the open ocean. The payload flight would occur at high altitude where it would be generally undetected by vessels or aircraft. Public NOTAMs and NTMs would be issued along the flight path to ensure the safety of both aircraft and vessels. Components would drop over predetermined open ocean areas to ensure, along with the public notices, that there would be no vessels or aircraft in the vicinity. There would be no impacts from the JFC flight test to transportation along the flight path over the open ocean.

Public Health and Safety: The JFC flight would occur at high altitudes where it would be generally undetected by vessels or aircraft. NOTAMs and NTMs would be issued along the flight path to ensure the safety of personnel on aircraft and vessels. Components would drop over predetermined open ocean areas to ensure, along with the public notices, that there would be no vessels or aircraft in the vicinities. Range Safety at PMRF would monitor the flight until takeover by downrange range safety as the payload descends to the planned impact area. If the JFC flight strays outside its designated corridor, it would be considered to be malfunctioning and to constitute an imminent safety hazard. The destruct package, which is installed in all flight vehicles capable of impacting inhabited areas, would be activated. This effectively halts powered flight, causing the remaining hardware to fall into the ocean along a ballistic trajectory. The low potential for a flight failure, combined with the low density of vessels in the open ocean, makes any potential impact discountable. There would be no impacts from the JFC flight test to public health and safety along the flight path over the over-ocean flight corridor.

Hazardous Materials and Wastes: Each of the two rocket motor boosters would exhaust on-board propellant before dropping into the ocean, while fairings would not carry hazardous materials. *De minimus* residual quantities of other materials may remain on the boosters and fairings; these would be carried to the ocean floor by the sinking components. There would be no impacts to hazardous materials and wastes along the over-ocean flight corridor from the JFC flight test.

Socioeconomics: The JFC flight corridor is at high altitudes where there would be no impacts to socioeconomics from the JFC flight test.

Environmental Justice: Range safety regulations and procedures protective of health and safety would be applied throughout the flight corridor. There would be no disproportionate impacts within the over-ocean flight corridor to minority populations or low-income populations under EO 12898 from the JFC flight test.

Visual Resources: The JFC flight would occur at high altitude where it would be generally undetected by vessels or aircraft. There would be no changes from the JFC flight test to visual resources along the flight path over the over-ocean flight corridor.

Marine Sediments: There would be no marine sediment disturbance beyond the settling of the rocket components as they come to rest on the sea floor after splashing into the ocean along the flight path and slowly sinking thousands of meters (feet). There would be no impacts to marine sediments in the over-ocean flight corridor from the JFC flight test.

3.5.1 Air Quality (Pacific Ocean Flight Corridors and Booster Drop/Payload Impact Zones)

3.5.1.1 Regulatory Setting

Because of the potential global effects of testing rockets over the ocean and through the Earth's atmosphere, this EA/OEA considers the environmental effects on the global environment in accordance with the requirements of EO 12114, *Environmental Effects of Major Federal Actions*, Department of Defense Directive 6050.7, *Environmental Effects Abroad of Major Department of Defense Actions;* and EO 13990, *Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis*. This section describes the baseline conditions within the Pacific BOA over-ocean flight corridor and booster drop/payload impact zones shown on **Figure 1-1** and **Figure 1-3** that may be affected by the proposed JFC flight test.

Air Quality

The stratosphere, which extends from 10 km (6 mi) to approximately 50 km (30 mi) in altitude, contains the Earth's ozone layer (NOAA 2008). The ozone layer plays a vital role in absorbing harmful ultraviolet radiation from the sun. Over the last 20 years, anthropogenic (human-made) gases released into the atmosphere—primarily chlorine related substances—have threatened ozone concentrations in the stratosphere which filter harmful ultraviolet sunlight. Such materials include chlorofluorocarbons, which have been widely used in electronics and refrigeration systems, and the lesser-used halons, which are extremely effective fire extinguishing agents. Once released, the motions of the atmosphere mix the gases worldwide until they reach the stratosphere, where ultraviolet radiation releases their chlorine and bromine components.

Through global compliance with the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer and amendments, the worldwide production of CFCs and other ozone-depleting substances has been drastically reduced and banned in many countries. A continuation of these compliance efforts is expected to allow for a slow recovery of the ozone layer (World Meteorological Organization 2016).

Atomic chlorine produced from emissions of hydrogen chloride during high-temperature afterburning reactions in the exhaust plume of solid propellant rocket motors can contribute to overall global chlorine loading, which contributes to long-term ozone depletion. Stratospheric hydrogen chloride is diffused through the troposphere and dissipates with a half-life of about 2.3 years; however, hydrogen chloride from rocket emissions could have longer lifetimes because part of the emission occurs at atmospheric levels above the stratosphere. Studies have shown that aluminum oxide, which is emitted from the rocket exhaust as solid particles, could contribute to ozone depletion via activation of chlorine in the atmosphere. Emissions of nitrogen oxides produced in the exhaust plume of rockets can also contribute to stratospheric ozone depletion.

Greenhouse Gases

GHGs are components of the atmosphere that contribute to the greenhouse effect and global warming. Several forms of GHG occur naturally in the atmosphere, while others result from human activities, such as the burning of fossil fuels. Federal agencies, states, and local communities address global warming by preparing GHG inventories and adopting policies that will result in a decrease of GHG emissions.

On January 20, 2021, EO 13990 reinstated the Final Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in National Environmental Policy Act Reviews (CEQ 2016). As stated in the final CEQ guidance, a projection of a proposed action's direct and reasonably foreseeable indirect GHG emissions may be used as a proxy for assessing potential climate change effects. Agencies should attempt to quantify a proposed action's projected direct and reasonably foreseeable indirect GHG emissions when the amount of those emissions is substantial enough to warrant quantification, and when it is practicable to quantify them using available data and GHG quantification tools. The amount of emissions from the JFC flight test is not substantial enough to warrant quantification, and GHG impacts will be analyzed qualitatively. NEPA does not require monetary cost-benefit analysis, and at this time the JFC flight test would not be required to quantify the costs of GHG emissions under EO 13990, Sec. 5.

Climate Change

Current global climate changes are scientifically attributable to global warming occurring from GHG emissions. The global annual land and ocean temperature has increased at an average rate of 0.13°F per decade since 1880 and at an average rate of 0.31°F since 1981 (NOAA 2019). Nine of the ten warmest years have occurred since 2005, with the last 5 years (2014–2018) ranked as the five warmest years in Earth's historical record (NOAA 2019).

Changes in sea level have occurred throughout history, with the primary influences being global temperatures; Arctic, Antarctic, and glacial ice masses; and changes in the shape of the oceanic basins and land/sea distribution (USAF 2021b). Generally, with rising global temperatures, less ice is created or maintained throughout the Earth and sea levels rise. Currently, small islands located within the over-ocean flight corridor may be affected by rising sea levels from global climate change. Tracked by NASA altimeter satellites since 1992, the current rate of sea level rise is calculated to be 0.33 centimeter (0.13 in) per year (NASA 2018).

3.5.1.2 Region of Influence – Over-Ocean Flight Corridor

The emissions from the JFC AUR have the potential to affect air quality in the global upper atmosphere (U.S. Navy 2017). Dominant during much of the year, trade winds effectively disperse air emissions along the over-ocean flight corridor. Studies in Pacific locations have shown seasonal variations in the concentrations of man-made emissions, consisting of sulfate, nitrate, and dust. Each spring, large quantities of pollution, aerosols, and mineral dust are carried eastward out of Asia and transported over a broad region of the northern Pacific Ocean. Although an increasing trend in emission levels was occurring from the early 1980s to the mid-1990s, a more recent downward trend was recorded through 2000. Because of the lack of local air pollution sources, the dispersal of emissions by trade winds, and the lack of topographic features that inhibit dispersion, air quality in the Pacific BOA over-ocean flight corridor is considered good. Unlike the Continental United States, tropospheric ozone is not a concern in this general area (USAF 2021b).

Changes in sea level have occurred throughout history, with the primary influences being global temperatures; Arctic, Antarctic, and glacial ice masses; and changes in the shape of the oceanic basins and land/sea distribution. Generally, with rising global temperatures, less ice is created or maintained throughout the Earth and sea levels rise. Currently, small islands located within the over-ocean flight corridor may be affected by rising sea levels from global climate change.

3.5.2 Biological Resources (Pacific Ocean Flight Corridors and Booster Drop/Payload Impact Zones)

Biological resources in the Pacific BOA are defined as in **Section 3.1.2**. The biological resources described in this section are those within the affected environment in the BOA, specifically those areas subject to proposed flight test activities.

3.5.2.1 Regulatory Setting

The regulatory setting under the ESA, MMPA, and MBTA is described in detail in **Section 3.1.2** including relevant definitions under these Acts. The MSA as described in **Section 3.1.2.1** also applies to waters within the U.S. EEZ.

Since the Pacific BOA ROI includes international waters, biological resources are evaluated in accordance with the requirements of EO 12114, *Environmental Effects Abroad of Major Federal Actions* and DOD procedures for implementing EO 12114 (32 CFR § 187).

3.5.2.2 Region of Influence

The ROI for biological resources in the Pacific BOA includes the areas subject to effects of the Proposed Action as described in **Chapter 2.0** including:

- The Pacific over-ocean flight corridors beyond territorial seas (22 km [12 nm] from shore);
- The stage 1 booster drop zones within the U.S. EEZ near PMRF and VSFB; and
- The stage 2 booster drop/payload impact zones (primarily in international waters).

These marine areas include all the areas which may be subject to effects of the Proposed Action including elevated noise levels, human activity and vessel traffic, and exposure to hazardous materials and debris. Because the regulatory environment and baseline conditions for biological resources is different in the stage 1 vs stage 2 booster drop/payload impact zones, this section divides the Pacific BOA ROI into three subsections; (1) the stage 1 booster drop zone for a PMRF launch, (2) the stage 1 booster drop zone for a VSFB launch, and (3) the stage 2 booster drop/payload impact zones which include the payload impact areas. The flight corridor would be mostly over these drop zones and the areas that are not would have similar baseline conditions as the closest drop zone to the flight path.

There are no terrestrial habitats in the ROI. Some seabirds which breed on land and forage in open ocean areas of the Pacific have the potential to occur in the ROI. The waters of the ROI consist of deep ocean waters with both pelagic and benthic habitats. Pelagic areas support communities of planktonic (drifting) and nektonic (swimming) organisms. Benthic communities are made up of marine organisms that live on or near the sea floor such as bottom dwelling fish, mollusks, crustaceans, and echinoderms. **Table 3-14** lists the ESA-listed species with the potential to occur in the ROI.

Due to the limited potential for the Proposed Action to impact biological resources, only a brief summary of biological resources is provided in the following sections and is focused on special-status species which might respond to stressors resulting from the Proposed Action.

3.5.2.3 PMRF Launch Stage 1 Booster Drop Zone

Water depths in the PMRF stage 1 booster drop zone are between 60 and 4,700 m (196 to 15,420 ft) deep. These waters provide habitat for a diversity of marine wildlife including several special-status species.

Table 3-14. ESA-Listed Species with the Potential to Occur in the Pacific Ocean Flight Corridor and Booster Drop/Payload Impact Zones.

Common Name	Scientific Name	Federal Listing Status	Likelihood of Occurrence		
			PMRF Stage 1 Booster Drop Zone	VSFB Stage 1 Booster Drop Zone	Pacific Stage 2 Booster Drop/ Payload Impact Zones
Marine Mammals					
Sei whale	*Balaenoptera borealis*	E	P	L	L
Blue whale	*B. musculus*	E	P	L	L
Fin whale	*B. physalus*	E	P	L	L
North Pacific right whale	*Eubalaena japonica*	E	-	P	L
Humpback whale	*Megaptera novaeangliae*				
Mexico DPS		T	U[1]	L	L
Western North Pacific DPS		E	U[1]	-	L
Sperm whale	*Physeter macrocephalus*	E	L	L	L
False killer whale – Main Hawaiian Islands Insular DPS	*Pseudorca crassidens*	E	P	-	-
Pinnipeds					
Guadalupe fur seal	*Arctocephalus townsendi*	T	-	P	-
Hawaiian monk seal	*Neomonachus schauinslandi*	E	P	-	-
Birds					
Band-rumped storm petrel	*Oceanodroma castro*	E	P	-	P
Short-tailed albatross	*Phoebastria albatrus*	E	P	P	L
Hawaiian petrel	*Pterodroma sandwichensis*	E	L	-	L
Newell's shearwater	*Puffinus auricularis newelli*	T	P	-	P
Sea Turtles					
Loggerhead turtle – North Pacific Ocean DPS	*Caretta caretta*	E	P	L	L
Green turtle	*Chelonia mydas*				
Central North Pacific DPS		T	L	-	L
Central West Pacific DPS		E	-	-	L
East Pacific DPS		T	-	L	L
Leatherback turtle	*Dermochelys coriacea*	E	P	L	L
Hawksbill turtle	*Eretmochelys imbricata*	E	L	P	L
Olive ridley turtle	*Lepidochelys olivacea*	T	P	P	L

Table 3-14. ESA-Listed Species with the Potential to Occur in the Pacific Ocean Flight Corridor and Booster Drop/Payload Impact Zones. (Continued)

Common Name	Scientific Name	Federal Listing Status	Likelihood of Occurrence		
			PMRF Stage 1 Booster Drop Zone	VSFB Stage 1 Booster Drop Zone	Pacific Stage 2 Booster Drop/ Payload Impact Zones
Fish					
Oceanic whitetip shark	*Carcharhinus longimanus*	T	L	P	L
Oceanic giant manta ray	*Manta birostris*	T	P	P	L
Coho salmon	*Oncorhynchus kisutch*	T[2]	-	P	-
Steelhead	*O. mykiss*	E, T[2]	-	P	-
Chinook salmon	*O. tshawytscha*	E, T[2]	-	P	-
Scalloped hammerhead shark	*Sphyrna lewini*				
Eastern Pacific DPS		E	-[3]	P	L
Indo-West Pacific DPS		T	-[3]	-	L

Abbreviations: DPS = Distinct Population Segment, E = federal endangered, T = federal threatened, L = Likely, P = Potential, U = Unlikely.
[1] Humpback whales are likely to occur in the PMRF stage 1 booster drop zone but are likely part of the Hawai`i DPS which is not listed under the ESA.
[2] Seven ESA listed ESUs of salmon and steelhead have the potential to occur in the ROI seasonally (U.S. Navy 2002, DARPA 2019) but are considered rare in the ROI.
[3] Scalloped hammerhead sharks may occur in the PMRF stage 1 booster drop zone but would be part of the Central Pacific DPS which is not listed under the ESA.

Marine Wildlife

Marine Mammals. All marine mammal species in the ROI are protected under the MMPA and six species listed under the ESA have the potential to occur in the stage 1 booster drop zone (**Table 3-14**). Several marine mammal species in the ROI, such as humpback whales, short-finned pilot whales, killer whales (*Orcinus orca*), spinner dolphins, and bottlenose dolphins have more coastal distributions. These species are more likely to occur in the up-range portion of the flight corridor near the Hawaiian Islands. The U.S. Navy has compiled a technical report summarizing species-specific marine mammal and sea turtle density estimates for the Hawai`i-Southern California Testing and Training area which includes the stage 1 booster drop zone (Hanser et al. 2017). Species with the highest densities in the stage 1 booster drop zone include humpback whales, Fraser's dolphins (*Lagenodelphis hosei*), short-finned pilot whales, dwarf sperm whales (*Kogia sima*), pantropical spotted dolphins, Risso's dolphins (*Grampus griseus*), and pygmy killer whales (*Feresa attenuata*) (Hanser et al. 2017).

Potential threats to cetacean species in the Pacific BOA include ingestion of marine debris, entanglement in fishing nets or other marine debris, collision with vessels, loss of prey species due to new seasonal shifts in prey species or overfishing, excessive noise above baseline levels in a given area, chemical and physical pollution of the marine environment, parasites and diseases, and changing sea surface temperatures due to global climate change. There is increasing evidence that loud underwater noise can be lethal, physically damaging, or disruptive to cetaceans (Miller 2007). Cetaceans have been observed altering their vocalizations in the presence of underwater anthropogenic noises and avoiding some underwater sounds, even vacating feeding or mating grounds, changing migratory routes, or suspending feeding (Miller 2007). Certain cetaceans are affected by elevated noise levels more than others. The beaked whales (Ziphiidae) and other deep diving species seem to be particularly susceptible to acoustic damage and anthropogenic noise has been linked to strandings in some species (Miller 2007, Ellis and Mead 2017).

Hawaiian monk seals breed only on the Hawaiian Islands with the majority of breeding and pupping taking place on the Northwest Hawaiian Islands (NMFS 2011). Monk seals spend the majority of their time close to shore in waters less than 90 m (300 ft) deep; however, seals are known to forage in offshore areas up to 700 km (378 nm) from the Hawaiian Islands and in waters up to 500 m (1,640 ft) deep (NMFS 2011).

Seabirds. While no terrestrial habitat occurs in the ROI, many seabirds have wide ranging foraging and non-nesting season distributions. It is possible that some seabird species may forage or rest at sea in the ROI. Two ESA-listed species have the potential to occur in the ROI; Newell's shearwater and band-rumped storm petrel. Both species are protected under the ESA and MBTA.

Newell's shearwaters, Hawaiian petrels, and band-rumped storm-petrels nest in burrows on steep forested mountain slopes in the Hawaiian Islands (Pyle and Pyle 2017). These species are highly pelagic, spending large amounts of time foraging at-sea both during and outside of their breeding season (USFWS 2005, Pyle and Pyle 2017, Wiley et al. 2012). Little is known about their winter range or about their pelagic foraging distribution, but these species have been observed in offshore waters near Hawai`i (USFWS 2005, Pyle and Pyle 2017). While little is known about the abundance and distribution of these birds in the open ocean, it is likely that the distribution and abundance of the pelagic food supply determines the marine distribution of seabirds.

Marine Reptiles. Five species of sea turtle: green, hawksbill, leatherback, loggerhead, and olive ridley (*Lepidochelys olivacea*), all of which are listed under the ESA (**Table 3-14**), have the potential to occur in the ROI. Green turtles and hawksbill turtles are the most abundant species in the waters of the Hawaiian Islands; however, the other species are likely to occur at very low densities. Much of the sea turtle research in the ROI has been conducted on the beaches and nearshore waters of Hawai`i; thus, much of the data documenting the species' occurrence in the BOA is limited to that region. The primary threats to sea turtles in the ROI include bycatch in commercial fisheries, ship strikes, and marine debris (Lutcavage et al. 1997).

Each sea turtle species has unique life history characteristics which result in different patterns of distribution and abundance in the Pacific. While green turtles spend much of their time resting and foraging in shallow, nearshore waters, individuals are also known to migrate through deeper waters of the Pacific (Hanser et al. 2017). Studies also suggest that after hatching, juveniles are pelagic (Dutton et al. 2008). Hawksbill turtle hatchlings and small juveniles live in the open ocean where water depths are greater than 200 m (656 ft) before settling into nearshore coral reef habitats as older juveniles (NMFS and USFWS 2013a). Hawksbills are thought to have a mixed migration strategy where some turtles remain close to their rookery and others are highly mobile, traveling thousands of kilometers to foraging areas (NMFS and USFWS 2013a). Similarly, loggerhead turtle hatchlings and early juveniles live in the open ocean before moving to nearshore foraging habitats close to their birth area (Musick and Limpus 1997). They may use the same nearshore habitat as juveniles or may move among different areas before settling in an adult coastal foraging habitat (Godley et al. 2003). Leatherback turtles occur mostly in the open ocean and are only occasionally found in coastal areas. While hatchlings distribution is likely determined by passive drift, juveniles begin to actively swim toward warmer latitudes during winter and higher latitudes during spring (NMFS and USFWS 2013b). Little is known about olive ridley turtles in the ROI, but available information suggests that olive ridleys traverse through the oceanic waters surrounding the Hawaiian Islands during foraging and developmental migrations (Polovina et al. 2004).

Fish. A diversity and abundance of fish occur in the PMRF stage 1 booster drop zone. These fish have great ecological and economic importance. The major fisheries in the Central Pacific include several tuna species, marlin, swordfish (*Xiphias gladius*), sharks, dolphinfish, and wahoo (Lawseth 2007). The WPRFMC has designated EFH in the waters around Hawai`i, including in the stage 1 booster drop zone as described in the *Environmentally Sensitive Habitats* subsection. Two ESA listed species have the potential to occur in the ROI: the oceanic whitetip shark and oceanic giant manta ray.

The oceanic whitetip is a highly migratory species and is one of the most widespread shark species in tropical and subtropical waters of the world (Young et al. 2018). While these sharks may occasionally be found in coastal waters, oceanic whitetip sharks are usually found far offshore in the open ocean, on the outer continental shelf, or around oceanic islands in deeper waters (Young et al. 2018).

The giant manta ray is commonly sighted along productive coastlines with upwelling but primarily occurs near offshore pinnacles and seamounts (Marshall et al. 2011). This species is thought to spend the majority of its time in deep water with occasional visits to coastal areas (Defenders of Wildlife 2015). While oceanic giant manta rays are known to occur in the ROI, densities, distributions, and migratory patterns for this area are poorly known.

Invertebrates. Deepwater coral occur around the Hawaiian Islands (Parrish and Baco 2007) and may occur in portions of the stage 1 booster drop zone. Anthozoan stony corals are known to occur at depths of 500-600 m (1,640-1,969 ft) in Hawai`i, gold (*Gerardia* spp.) and pink (*Corallium* spp.) corals at depths of 350-600 m (1,148-1,969 ft), and black corals at depths of 30-100 m (98-328 ft) (Parrish and Baco 2007). The stage 1 drop zone is located in waters approximately 60 to 4,700 m (196 to 15,420 ft) deep and may contain some deepwater coral communities.

Various other deepwater benthic and pelagic invertebrates are likely to occur in the ROI. Overall, these organisms likely have low densities within the booster drop zones of the ROI and no special-status invertebrates are known to occur in the ROI.

Environmentally Sensitive Habitats

Critical Habitat. No designated critical habitat occurs within the stage 1 booster drop zone. Designated critical habitat for both Hawaiian monk seals and the Main Hawaiian Islands DPS of the false killer whale occur in waters offshore of Kauai near the stage 1 booster drop zone (**Figure 3-4**). However, proposed activities would not affect either of these designated critical habitats.

Essential Fish Habitat. EFH and its geographic boundaries have been designated by the WPRFMC under the MSA, including waters in the stage 1 booster drop zone. The WPRFMC developed EFH designations for Management Unit Species (MUS) including Bottomfish and Seamount Groundfish, Crustaceans, and Precious Corals (64 FR 19068) as well as for Coral Reef Ecosystem MUS (69 FR 8336, WPRFMC 2009). NMFS has recently implemented a reclassification of EFH that has resulted in many species being moved from MUS to ecosystem components (NMFS 2019). The current EFH designations for all MUS in the Hawaiian Islands EEZ are summarized in Table 3-3 of the FE-2 EA/OEA (U.S. Navy 2019a) and incorporated here by reference. While changes have been made to the MUS categories and the species within those categories, the geographic footprint of EFH has not changed (NMFS 2019). EFH for these species management units is discussed in detail by WPRFMC in the Fishery Ecosystem Plan for the Hawaiʻi Archipelago (WPRFMC 2009). No designated habitat areas of particular concern (HAPCs) within the EFH occur in the ROI.

Papahānaumokuākea Marine National Monument. The flight path would cross over the Papahānaumokuākea Marine National Monument (**Figure 3-4, Figure 1-1**. The Papahānaumokuākea Marine National Monument is the largest contiguous conservation area belonging to the United States, and one of the largest protected marine areas in the world (NOAA 2018c). The booster drop zones do not occur in the Marine National Monument and no part of the Proposed Action would impact the monument.

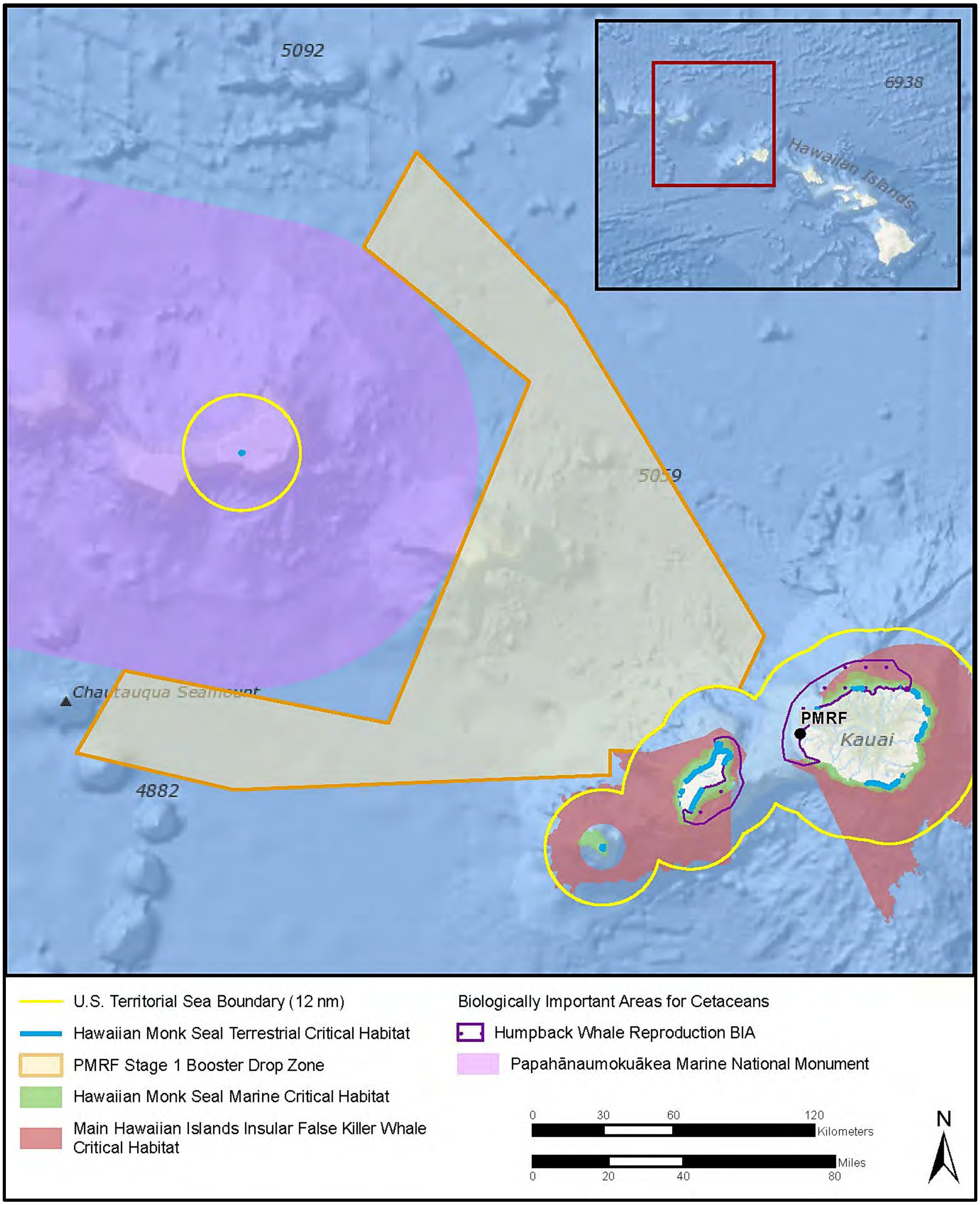

Figure 3-4. Environmentally Sensitive Habitats near the PMRF Stage 1 Booster Drop Zone.

3.5.2.4 VSFB Launch Stage 1 Booster Drop Zone

The VSFB stage 1 booster drop zone begins approximately 76 km (41 nm) west of VSFB and extends approximately 260 km (140 nm) into the Pacific Ocean (see **Figure 3-5**). The waters of the stage 1 booster drop zone consist of deep ocean waters approximately 600 to 4,200 m (1,970 to 13,780 ft) deep. **Table 3-14** lists the ESA-listed species with the potential to occur in the stage 1 booster drop zone. Designated critical habitat for leatherback sea turtles occurs in the ROI and is discussed in the *Environmentally Sensitive Habitats* subsection. Baseline conditions for biological resources in the ROI were recently described in the USAF Air-Launched Rapid Response Weapon (ARRW) EA/OEA (USAF 2019) and the Defense Advanced Research Projects Agency Tactical Boost Glide EA/OEA (DARPA 2019) and are incorporated here by reference.

Marine Wildlife

Marine Mammals. The waters offshore of VSFB have a high diversity and abundance of marine mammals. At least 17 cetacean species have the potential to occur in the ROI, all of which are protected under the MMPA and six of which are listed as threatened or endangered under the ESA (**Table 3-14**). The U.S. Navy has compiled a technical report summarizing species-specific marine mammal and sea turtle density estimates for the Hawai`i-Southern California Testing and Training area which includes waters approximately 100 km (54 nm) southeast of the stage 1 booster drop zone (Hanser et al. 2017). Species with the highest estimated densities in the stage 1 booster drop zone include short-beaked common dolphins (*Delphinus delphis*), Dall's porpoises (*Phocoenoides dalli*), northern right whale dolphins (*Lissodelphis borealis*), striped dolphins (*Stenella coeruleoalba*), and Pacific white-sided dolphins (*Lagenorhynchus obliquidens*) (Hanser et al. 2017). Many of these species are more likely to occur in coastal waters; however, these species transit deeper offshore waters and may occur in higher numbers in the ROI seasonally (USAF and USASMDC 2019).

Six pinniped species, all protected under the MMPA, have the potential to occur in the stage 1 booster drop zone. The three most abundant pinnipeds in the ROI are northern fur seals, northern elephant seals, and California sea lions (U.S. Navy 2002). These species forage primarily in deeper waters and can regularly be found in offshore waters of the ROI (U.S. Navy 2002). The ESA-listed Guadalupe fur seal (*Arctocephalus townsendi*) is considered rare in the ROI (U.S. Navy 2018) but is known to forage up to 444 km (240 nm) from land (Gallo-Reynoso et al. 2008).

Seabirds. While no terrestrial habitat occurs in the ROI, many seabirds have wide ranging foraging distributions and extensive pelagic migrations in the Pacific. It is likely that several seabird species may forage or rest at sea in the ROI. Some seabirds known to occur in the temperate North Pacific include trans-Pacific species such as sooty shearwater (*Ardenna grisea*), Murphy's petrel (*Pterodroma ultima*), Leach's storm-petrel (*Oceanodroma leucorhoa*), and black-footed albatross (*P. nigripes*) (DARPA 2019). The short-tailed albatross is listed as endangered under the ESA and has potential to occur in the ROI. Outside of the breeding season, short-tailed albatross migrate to feeding grounds in waters of the Bering Sea, Aleutian Islands, Gulf of Alaska, and the Hawaiian Islands (USFWS 2000). The short-tailed albatross has been observed feeding in both nearshore and pelagic waters (USFWS 2000). In a study of satellite tagged birds, most locations for foraging birds were nearshore in the Bearing Sea, Aleutian Islands, and Gulf of Alaska; however, some locations were recorded for the open ocean west of California, Oregon, and Washington (USFWS 2014).

Marine Reptiles. Five species of sea turtle have the potential to occur in the ROI, all of which are listed under the ESA (**Table 3-14**). Each sea turtle species has unique life history characteristics that result in different patterns of distribution and abundance in the Pacific as described in **Section 3.5.2.3**. Of these five species, green, leatherback, and loggerhead turtles have a higher chance of occurrence in the ROI. The primary threats to sea turtles in the ROI are also discussed in **Section 3.5.2.3**.

Fish. At least 481 species of fish are known to inhabit the Southern California Bight (U.S. Navy 2002) and many of these likely occur in the ROI. Epipelagic fish in the region include species such as northern anchovy (*Engraulis mordax*), Pacific sardine (*Sardinops sagax caeruleus*), Pacific mackerel (*Scomber japonicus*), Pacific bonito (*Sarda chiliensis*), yellowtail (*Seriola lalandi*), and swordfish (U.S. Navy 2002). Commercial fisheries are important in the ROI and the largest commercial fish landing in the Santa Barbara area in 2017 were of Pacific mackerel, sablefish (*Anoplopoma fimbria*), shortspine thornyhead (*Sebastolobus alascanus*), Pacific bonito, Pacific sardine, California halibut (*Paralichthys californicus*), and white seabass (*Atractoscion nobilis*) (CDFW 2018).

Five species of ESA-listed fish have the potential to occur in the ROI (**Table 3-14**). Most of these fish are considered rare in these waters and are unlikely to occur in the ROI; however, some ESA-listed Evolutionarily Significant Units (ESUs) of salmon and steelheads are likely to occur in the ROI seasonally as detailed in DARPA 2019. Oceanic giant manta rays are considered very rare in the ROI but are known to occur off the California coast on occasion (Larese and Coan 2008).

Invertebrates. Given the large spatial extent of the ROI, there are a diversity of pelagic and benthic habitats for invertebrates. Offshore shelves, ridges, and banks provide unique benthic habitats that support the diverse benthic invertebrate communities due to persistent upwelling and diverse sediment types (U.S. Navy 2002). Dominant invertebrates in these habitats include polychaetes (*Chloeia pinnata*, *Lumbrineris* spp.), brittle stars (*Amphipholis squamata*, *Amphiodia urtica*), bivalves (*Parvilucina tenuisculpta*), ostracods (*Euphilomedes* spp.), and amphipods (*Photis californica*) (U.S. Navy 2002).

The basins, submarine canyons, and abyssal regions of the ROI, with water depths from 730 to more than 4,000 m (2,400 to 13,123 ft), have very low invertebrate abundance and diversity (U.S. Navy 2002). Invertebrate species that may occur in the ROI include some polychaete worms, brittle stars, and *Aplacophora* mollusks (U.S. Navy 2002).

Commercial invertebrate fisheries are also important in the ROI and the largest crustacean catches (by weight) in the Santa Barbara area were of red (*Cancer productus*), brown (*C. antennarius*), and yellow (*C. anthonyi*) rock crabs; ridgeback (*Sicyonia ingentis*) and spot (*Pandalus platyceros*) prawns; and California spiny lobster (CDFW 2018). The largest mollusk landings (by weight) were of various market squid, Kellet's welk (*Kelletia kelleii*), and moon snails (*Neverita lewisii*) (CDFW 2018). Echinoderms caught in Santa Barbara fisheries included red sea urchins (*Mesocentrotus franciscanus*), bat stars (*Patiria miniata*), warty sea cucumbers (*Parastichopus parvimensis*), and giant red sea cucumbers (*P. californicus*) (CDFW 2018).

Environmentally Sensitive Habitats

Critical Habitat. Designated critical habitat for leatherback sea turtles occurs within the stage 1 booster drop zone (**Figure 3-5**) and is described in **Section 3.3.3**. Designated critical habitat for both the Central America DPS and Mexico DPS of humpback whales also occurs in the VSFB stage 1 booster drop zone (**Figure 3-5**) and is described in **Section 3.3.3**.

Essential Fish Habitat. EFH and its geographic boundaries in and near the stage 1 booster drop zone have been designated by the PFMC under the MSA. The PFMC has developed EFH and HAPC designations for Pacific coast groundfish, coastal pelagic species, and highly migratory species. Complete descriptions of the designated EFH and HAPCs for each life history stage for each managed species are included in the Fishery Management Plans for each group; coastal pelagic species (PFMC 1998), Pacific coast groundfish (PFMC 2016), and highly migratory species (PFMC 2018). The designated EFH and HAPC in the stage 1 booster drop zone are summarized in **Table 3-15**.

Coastal pelagic species with designated EFH (**Table 3-15**) include northern anchovy, jack mackerel (*Trachurus symmetricus*), Pacific sardine, Pacific mackerel, and market squid (*Loligo opalescens*) (PFMC 1998). These fish are pelagic, generally occurring above the thermocline in the upper mixed layer of water and all are treated as a single species complex (along with the squid) because of similarities in habitat requirements (PFMC 1998).

There are 87 species managed under the Pacific Coast Groundfish Fishery Management Plan (PFMC 2016). These species with designated EFH (**Table 3-15**) include leopard sharks (*Trikis semifasciata*), longnose sharks (*Raja rhina*), big skates (*R. binoculata*), spiny dogfish (*Sualus suckleyi*), 6 species of roundfish, 65 species of rockfish, and 12 species of flatfish (PFMC 2016). One designated HAPC for groundfish occurs within the stage 1 booster drop zone, a rocky reef area (**Figure 3-5**). The rocky reefs HAPC includes those waters, substrates and biologic features associated with hard substrates such as bedrock, boulders, cobble, and gravel important to groundfish (PFMC 2016).

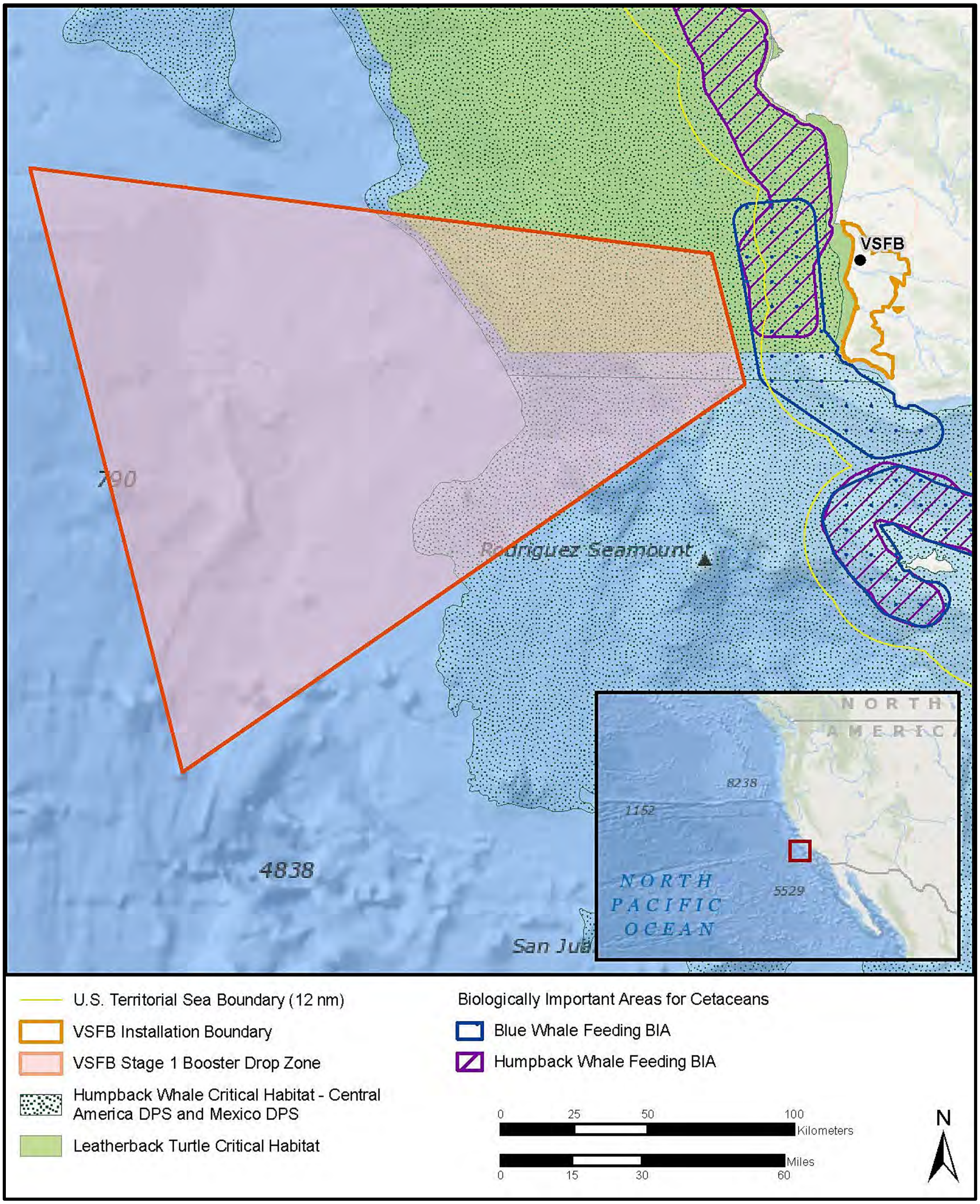

Figure 3-5. Environmentally Sensitive Habitats near the VSFB Stage 1 Booster Drop Zone.

Table 3-15. Designated Essential Fish Habitat (EFH) and Habitat Areas of Particular Concern (HAPC) in and Near the VSFB Stage 1 Booster Drop Zone.

Management Unit	EFH	HAPC
Coastal Pelagic Species	All marine and estuarine waters above the thermocline from the shoreline offshore to 370 km (200 nm) offshore.	None
Pacific Coast Groundfish	All waters and substrate within the following areas: • Depths less than or equal to 3,500 m (11,500 ft) to mean higher high-water level or the upriver extent of saltwater intrusion. • Seamounts in depths greater than 3,500 m (11,500 ft) as mapped (PFMC 2016). • Areas designated as HAPCs not included above.	Estuaries, canopy kelp, seagrass, rocky reefs, and “areas of interest”, including several seamounts off California.
Highly Migratory Species	All marine waters from the shoreline offshore to 370 km (200 nm) offshore. [1]	None

Sources: PFMC 1998, PFMC 2016, PFMC 2018

[1]Varies by species but encompassed by this definition.

Species with designated EFH under the U.S. West Coast Fisheries Management Plan for Highly Migratory Species (PFMC 2018) include common thresher shark (*Alopias vulpinus*), shortfin mako shark (*Isurus oxyrinchus*), blue shark (*Prionace glauca*), albacore tuna (*Thunnus alalunga*), bigeye tuna (*T. obesus*), Pacific bluefin tuna (*T. orientalis*), skipjack tuna (*Katsuqonus pelamis*), yellowfin tuna (*T. albacares*), striped marlin (*Kajikia audax*), swordfish, and dolphinfish (PFMC 2018). EFH varies by species and life history stage as detailed in PFMC 2018 but overall includes all marine waters from the shoreline offshore to the EEZ boundary.

3.5.2.5 Pacific BOA Stage 2 Booster Drop/Payload Impact Zones

The stage 2 booster drop/payload impact zones are in the BOA of the North Pacific Ocean from approximately 3° to 50° North and from 125° West to 147° East (**Figure 1-1, Figure 1-3**). The stage 2 booster drop/payload impact zones include only waters almost exclusively outside of the EEZs of the United States and other countries with territory in the central Pacific (**Figure 1-3**). The waters of the stage 2 booster drop/payload impact zone consist of deep ocean waters with both pelagic and benthic habitats. **Table 3-14** lists the ESA-listed species with the potential to occur in the ROI. No designated critical habitat for any special-status species occurs in the ROI. Biological resources for much of this area have been described in the FE-2 BA (U.S. Navy 2019b) and ARRW BA (USAF and USASMDC 2019) which are incorporated here by reference.

Marine Wildlife

Marine Mammals. Several species of cetaceans and pinnipeds have been documented in the ROI. All marine mammal species in the ROI are protected under the MMPA, and seven species are listed under the ESA. All of these species have been described in detail in the U.S. Navy FE-2 BA (U.S. Navy 2019b) and the USAF ARRW BA (USAF and USASMDC 2019). Given the large extent of the ROI, there are at least 26 cetacean species and 4 pinniped species that are likely to occur in some portion of the ROI. The best available marine mammal density data for the North

Pacific comes from the U.S. Navy's marine species density databases which summarize existing density data for marine mammals and sea turtles (Hanser et al. 2017, U.S. Navy 2018c). While these U.S. Navy study areas do not completely overlap with the drop zones, they are the best available data for the ROI. The most abundant marine mammals in the ROI include short-beaked common dolphins, northern right whale dolphins, striped dolphins, Pacific white-sided dolphins, bottlenose dolphins, pantropical spotted dolphins, and Fraser's dolphins (Hanser et al. 2017, U.S. Navy 2018c). Descriptions of many of these species and their distribution patterns in the ROI are discussed in **Sections 3.5.2.3** and **3.5.2.4**.

Seabirds. While no terrestrial habitat occurs in the ROI, many seabirds have wide ranging foraging distributions and extensive pelagic migrations in the Pacific. It is likely that several seabird species may forage or rest at sea in the ROI. At least three ESA-listed seabirds have the potential to occur in the ROI (**Table 3-14**). Distributions and densities of these species in the ROI are largely unknown but likely vary seasonally with changes in the pelagic food supply as described in **Sections 3.5.2.3** and **3.5.2.4**.

Marine Reptiles. Five ESA-listed sea turtle species have the potential to occur in the ROI: green, leatherback, loggerhead, olive ridley, and hawksbill (**Table 3-14**). Descriptions of these species, their occurrence patterns, and threats are the same as those discussed in **Sections 3.5.2.3** and **3.5.2.4**.

Fish. Fish have great ecological and economic importance. The major fisheries in the Central Pacific include several tuna species, marlin, swordfish, sharks, dolphinfish, and wahoo (Lawseth 2007). Due to the large size of the ROI, there are a diversity of oceanic habitats for fish from epipelagic to deep benthic and seamount habitats, and therefore a wide diversity of fish species. Two ESA-listed species have the potential to occur in the ROI: the oceanic whitetip shark and giant manta ray. Descriptions of these species and their occurrences patterns are the same as those discussed in **Sections 3.5.2.3** and **3.5.2.4**. Because the ROI is almost entirely outside of the U.S. EEZ, no essential fish habitat occurs in the ROI.

Invertebrates. Given the large spatial extent of the ROI, there are a diversity of pelagic and benthic habitats for invertebrates. Waters beyond the EEZs are usually beyond the continental shelves and are mostly very deep waters (1–6 km [0.6–3.7 mi] deep) (UNEP 2006). The greatest diversity of invertebrates in these waters occurs in the epipelagic zone where available sunlight enables primary production by phytoplankton and algae. Hotspots for diversity tend to occur near underwater features such as seamounts, submarine canyons, and shelf breaks where upwelling occurs, as well as in areas where warm and cold-water currents converge (UNEP 2006). Deep-water benthic habitats also support a diversity of invertebrates including echinoderms, sponges, tube worms, anemones, mollusks, and crustaceans (UNEP 2006). While many species of deepwater benthic and pelagic invertebrates are likely to occur in the Pacific Ocean BOA ROI, the density and distribution of these organisms are largely unknown. No special-status invertebrates are known to occur in the ROI.

Environmentally Sensitive Habitats

Papahānaumokuākea Marine National Monument. The Papahānaumokuākea Marine National Monument is as described in **Section 3.5.2.3**. The flight path may cross over the Papahānaumokuākea Marine National Monument; however, no part of the Proposed Action would impact this Marine National Monument.

Remote Pacific Islands Marine National Monument. The Remote Pacific Islands Marine National Monument comprises seven islands and atolls including Howland, Baker, and Jarvis Islands; Palmyra, Johnston, and Wake Atolls; and Kingman Reef (**Figure 1-1**, **Figure 1-3**). The monument also includes 165 known seamounts that are hotspots of species diversity and abundance (NOAA 2020). Several nationally and internationally endangered, threatened, and depleted species thrive at the monument, including giant clams, pearl oysters, coconut crabs, fishes, reef sharks, and dolphins. The monument also provides important migratory shorebird and seabird habitat. Kingman Reef and Palmyra Atoll support higher levels of coral diversity (180–190 species) than any other reef island or atoll in the central Pacific (NOAA 2020).

The flight path may cross over the Remote Pacific Islands Marine National Monument; however, no JFC components would fall into this Marine National Monument and no part of the Proposed Action would impact the Monument.

3.6 Atlantic Ocean Flight Corridors and Booster Drop/Payload Impact Zones

This section includes air quality and biological resources within the Atlantic BOA along the over-ocean flight corridor for the JFC flight tests. This includes the areas shown on **Figure 1-2** for launches from WFF and **Figure 1-4** for launches from CCSFS.

The potential impacts to the following resource areas are considered to be negligible or non-existent so they were not analyzed in detail in this EA/OEA:

Water Resources: There are no groundwater or surface water resources along the over-ocean flight corridor that would be affected by the JFC flight test. There would be no disturbance to ocean waters beyond the settling of the individual booster stages hundreds of kilometers (miles) apart as they come to rest on the sea floor after splashing into the ocean along the flight path and slowly sinking thousands of meters (feet). No impacts would occur to water resources within the over-ocean flight corridor from the JFC flight test.

Geological Resources: There would be no drilling, mining, or construction in the open ocean and no sediment disturbance beyond the settling of the individual rocket booster stages hundreds of kilometers (miles) apart as they come to rest on the sea floor after splashing into the ocean along the flight path and slowly sinking thousands of meters (feet). There would be no impacts to geological resources in the over-ocean flight corridor from the JFC flight test.

Cultural Resources: There are no identified cultural resources along the flight path within the over-ocean flight corridor; therefore, there would be no impacts to cultural resources within that area from the JFC flight test.

Land Use: The JFC flight path would avoid populated land masses with their associated assigned land uses. There would be no changes, and therefore, no impacts, from the JFC flight test to land use along the flight path over the over-ocean flight corridor.

Airspace: The over-ocean flight corridor is located over international airspace and, therefore, has no formal airspace restrictions governing it. Over-ocean flight tests must comply with DOD Instruction 4540.01, *Use of International Airspace by US Military Aircraft and for Missile/Projectile Firings*. Commercial and private aircraft would be notified through NOTAMs issued through the FAA in advance of the JFC flight test launch at the request of WFF and CCSFS as part of their routine operations. Test flight operations would be conducted in accordance with NASA and Air Force procedures and would not expand or alter currently controlled airspace. There would be no impacts to airspace from the JFC flight test.

Noise: The JFC flight would occur at high altitude where it would be generally undetected by aircraft or vessels at the ocean's surface. Sonic booms are generated following launch and during terminal flight and impact. Noise impacts for biological receptors are discussed in **Section 3.6.2**.

There are no expected sensitive noise receptors in the over-ocean flight corridor. Therefore, aside from the potential impacts to biological noise receptors discussed in **Section 3.6.2**, there would be no impacts to noise receptors within the over-ocean flight corridor from the JFC flight test.

Infrastructure: No changes would occur to infrastructure in the over-ocean flight corridor from the JFC flight test; therefore, there would be no impacts to infrastructure in the over-ocean flight corridor.

Transportation: Transportation services would be unaffected by the JFC flight test over the open ocean. The payload flight would occur at high altitude where it would be generally undetected by vessels or aircraft. Public NOTAMs and NTMs would be issued along the flight path to ensure the safety of both aircraft and vessels. Components would drop over predetermined open ocean areas to ensure, along with the public notices, that there would be no vessels or aircraft in the vicinity. There would be no impacts from the JFC flight test to transportation along the flight path over the open ocean.

Public Health and Safety: The JFC flight would occur at high altitudes where it would be generally undetected by vessels or aircraft. NOTAMs and NTMs would be issued along the flight path to ensure the safety of personnel on aircraft and vessels. Components would drop over predetermined open ocean areas to ensure, along with the public notices, that there would be no vessels or aircraft in the vicinities. Range Safety at WFF and CCSFS would monitor the flight until takeover by downrange range safety as the payload descends to the planned impact area. If the JFC flight strays outside its designated corridor, it would be considered to be malfunctioning and to constitute an imminent safety hazard. The destruct package, which is installed in all flight vehicles capable of impacting inhabited areas, would be activated. This effectively halts powered flight, causing the remaining hardware to fall into the ocean along a ballistic trajectory. The low potential for a flight failure, combined with the low density of vessels in the open ocean, makes any potential impact discountable. There would be no impacts from the JFC flight test to public health and safety along the flight path over the over-ocean flight corridor.

Hazardous Materials and Wastes: Each of the two rocket motor boosters would exhaust on-board propellant before dropping into the ocean, while fairings would not carry hazardous materials. *De minimus* residual quantities of other materials may remain on the boosters and fairings; these would be carried to the ocean floor by the sinking components. There would be no impacts to hazardous materials and wastes along the over-ocean flight corridor from the JFC flight test.

Socioeconomics: The JFC flight corridor is at high altitudes where there would be no impacts to socioeconomics from the JFC flight test.

Environmental Justice: Range safety regulations and procedures protective of health and safety would be applied throughout the flight corridor. There would be no disproportionate impacts within the over-ocean flight corridor to minority populations or low-income populations under EO 12898 from the JFC flight test.

Visual Resources: The JFC flight would occur at high altitude where it would be generally undetected by vessels or aircraft. There would be no changes from the JFC flight test to visual resources along the flight path over the over-ocean flight corridor.

Marine Sediments: There would be no marine sediment disturbance beyond the settling of the rocket components as they come to rest on the sea floor after splashing into the ocean along the flight path and slowly sinking thousands of meters (feet). There would be no impacts to marine sediments in the over-ocean flight corridor from the JFC flight test.

3.6.1 Air Quality (Atlantic Ocean Flight Corridors and Booster Drop/Payload Impact Zones)

The regulatory setting and background information provided in **Section 3.5.1** for the Pacific Ocean Flight Corridor would also apply to the Atlantic Ocean Flight Corridor.

Dominant during much of the year, the prevailing westerlies winds effectively disperse air emissions along the over-ocean flight corridor. Because of the lack of local air pollution sources, the dispersal of emissions by westerlies winds, and the lack of topographic features that inhibit dispersion, air quality along the Atlantic Ocean flight corridor is considered good. Unlike the Continental United States, tropospheric ozone is not a concern in this general area (U.S. Navy 2019a).

3.6.1.1 Region of Influence

During its flight path, the emissions from the JFC AURs have the potential to affect air quality in the global upper atmosphere.

Changes in sea level have occurred throughout history, with the primary influences being global temperatures; Arctic, Antarctic, and glacial ice masses; and changes in the shape of the oceanic basins and land/sea distribution. Generally, with rising global temperatures, less ice is created or maintained throughout the Earth and sea levels rise. Currently, Bermuda and other small islands located within the over-ocean flight corridor may be affected by rising sea levels from global climate change.

3.6.2 Biological Resources (Atlantic Ocean Flight Corridors and Booster Drop/Payload Impact Zones)

Biological resources in the Atlantic BOA are defined as in **Section 3.1.2.** The biological resources described in this section are those within the affected environment in the BOA, specifically those areas subject to proposed flight test activities.

3.6.2.1 Regulatory Setting

The regulatory setting under the ESA, MMPA, and MBTA is described in detail in **Section 3.1.2.1** including relevant definitions under these Acts. The MSA as described in **Section 3.1.2.1** also applies to waters within the U.S. EEZ.

Since the Atlantic BOA ROI includes international waters, biological resources are evaluated in accordance with the requirements of EO 12114, *Environmental Effects Abroad of Major Federal Actions* and DOD procedures for implementing EO 12114 (32 CFR § 187).

3.6.2.2 Region of Influence

The ROI for biological resources in the Atlantic BOA includes the areas subject to effects of the Proposed Action as described in **Chapter 2.0** including:

- The Atlantic over-ocean flight corridors;
- The stage 1 booster drop zones within the U.S. EEZ near WFF and CCSFS; and
- The stage 2 booster drop/payload impact zones in international waters.

These marine areas include all the areas which may be subject to effects of the Proposed Action including elevated noise levels, human activity and vessel traffic, and exposure to hazardous materials and debris. Because the regulatory environment and baseline conditions for biological resources are different in the stage 1 vs stage 2 booster drop/payload impact zones, this section divides the Atlantic BOA ROI into three subsections; (1) the stage 1 booster drop zone for a WFF launch, (2) the stage 1 booster drop zone for a CCSFS launch, and (3) the stage 2 booster drop/payload impact zones. The flight corridor would be mostly over these drop zones and the areas that are not would have similar baseline conditions as the closest drop zone to the flight path.

There are no terrestrial habitats in the ROI. Some seabirds which breed on land and forage in open ocean areas of the North Atlantic have the potential to occur in the ROI. The waters of the ROI consist of deep ocean waters with both pelagic and benthic habitats. Pelagic areas support communities of planktonic (drifting) and nektonic (swimming) organisms. Benthic communities are made up of marine organisms that live on or near the sea floor such as bottom dwelling fish, mollusks, crustaceans, and echinoderms. **Table 3-16** lists the ESA-listed species with the potential to occur in the ROI.

Due to the limited potential for the Proposed Action to impact biological resources, only a brief summary of biological resources is provided in the following sections and is focused on special-status species which might respond to stressors resulting from the Proposed Action.

Table 3-16. ESA-Listed Species with the Potential to Occur in the Atlantic Ocean Flight Corridor and Booster Drop/Payload Impact Zones.

Common Name	Scientific Name	Federal Listing Status	Likelihood of Occurrence: WFF Stage 1 Booster Drop Zone	Likelihood of Occurrence: CCSFS Stage 1 Booster Drop Zone	Likelihood of Occurrence: Atlantic Stage 2 Booster Drop/ Payload Impact Zones
Marine Mammals					
Sei whale	*Balaenoptera borealis*	E	L	L	L
Blue whale	*B. musculus*	E	L	L	L
Fin whale	*B. physalus*	E	L	P	L
North Atlantic right whale	*Eubalaena glacialis*	E	L	L	P
Humpback whale - Cape Verde/Northwest Africa DPS	*Megaptera novaeangliae*	E	-[1]	-[1]	P
Sperm whale	*Physeter macrocephalus*	E	L	L	L
Birds					
Bermuda petrel	*Pterodroma cahow*	E	P	-	L
Roseate tern	*Sterna dougallii*				
U.S. Atlantic Coast south to North Carolina		E	P	-	-
Western Hemisphere and adjacent oceans		T	-	P	-
Sea Turtles					
Loggerhead turtle	*Caretta caretta*				
Northwest Atlantic Ocean DPS		T	L	L	L
Northeast Atlantic Ocean DPS		E	-	-	L
Green turtle – North Atlantic DPS	*Chelonia mydas*	T	L	L	L
Leatherback turtle	*Dermochelys coriacea*	E	L	L	L
Hawksbill turtle	*Eretmochelys imbricata*	E	P	L	P
Kemp's ridley turtle	*Lepidochelys kempii*	E	L	L	P
Olive ridley turtle	*L. olivacea*	T	-	L	P

Table 3-16. ESA-Listed Species with the Potential to Occur in the Atlantic Ocean Flight Corridor and Booster Drop/Payload Impact Zones (Continued)

Common Name	Scientific Name	Federal Listing Status	Likelihood of Occurrence: WFF Stage 1 Booster Drop Zone	Likelihood of Occurrence: CCSFS Stage 1 Booster Drop Zone	Likelihood of Occurrence: Atlantic Stage 2 Booster Drop/ Payload Impact Zones
Fish					
Atlantic sturgeon	*Acipenser oxyrinchus oxyrinchus*	E, T[2]	L	-	-
Oceanic whitetip shark	*Carcharhinus longimanus*	T	L	L	L
Oceanic giant manta ray	*Manta birostris*	T	P	L	P
Scalloped hammerhead shark	*Sphyrna lewini*				
Central and Southwest Atlantic DPS		T	-	P	L
Eastern Atlantic DPS		E	-	-	P

Abbreviations: DPS = Distinct Population Segment, E = federal endangered, T = federal threatened, L = Likely, P = Potential, U = Unlikely.

[1] Humpback whales are likely to occur in the stage 1 booster drop zones but are likely part of the West Indies DPS which is not listed under the ESA.

[2] Five DPSs of Atlantic sturgeon have the potential to or are likely to occur in the portion of the WFF stage 1 booster drop zone over the continental shelf as described in Section 3.6.2.3 (Watterson 2021).

3.6.2.3 WFF Launch Stage 1 Booster Drop Zone

The stage 1 booster drop zone begins approximately 70 km (38 nm) from WFF shores and extends approximately 270 km (146 nm) out into the Atlantic Ocean (see **Figure 3-6**). Water depths in the stage 1 booster drop zone range from 30 m to 2,600 m (100 ft to 8,500 ft). **Table 3-16** lists the ESA-listed species with the potential to occur in the stage 1 booster drop zone.

The stage 1 booster drop zone occurs almost entirely within the area evaluated in the VACAPES EIS/OEIS (U.S. Navy 2009) and the offshore impact area evaluated in the WFF PEIS (NASA 2019). Data from these documents represent some of the best available data for the marine affected environment in the ROI and are incorporated here by reference.

Marine Wildlife

Marine Mammals. Thirty-seven marine mammal species have the potential to occur in the Atlantic BOA ROI. All marine mammal species in the ROI are protected under the MMPA and five species are listed under the ESA (**Table 3-16**). The U.S. Navy has modeled marine mammal densities within the ROI in their Marine Species Density Database for the Atlantic Fleet Training and Testing Study Area (U.S. Navy 2017). The models contain estimates for marine mammal densities throughout the stage 1 booster drop zone as well as for a portion of the stage 2 booster drop/payload impact zones and provide the best available data for marine mammal densities and distributions in the Atlantic BOA ROI. Species such as the short-beaked common dolphin, striped dolphin, bottlenose dolphin, Atlantic spotted dolphin (*Stenella frontalis*), harbor porpoise, Atlantic white-sided dolphin (*Lagenorhynchus acutus*), and pilot whales (*Kogia* spp.) are most abundant in the stage 1 drop zone (U.S. Navy 2017). Major threats to marine mammals in the Atlantic BOA are similar to those discussed for the Pacific Ocean in **Section 3.5.2.3**.

Seabirds. While no terrestrial habitat occurs in the ROI, many seabirds have wide-ranging foraging and non-nesting season distributions and migratory land birds could migrate over the Atlantic BOA. A number of seabirds that are protected under the MBTA likely forage or rest at sea in the ROI. Two special-status species have the potential to occur in the ROI: the Bermuda petrel (*Pterodroma cahow*) and the roseate tern (*Sterna dougallii*) (U.S. Navy 2009). Both species are protected under the ESA and MBTA.

Bermuda petrels feed on squid, shrimp, and small fish at the sea surface in the North Atlantic Ocean (U.S. Navy 2009). The population of this species is very small, estimated at only 250 birds in 2005 (U.S. Navy 2009). Bermuda petrels breed only in Castle Harbor, Bermuda where they occur in small breeding colonies from October through June (U.S. Navy 2009). During the non-breeding season, birds are found at-sea, primarily in Gulf Stream waters between Bermuda and North Carolina (U.S. Navy 2009). These birds have the potential to occur in the ROI at certain times of the year.

Northern populations of roseate terns occur mostly in coastal areas between Massachusetts and New York during the breeding season (U.S. Navy 2009). During the non-breeding season, roseate terns may be found in waters around the Bahamas, Cuba, and the Lesser Antilles where they feed on schooling fish by diving (U.S. Navy 2009). The density and distribution of these birds in the ROI is unknown and is likely to be variable, depending on ocean conditions and prey availability.

Many other seabirds have the potential to occur in the ROI including the VACAPES study area (U.S. Navy 2017). Seabird distribution and abundance varies greatly with season, prey availability, and by species. Primary foraging areas for many breeding seabirds and migration corridors for birds including terns, gulls, skimmers, pelicans, loons, cormorants, and gannets are found within 19 km (10 nm) of the shoreline near WFF (U.S. Navy 2009). Areas further offshore provide pelagic foraging and habitat for non-breeding and transient seabirds such as loons, gannets, and terns (U.S. Navy 2009). Seabird density and distribution in the pelagic areas that make up the BOA ROI are unknown but are likely variable and overall densities are likely low in the open ocean.

Marine Reptiles. Five species of sea turtle have the potential to occur in the ROI (**Table 3-16**). All five of these species are listed as threatened or endangered under the ESA. While little information is available concerning sea turtle density and distribution in the open ocean, the U.S. Navy modeled sea turtle density for continental shelf waters within the U.S. EEZ (U.S. Navy 2017).

Loggerhead turtles are the most abundant sea turtles in this portion of the ROI with leatherback and Kemp's ridley turtles being regularly observed as well (U.S. Navy 2017). General sea turtle characteristics and threats are the same as those discussed for the Pacific BOA in **Section 3.5.2**.

Fish. In the waters offshore of WFF, which includes the stage 1 booster drop zone, fish assemblages are highly variable due to seasonal and climatic changes, varying life history strategies, fishing pressure, natural abundance cycles, and migration patterns (U.S. Navy 2009). Fish species in the Mid-Atlantic Bight include over 300 temperate, subtropical, and tropical species (U.S. Navy 2009). Some common fish species in the VACAPES area include bluefish, weakfish (*Cynoscion regalis*), Atlantic cod (*Gadus morhua*), Atlantic herring (*Clupea harengus*), American shad (*Alosa sapidissima*), summer flounder, butterfish (*Peprilus triacanthus*), black sea bass (*Centropristis striata*), and many shark species (U.S. Navy 2009). Important fisheries species include Atlantic yellowfin tuna, Atlantic bluefin tuna (*T. thynnus*), Atlantic bigeye tuna, white marlin (*Tetrapturus albidus*), blue marlin (*Makaira nigricans*), sailfish (*Istiophorus platypterus*), swordfish, dolphinfish, and wahoo (U.S. Navy 2009).

Three ESA-listed fish species have the potential to occur in the ROI: Atlantic sturgeon, oceanic whitetip shark, and oceanic giant manta ray. General characteristics and threats for oceanic whitetip sharks and oceanic giant manta rays are the same as those described for the Pacific BOA in **Section 3.5.2**. Atlantic sturgeon are anadromous fish that spawn in freshwater rivers on the east coast of North America but spend most of their adult life in marine habitats (ASSRT 2007). While the primary migratory pathways appear to be nearshore, Atlantic sturgeon are found in deeper offshore shelf waters (Dunton et al. 2015, ASSRT 2007, Watterson 2021). Up to five ESA-listed DPSs of Atlantic sturgeon may occur in the stage 1 booster drop zone for WFF flights during the marine phase of their life cycle. Fish from the endangered Carolina, Chesapeake Bay, New York Bight, and South Atlantic DPSs are likely to occur in shelf waters of the WFF stage 1 booster drop zone (Watterson 2021). Fish from the threatened Gulf of Maine DPS also have the potential to occur in this area (Watterson 2021).

Invertebrates. Invertebrate communities in the ROI consist of both pelagic and benthic assemblages. Pelagic communities are dominated by zooplankton which include a diversity of organisms from microscopic protists to multicellular animals such as jellyfish (U.S. Navy 2009). These plankton assemblages include the larvae and gametes of invertebrates such as corals and mollusks as well as some vertebrate larvae such as those of some fish. As with phytoplankton, the abundance and distribution of zooplankton is seasonal and depends on temperature, salinity, nutrient availability, oxygen concentration, and food availability (U.S. Navy 2009). As a result, zooplankton is seasonally and spatially variable in the Atlantic BOA with concentrations in areas of high primary productivity, including the Gulf Stream and areas of upwelling (U.S. Navy 2009).

Benthic invertebrate communities include a variety of organisms including cnidarians, annelids, crustaceans, and mollusks. These benthic communities depend primarily on the type of bottom habitat or substrate in an area (U.S. Navy 2009). Both soft bottom and hard bottom habitats occur in the Atlantic ROI. Benthic invertebrates which occur in soft bottom habitats are generally organisms such as polychaete worms, amphipods, annelid worms, bivalves, and sea stars (U.S. Navy 2009). Hard bottom habitats can support a diversity of sessile organisms including bryozoans, hard and soft corals, anemones, hydrozoans, and sponges (U.S. Navy 2009). The continental shelf off the coast of WFF primarily consists of soft bottom habitats, but there are some hardbottom habitats as well as artificial hard bottom habitats such as artificial reefs and shipwrecks (U.S. Navy 2009).

There is a high diversity and abundance of corals in the stage 1 booster drop zone. Temperate corals are found on the continental shelf in the VACAPES area and deep-sea corals are found on the continental slope between 200 and 1,000 m (650 to 3,280 ft) deep (U.S. Navy 2009). Deep sea corals in the ROI are found on top of canyons, plateaus, edges of the continental shelf, and bases of slopes where they can occur as solitary colonies or thickets and banks (U.S. Navy 2009, Packer et al. 2007). Canyons of the Frank R. Lautenberg Deep Sea Coral Protection Area (**Figure 3-6**) such as Baltimore Canyon, Washington Canyon, Norfolk Canyon, and Submarine Canyon in the ROI are known to support a diversity of hard and soft deep-sea corals (Packer et al. 2007). These deep-sea coral communities can support a wide diversity of invertebrate species and may act as spawning and feeding areas for fish species (U.S. Navy 2009). As discussed in the *Essential Fish Habitat* subsection, EFH has been designated for coral, coral reef, live or hard bottom EFH in the stage 1 booster drop zone.

Environmentally Sensitive Habitats

Critical Habitat. Designated critical habitat for loggerhead sea turtles occurs near the stage 1 booster drop zone (**Figure 3-6**). However, no portion of the Proposed Action would impact this designated critical habitat.

Biologically Important Areas. The deepwater canyons of the ROI support a diversity of hard and soft deep-sea corals (Packer et al. 2007) and are part of the Frank R. Lautenberg Deep Sea Coral Protection Area (**Figure 3-6**). Within this protected area, commercial fishermen are prohibited from using most types of bottom-tending fishing gear such as trawls, dredges, bottom longlines, and traps to protect the slow-growing corals. The submarine canyons are highly productive areas that not only provide habitat for deep sea corals but provide feeding grounds for pelagic species, including dolphins, whales, and turtles; highly migratory fish, such as sharks, billfish, and tuna; and seabirds (NOAA 2018a).

Essential Fish Habitat. EFH has been designated within the U.S. EEZ offshore of WFF. These offshore areas provide important habitat for a large number of fish and invertebrate species. The number of fish species and life stages with designated EFH in this area is quite extensive and is detailed in the VACAPES Range Complex Final EIS/OEIS (U.S. Navy 2009) as incorporated here by reference. Given the limited potential for the Proposed Action to affect EFH, only a general overview of EFH in the stage 1 booster drop zone is included in this section.

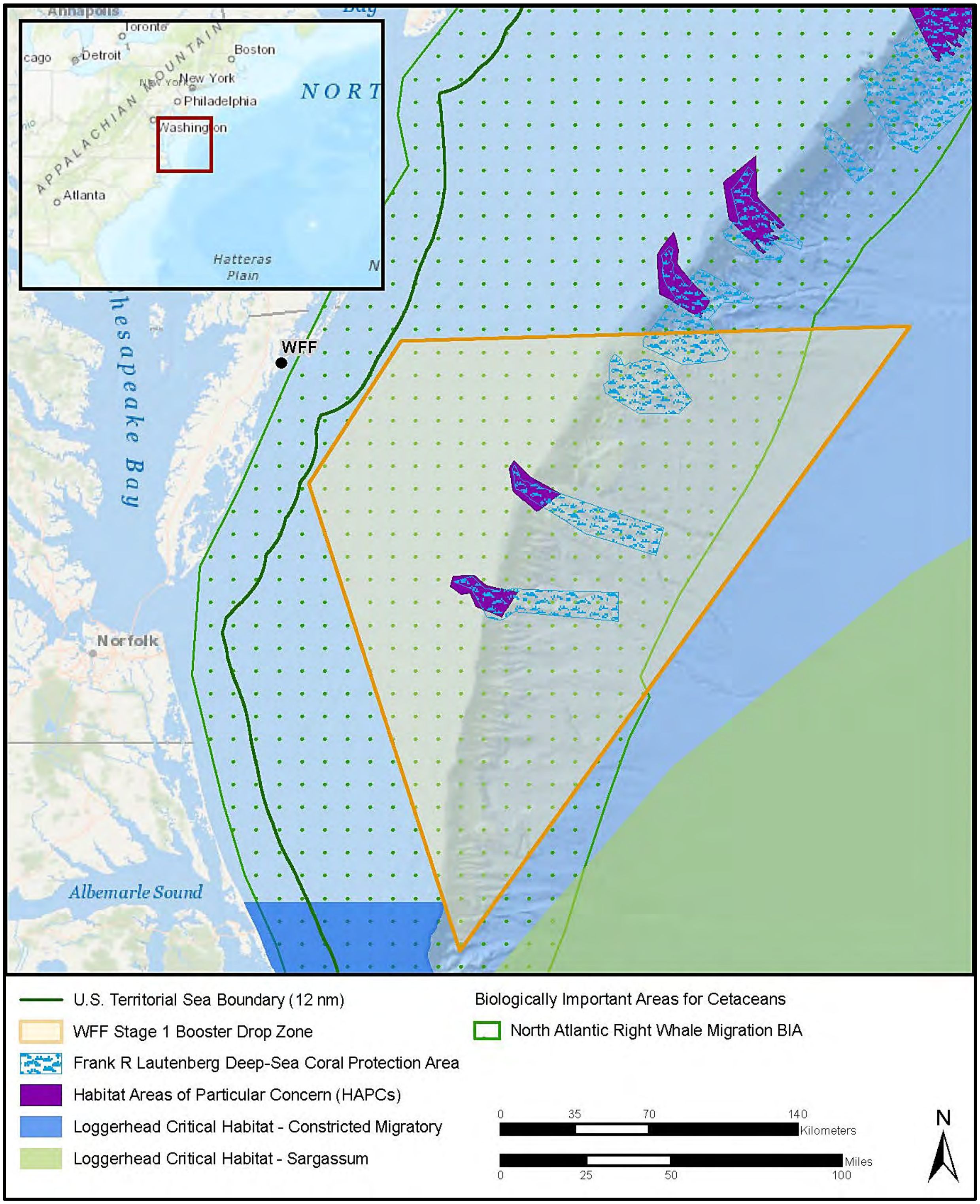

Figure 3-6. Environmentally Sensitive Habitats near the WFF Stage 1 Booster Drop Zone.

In general, fisheries management councils designate EFH for marine species for separate life stages: eggs, larvae, juveniles, adults, and spawning adults. At least 94 species (not including corals) with designated EFH for at least one life stage may occur in the ROI (Table 3.9-2 in U.S. Navy 2009). In addition to fish, macroalgae such as *Sargassum* and invertebrates such as crabs, lobsters, and scallops also have designated EFH. The EFH in this portion of the ROI includes benthic habitats (e.g., rocks, gravel, cobbles, sand, etc.), structure habitat (e.g., artificial reefs, shipwrecks, natural sponge and coral habitats), *Sargassum* habitat (pelagic mats of *Sargassum* spp.), Gulf Stream habitat, and water column habitat (U.S. Navy 2009). Several species with designated EFH also have designated HAPC which may occur within the ROI (Table 3.9-4 in U.S. Navy 2009). Designated HAPCs include an Existing Coral, Coral Reefs, Live or Hardbottom HAPC (U.S. Navy 2009) and occur in the stage 1 booster drop zone (**Figure 3-6**).

3.6.2.4 CCSFS Launch Stage 1 Booster Drop Zone

The stage 1 booster drop zone ranges from approximately 58 to 240 km (31 to 130 nm) from CCSFS shores (see **Figure 3-7**). Water depths in the stage 1 booster drop zone range from 70 to 900 m (230 to 2,950 ft). **Table 3-16** lists the ESA-listed species with the potential to occur in the stage 1 booster drop zone.

Marine Wildlife

<u>*Marine Mammals.*</u> At least 32 cetaceans have the potential to occur in the ROI, all of which are protected under the MMPA and five of which are listed as endangered under the ESA (**Table 3-16**). As described in **Section 3.6.2.3**, the best density data for marine mammals in the ROI can be found in the U.S. Navy's Marine Species Density Database (U.S. Navy 2017). The species with the highest estimated densities in the ROI include bottlenose dolphins, pantropical spotted dolphins, spinner dolphins, clymene dolphins (*Stenella clymene*), melon-headed whales (*Peponocephala electra*), Atlantic spotted dolphins, and Risso's dolphins (U.S. Navy 2017). Many of these species are more likely to occur in coastal waters of the ROI during the winter months, before moving north to productive summer feeding grounds (Hayes et al. 2019).

Potential threats to cetacean species in the stage 1 booster drop zone include ingestion of marine debris, entanglement in fishing nets or other marine debris, collision with vessels, loss of prey species due to new seasonal shifts in prey species or overfishing, excessive noise above baseline levels in a given area, chemical and physical pollution of the marine environment, parasites and diseases, and changing sea surface temperatures due to global climate change (NOAA 2018a).

<u>*Seabirds.*</u> While no terrestrial habitat occurs in the ROI, many seabirds have wide ranging foraging and non-nesting season pelagic distributions and migratory land birds could migrate over the ROI. It is likely that a number of seabird species protected under the MBTA forage or rest at sea in the ROI. Two ESA-listed bird species have the potential to occur in the ROI: the Bermuda petrel and the roseate tern (U.S. Navy 2009).

Bermuda petrels and roseate terns are described in **Section 3.6.2.3**. The Caribbean population of roseate terns breeds in the Bahamas among other locations in the Caribbean (U.S. Navy 2009). During the non-breeding season, roseate terns may be found in waters around the Bahamas, Cuba, and the Lesser Antilles (U.S. Navy 2009). The density and distribution of these birds in the ROI is unknown and is likely to be variable, depending on ocean conditions and prey availability.

Many other seabirds are likely to occur in the ROI. Seabird distribution and abundance varies greatly with season, prey availability, and by species. Offshore waters, such as those of the ROI, provide pelagic foraging and habitat for non-breeding and transient seabirds such as loons, gannets, and terns (U.S. Navy 2009).

Marine Reptiles. Six ESA listed sea turtle species have the potential to occur in the stage 1 booster drop zone (**Table 3-16**). Loggerhead, green, and leatherback sea turtles are known to nest on the beaches of CCSFS and nearby PSFB, with loggerheads being the most abundant (USAF 2020b). The loggerhead nesting season lasts from April to September each year, making their likelihood of occurrence in the stage 1 booster drop zone highest during this time of year (Appendix C, USAF 2020b). General sea turtle characteristics and threats are the same as those discussed for the Pacific BOA in **Section 3.5.2**.

Fish. Three ESA listed fish species have the potential to occur in the ROI: oceanic whitetip shark, oceanic giant manta ray, and scalloped hammerhead shark (*Sphyrna lewini*). General characteristics and threats for oceanic whitetip shark and giant manta ray are the same as those discussed for the Pacific ROI in **Section 3.5.2**.

The scalloped hammerhead shark occurs globally in tropical and warm temperate seas. On the Atlantic coast they occur from New Jersey to Brazil (Adams and Paperno 2007). In U.S. waters, scalloped hammerhead sharks are commercially landed in driftnet, gill-net, and longline fisheries (Adams and Paperno 2007). Little information is available regarding specific nursery grounds off the U.S. Atlantic coast; however, research reveals that nursery areas typically include littoral zones, sounds, and bays. One 1993 review of shark nursery grounds suggests that an extensive scalloped hammerhead shark nursery exists off the southeastern coast of the U.S. One recent study by Adams and Paperno (2007) revealed that the nearshore waters of the Cape Canaveral area provide suitable habitat for neonate scalloped hammerheads. Threats include both target and bycatch capture in fisheries as a significant cause of mortality for the species. Because scalloped hammerheads aggregate in large schools, large numbers may be captured with minimal effort. They are sought for their highly valuable fins and are being increasingly targeted in some areas (U.S. Navy 2018b).

Invertebrates. Pelagic and benthic invertebrate communities are the same as those described for the WFF stage 1 booster drop zone in **Section 3.6.2.3**. EFH for corals, coral reefs, and live/hardbottom habitat occurs in the stage 1 booster drop zone and is discussed in the following Environmentally Sensitive Habitats subsection.

Environmentally Sensitive Habitats

Critical Habitat. The only designated critical habitat for any listed species in the CCSFS stage 1 booster drop zone is the pelagic *Sargassum* habitat of the loggerhead turtle (**Figure 3-3**). This convergence zone area at the margin of the Gulf Stream allows *Sargassum* growth in concentrations that support adequate prey abundance and cover for young loggerhead turtles (79 FR 39856 [July 10, 2014]). The loggerhead nesting season lasts from April to September each year, making their likelihood of occurrence in the stage 1 booster drop zone highest during this time (Appendix C, USAF 2020b).

Biologically Important Areas. The ROI and areas near the ROI include BIAs for North Atlantic right whale migration and calving (**Figure 3-7**). These important right whale areas are supported by a number of management measures implemented by the NMFS, the U.S. Navy, the U.S. Coast Guard, and the U.S. Army Corps of Engineers. These measures include ship speed restrictions within seasonal management areas, recommended transit lines for large ships, a mandatory ship reporting system, and aerial surveys during the calving season (Gowan and Ortega-Ortiz 2014).

Essential Fish Habitat. The stage 1 booster drop zone contains EFH for the dolphin and wahoo fishery, South Atlantic snapper-grouper fishery, coastal migratory pelagic species, South Atlantic shrimp, golden crab, spiny lobsters, coral, coral reef, live/hardbottom habitat, and pelagic *Sargassum*. Major threats to all of these EFH areas include overfishing, bycatch, fishing gear entanglement, use of prohibited fishing gear and techniques, extreme weather events, and climate change (SAFMC 2020). The designated EFH in the ROI is described in detail by the SAFMC (SAFMC 2020) and in the CCSFS INRMP (USAF 2020b) and are incorporated here by reference.

HAPCs within the stage 1 booster drop zone included Offshore Hard Bottom HAPCs and Oculina HAPC (**Figure 3-8**). Coral, coral reef, and live/hardbottom HAPCs occur along the Atlantic coast in the Florida Keys, and from Biscayne Bay to North Carolina. Over 200 species of corals are incorporated into this EFH, which include black corals, spiny corals, octocorals, and pennatulaceans. EFH for corals includes stable substrates that extend from the shoreline to water depths of 16 m (54 ft) for black corals, and subtidal to outer shelf depths for stony corals, octocorals and pennatulaceans (USAF 2020b). The SAFMCs plan prohibits the harvest of coral reefs, stony corals, seafans, and live rock. In addition, HAPCs for corals in Florida, including the Oculina Bank and Satellite Coral, have been designated and prohibit the use of habitat damaging fishing gear such as dredges, traps, bottom longlines, and bottom tending trawl gear (SAFMC 2020).

The Oculina Bank HAPC was established in 1984 off the east coast of Florida, including off the coast of CCSFS. A slow-growing branchlike coral, ivory tree coral (*Oculina varicosa*) provides spawning habitat for many reef-dwelling fish species, including snappers and groupers. The 92 km^2 (35 mi^2) area is closed to longlining, trapping, trawling, and dredging (SAFMC 2020).

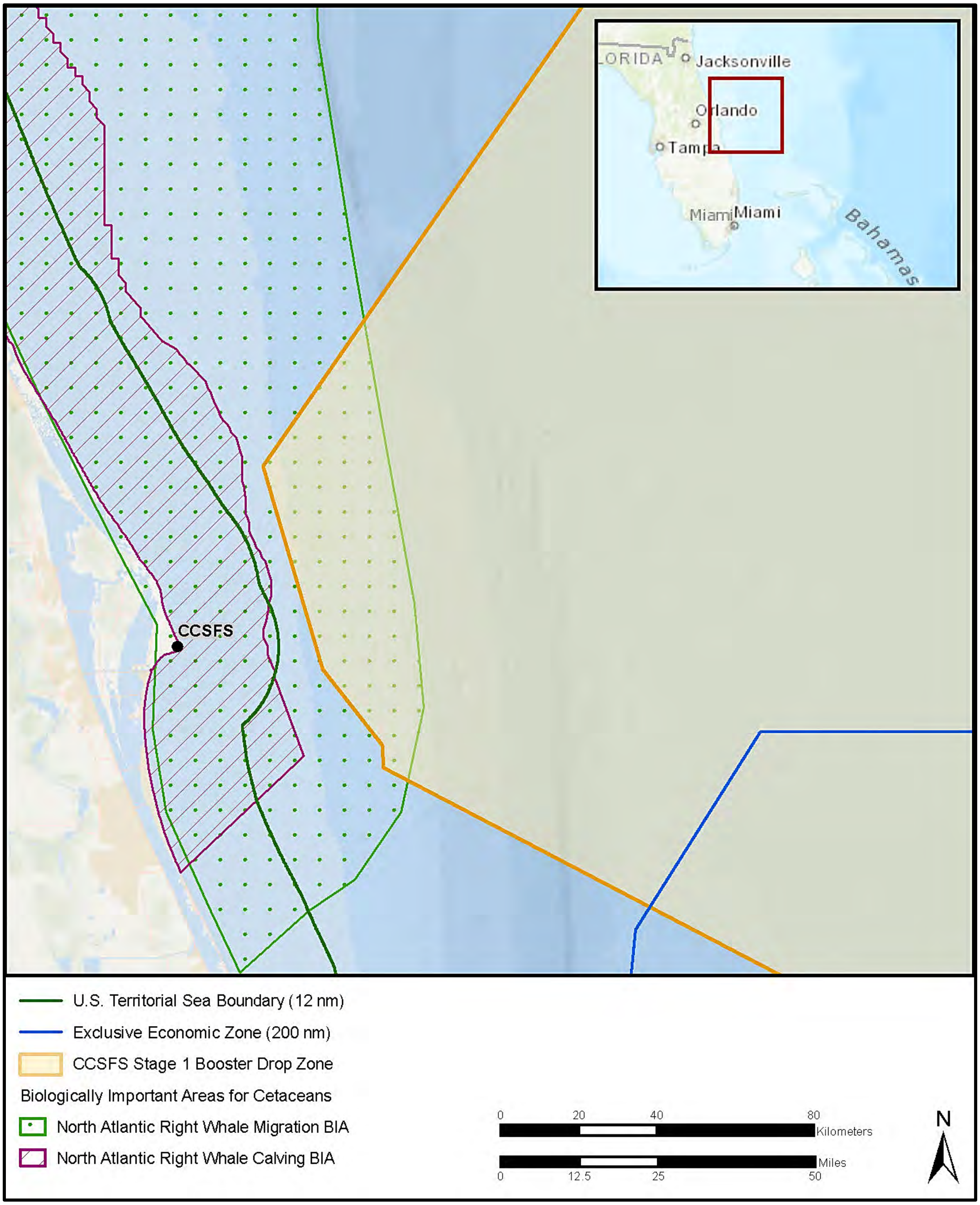

Figure 3-7. Biologically Important Areas near the CCSFS Stage 1 Booster Drop Zone.

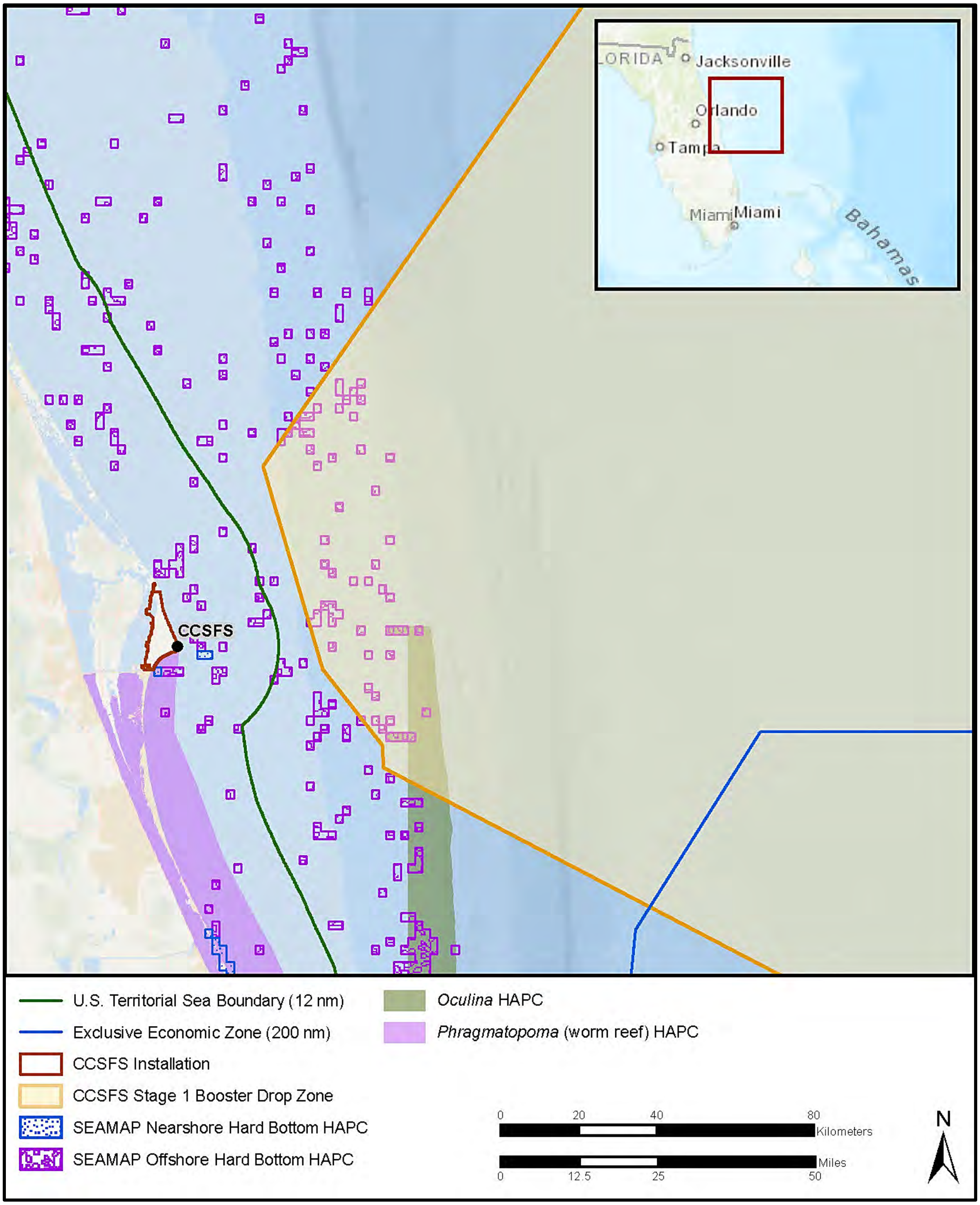

Figure 3-8. Designated EFH HAPCs within and near the CCSFS Stage 1 Booster Drop Zone.

3.6.2.5 Atlantic BOA Stage 2 Booster Drop/Payload Impact Zones

The ROI is in the BOA of the North Atlantic Ocean (**Figure 1-2** and **Figure 1-4**). The stage 2 booster drop/payload impact zones include only deep ocean waters, mostly outside of the EEZs of the United States and other countries with territory in the central Atlantic. **Table 3-16** lists the ESA-listed species with the potential to occur in the ROI. No designated critical habitat for any special-status species occurs in the ROI. There are no terrestrial habitats in the ROI; however, some seabirds that breed on land and forage in open ocean area of the Atlantic have the potential to occur in the ROI.

Marine Wildlife

Marine Mammals. Given the large extent of the ROI, there are 36 cetacean species that are likely to occur in some portion of the ROI (**Table 3-16**). All marine mammal species in the ROI are protected under the MMPA, and six species are listed under the ESA. Some species such as humpback whales, short-finned pilot whales, killer whales, North Atlantic right whales, and fin whales, are more likely to occur in coastal waters outside of the stage 2 booster drop/payload impact zone (Hayes et al. 2019). The U.S. Navy has estimated marine mammal densities in the North Atlantic in their Marine Species Density Database for the Atlantic Fleet Training and Testing Study Area (U.S. Navy 2017). The database only covers a portion of the ROI but is the best available data for marine mammal densities. Species with the highest estimated densities in the stage 2 booster drop/payload impact zones include pilot whales, pantropical spotted dolphins, striped dolphins, Atlantic spotted dolphins, clymene dolphins, spinner dolphins, and bottlenose dolphins.

Seabirds. While no terrestrial habitat occurs in the ROI, many seabirds have wide ranging foraging distributions and extensive pelagic migrations in the Atlantic. It is likely that several seabird species may forage or rest at sea in the ROI. Only one ESA-listed seabird, the Bermuda petrel, is likely to occur in the ROI (**Table 3-16**). The distribution and density of Bermuda petrels in the ROI is largely unknown but a description of this species and its known occurrence is in **Sections 3.6.2.3** and **3.6.2.4**.

Marine Reptiles. Six ESA-listed sea turtle species have the potential to occur in the ROI: green, leatherback, loggerhead, olive ridley, Kemp's ridley, and hawksbill. (**Table 3-16**). Descriptions of these species and their occurrences in the ROI are the same as those discussed in **Sections 3.6.2.3** and **3.6.2.4**.

Fish. Fish are vital components of the marine ecosystem. They have great ecological and economic importance. The major fisheries in the North Atlantic include several snapper grouper species, mackerel, cobia, sharks, dolphinfish, and wahoo (SAFMC 2020). Due to the large size of the ROI, there are a diversity of oceanic habitats for fish from epipelagic to deep benthic and seamount habitats, and therefore a wide diversity of fish species. Three ESA-listed species have the potential to occur in the ROI: the oceanic whitetip shark, oceanic giant manta ray, and scalloped hammerhead shark (**Table 3-16**). Descriptions of these species and their occurrences in the ROI are the same as those discussed in **Sections 3.6.2.3** and **3.6.2.4**. Because the ROI is entirely outside of the U.S. EEZ, no EFH occurs in the ROI.

Invertebrates. Given the large spatial extent of the ROI, there are a diversity of pelagic and benthic habitats for invertebrates. Waters beyond the EEZs are usually beyond the continental shelves and are mostly very deep waters (1–6 km [0.6–3.7 mi] deep) (UNEP 2006). The greatest diversity of invertebrates in these waters occurs in the epipelagic zone where available sunlight enables primary production by phytoplankton and algae. Hotspots for diversity tend to occur near underwater features such as seamounts, submarine canyons, and shelf breaks where upwelling occurs, as well as in areas where warm and cold-water currents converge (UNEP 2006). Deep-water benthic habitats also support a diversity of invertebrates including echinoderms, sponges, tube worms, anemones, mollusks, and crustaceans (UNEP 2006). While many species of deepwater benthic and pelagic invertebrates are likely to occur in the Atlantic Ocean ROI, the density and distribution of these organisms are largely unknown.

Environmentally Sensitive Habitats

Designated Sargassum critical habitat for loggerhead sea turtles occurs within portions of the stage 2 booster drop/payload impact zones that are within the U.S. EEZ. This designated critical habitat is described in **Section 3.6.2.4**. The only North Atlantic marine national monument, the Northeast Canyons and Seamounts Marine National Monument, occurs outside of the ROI. The flight path may cross over the Northeast Canyons and Seamounts Marine National Monument; however, no part of the Proposed Action would impact this Marine National Monument.

4.0 Environmental Consequences

This chapter presents the potential environmental consequences of the Proposed Action and No Action Alternative when compared to the affected environment resource areas described in **Chapter 3.0**. **Sections 4.1** through **4.6** provide a detailed discussion of the potential direct and indirect effects of implementing the Proposed Action and the No Action Alternative at each location under each of the resource topics evaluated. **Section 4.7** provides a summary of impacts and impact avoidance measures. As discussed in **Chapter 3.0**, the information and data presented are commensurate with the importance of the potential impacts.

Additional analyses to address any concerns from EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations,* and EO 13045 (as amended by EO 13229 and 13296), *Federal Actions to Address Protection of Children from* Environmental Health Risks and Safety Risks are discussed in **Sections 6.1.1** and **6.1.2**.

4.1 Pacific Missile Range Facility

The Proposed Action entails up to six flight test launches annually at up to four different launch locations over the next 10 years. PMRF was selected as an alternative test range for the JFC flight test because of its launch pad infrastructure and suitability, data collection and storage capabilities, booster and explosive materials storage capabilities, available timeframe for launch tests, range and explosive safety record, and ability to meet security requirements. The JFC AUR could be launched from a launch stool, a cannister/box launcher, or a transporter erector launcher as shown in **Figure 2-2**.

4.1.1 Cultural Resources (PMRF)

4.1.1.1 PMRF – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to cultural resources from the baseline conditions described in **Section 3.1.1.2**. Therefore, no significant impacts to cultural resources would occur with implementation of the No Action Alternative.

4.1.1.2 PMRF – Proposed Action

Federal cultural resource preservation statutes mandate that if prehistoric or historic artifacts are unexpectedly discovered during construction or excavation, such materials would be identified and evaluated by a professional archaeologist. Should human remains or cultural artifacts be encountered, federal statutes specify that work would cease immediately and the proper authorities would be notified. If during the performance of an undertaking, historic properties, including submerged archaeological sites and traditional cultural properties, are discovered or unanticipated effects are found, or a previously unidentified property which may be eligible for listing on the National Register of Historic Places is discovered, Commander, Navy Region Hawaii would take all reasonable measures to avoid harm to the property until it concludes consultation with the SHPO and any Native Hawaiian organization, including Oahu Council of Hawaiian Civic Clubs, which has made known to Commander, Navy Region Hawaii that it attaches religious and cultural significance to the historic property (U.S. Navy 2018a).

The Proposed Action would not require construction at KTF Pad 42 or PMRF THAAD Launch Site. There are no properties eligible for listing on the National Register of Historic Places at either launch site. No impacts on cultural resources would be expected as a result of this Proposed Action. Therefore, no Section 106 consultation with the Hawai`i SHPD is required for the Proposed Action.

4.1.2 Biological Resources (PMRF)

Potential environmental consequences of the Proposed Action on biological resources are evaluated based on the best available information about species distributions and in the context of the regulatory setting discussed in **Chapter 3.0**.

Determination of the significance of potential impacts to biological resources is based on (1) the importance of the resource (i.e., threatened or endangered species; critical habitats; recreationally, commercially, ecologically, culturally, or scientifically important species); (2) the sensitivity of the resource to proposed activities; (3) the proportion of the resource that would be affected relative to its occurrence in the region; and (4) the duration of ecological ramifications. For example, impacts to vegetation would be considered significant if species or habitats of concern were substantially affected over relatively large areas or habitat disturbances resulted in reductions in the population size or distribution of an important species, or the introduction of invasive species to sensitive habitats. Impacts to terrestrial wildlife would be considered significant if species or habitats of concern were substantially affected over relatively large areas or disturbances resulted in reductions in the population size or distribution that might limit the ability of a local or regional population to sustain itself. Impacts to federally listed threatened or endangered species would be considered significant if they resulted in reductions in the population size or distribution of the species. Impacts to designated critical habitats would be considered significant if these habitats were destroyed or substantially modified.

Potential impacts of missile launches on biological resources within the PMRF ROI have been addressed in detail in the Advanced Hypersonic Weapon Program EA (USASMDC/ARSTRAT 2011), the HRC EIS/OEIS (U.S. Navy 2008), the FE-1 EA/OEA (U.S. Navy 2017), and the FE-2 EA/OEA (U.S. Navy 2019a).

4.1.2.1 PMRF – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to biological resources. The impacts of ongoing launch and support activities at KTF were evaluated in the SNL/KTF Site-wide EA (DOE 2019). Therefore, no significant impacts to biological resources would occur with implementation of the No Action Alternative.

4.1.2.2 PMRF – Proposed Action

Potential impacts of the Proposed Action to biological resources in the PMRF ROI could result from exposure to elevated sound pressure levels, hazardous materials, artificial lighting, and increased human activity and equipment operation.

Launches of the new booster configurations as part of the Proposed Action testing would be similar to launches of the STARS vehicles, most recently analyzed in the SNL/KTF Site-wide EA (DOE 2019) and the FE-2 EA/OEA (U.S. Navy 2019a). The proposed JFC AUR is smaller (in length, diameter, and mass) than STARS vehicles and contains a fraction of the propellant mass of the STARS boosters. No new facilities would be required at PMRF. The launch azimuth and flight termination system would be the same as that of the previously analyzed STARS boosters. As a result, impacts on biological resources would be similar to or less than those concluded for previous STARS launches and are expected to be minimal. A summary of the consequences of JFC launches at PMRF is provided in this section, but additional details about impact evaluation and consequences based on STARS can be found in the SNL/KTF Site-wide EA (DOE 2019) and the FE-2 EA/OEA (U.S. Navy 2019a) which are incorporated here by reference.

Impacts of JFC launch activities on threatened and endangered species at PMRF are not expected to be different than those concluded for ongoing operations at PMRF in the SNL/KTF Site-wide EA (DOE 2019), in the USFWS letter of concurrence for proposed and ongoing launch operations at SNL/KTF (USFWS 2021), and in the Biological Opinion of the USFWS for PMRF Base-wide operations (USFWS 2018b). With the exception of vehicle launch, the potential effects of JFC activities (including pre-launch preparation, vehicle transportation, personnel movements, and launch pad lighting) on terrestrial ESA-listed species at PMRF are covered under Section 7 consultations for and the existing USFWS Biological Opinion for base-wide operations at PMRF (Consultation number 01EPIF00-2015-F-0227, USFWS 2018b). JFC activities would be conducted within the terms of the Biological Opinion(s) as implemented by the U.S. Navy and DOE at PMRF. The DOE has consulted with the USFWS on the potential effects of launch activities (including launch noise, heat, and emissions) at KTF on terrestrial ESA-listed species (USFWS 2021). The USFWS concurred with DOE's conclusion that proposed and ongoing launch activities at KTF may affect but are not likely to adversely affect ESA-listed species and designated critical habitat (USFWS 2021). Launch activities at KTF would be conducted within the SOPs as implemented by DOE at KTF. If the THAAD launch site were selected for JFC launches, additional coordination and/or consultation under Section 7 of the ESA may be required prior to launch. Additionally, installation personnel would continue to manage habitats according to the INRMP, which is designed to protect and benefit threatened and endangered species.

Terrestrial Vegetation

JFC activities would have no long-term adverse impact on vegetation at PMRF. Vegetation near the launch pad could be temporarily affected by the heat generated at launch and from launch emissions (U.S. Navy 2019a). Standard safety procedures are in place at KTF and PMRF to minimize the potential for wildfires and other potential vegetation impacts as the result of vehicle launch. Vegetation is typically cleared from areas adjacent to launch sites and the duration of high temperature is extremely short (U.S. Navy 2019a, DOE 2019). Prior to launches at Pad 42, the vegetation adjacent to the launch pad is pre-soaked with water using a sprinkler system affixed to the top rail of the KTF perimeter fence. PMRF has a Fire Protection Program and PMRF Fire crews are present at every launch (DOE 2019). After decades of launches, there have not been any off-site vegetation fires because of launches at KTF. KTF has been used for launches for decades and there is no evidence of any long-term adverse impact on vegetation from heat or chemical emissions (U.S. Navy 2019a). No threatened or endangered plants occur in the PMRF ROI.

Terrestrial Wildlife

Terrestrial wildlife species at PMRF such as birds as well as marine organisms that haul out on land (**Table 3-2**) have the potential to be impacted by elevated sound pressure levels from launch as well as hazardous chemicals, artificial lighting, and direct contact from debris. The launch site at KTF is in an area that has routine human activity, equipment operation, and launch activity. Overall, terrestrial wildlife are not expected to be significantly impacted by JFC stressors during launch activities at PMRF.

As analyzed for previous STARS launches at PMRF (U.S. Navy 2019a, DOE 2019), noise from launches and launch related activity may startle nearby wildlife, causing flushing behavior in birds, but this startle reaction would be of short duration. The brief noise peaks produced by missiles are comparable to levels produced by thunder at close range (120 decibels [dB] to 140 dB peak) (U.S. Navy 2019a, DOE 2019). Monitoring of birds in areas similarly exposed to launch noise during the breeding season indicates that adults respond to launch noise by flying away from nests but returning within 2 to 4 minutes (U.S. Navy 2019a). Terrestrial species at PMRF are already habituated to high levels of noise associated with ongoing activities at this facility. Disturbance to wildlife from launches would be brief and is not expected to have any long-term impacts.

Impact of launch noise on ESA-listed species would also be minimal and short-term. KTF is separated from known green turtle haul-out areas on the shoreline by the Nohili Dune (**Figure 3-1**) which would reduce launch noise exposure. The closest observed Hawaiian monk seal haul-out area is at least 1.0 km (0.6 mi) from the launch site (**Figure 3-1**). As described in the JFC Marine Biological Evaluation (U.S. Army and U.S. Navy 2021), the maximum sound pressure levels expected at this distance would not exceed the injury threshold for monk seals and behavioral response would be limited to short-duration startle responses with no long-term effects.

In addition, SOPs for launches at PMRF include a temporary hold on a launch if a monk seal is within the ESQD arc and delay of launch if humpback whales, Hawaiian monk seals, or green sea turtles are observed in the offshore launch safety zone (DOE 2019). Launch noise is not likely to adversely affect hauled out monk seals or sea turtles and impacts would be less than significant.

Hawaiian hoary bats roost in trees over 4.6 m (15 ft) tall and have the potential to roost in the kiawe-koa haole scrub habitat north and west of Pad 42 at KTF during the day. Roosting Hawaiian hoary bats have the potential to be impacted by disturbance due to launch noise. Sudden loud noise from launch might cause bats to leave their roost trees. Any bats that left their roost trees would likely find another roost tree in an adjacent area. Bats may be temporarily startled by launch noise (behavioral disturbance), but it is unlikely that launch noise would injure bats or that it would meaningfully impair essential behavioral patterns, including breeding, feeding, or sheltering. Any launch noise at night has the potential to disturb foraging bats. Launch noise may cause bats to leave the immediate launch area temporarily, but bats may normally range several kilometers in a night (Bonaccorso et al. 2015) and other areas of PMRF and the Mana Plain are known to provide foraging habitat for Hawaiian hoary bats (Bonaccorso and Pinzari 2011). Foraging bats would be expected to return to normal behaviors within minutes of launch. Launch noise would be a one-time, relatively short duration (less than 60 seconds) event that would have no long-term effects on bat roost or habitat use (roosting or foraging). Any disturbance from launch noise would be expected to be short-term behavioral response with no lasting or long-term physiological or behavioral effects. Overall, Hawaiian hoary bats are not likely to be adversely affected by launch activities and impacts would be less than significant.

Nēnē have the potential to be impacted by elevated noise levels which might cause disturbance of nesting and grazing birds. Launch sound pressure levels may exceed the injury threshold for birds (140 dB) up to 53 m (175 ft) from the launch pad. However, nēnē are considered unlikely to occur in this area during launch. Only a few nēnē have been recorded on KTF in recent years and no nēnē nesting has been documented on KTF or in nearby habitats. Human activity and equipment operation at the launch pad in the days leading up to the launch would likely deter nēnē from using the area within 53 m (175 ft) of the launch pad for grazing. If nēnē were to occur or persist in the immediate launch pad area (within 53 m or 175 ft) within 24 hours preceding the launch, project or KTF test personnel would coordinate a response with the PMRF Environmental Program. Response solutions might include hazing by trained and authorized personnel (under the terms of existing biological opinions on base-wide operations) to encourage nēnē to leave the area so they would not be harmed. Any effects on nēnē would likely be limited to temporary startle reactions and birds would be expected to return to normal behaviors and distributions within hours or days of the launch. Overall, nēnē are not likely to be adversely affected by launch activities and impacts would be less than significant.

Increased human and equipment activity, such as vehicles, helicopters, and landing craft, may cause birds and other mobile wildlife to temporarily leave the area. It is expected that these individuals would return to the area and to normal activity after the human activity and sound producing activities have ended.

As concluded for ongoing launch operations at KTF (DOE 2019), emissions from vehicle launches would have little effect on wildlife due to the low levels and short duration of emissions. Monitoring of wildlife for previous launches at KTF indicates that birds are unlikely to come into contact with launch emissions because of their reaction to initial launch noise which causes them to temporarily leave the launch area (DOE 2019). Because aluminum oxide and hydrogen chloride do not bioaccumulate, no indirect effects on the food chain are anticipated from these exhaust emissions (U.S. Navy 2019a, DOE 2019). In the unlikely event of an on-pad fire or early flight failure over land of this solid propellant missile, most or all of the fuel would likely burn up before being extinguished. Any remaining fuel would be collected and disposed of as hazardous waste. Soil contamination which could result from such an incident is expected to be localized, along with any impacts on vegetation or wildlife.

No impacts on wildlife due to direct contact from debris are expected during normal flight operations. The probability for a launch mishap is very low. However, an early flight termination or mishap would cause missile debris to impact, most likely in the water further downrange (U.S. Navy 2019a).

In the event of nighttime launch activities, the potential exists for ESA-listed seabirds to be impacted by artificial lighting. In general, pre-flight activities at PMRF, including final vehicle assembly and preflight checks, would take place during daylight hours. Launch activities would take place during daylight hours where possible but the potential exists for nighttime launch activities. ESA-listed seabirds, especially fledgling birds making their first flights to the ocean from mountain nest sites, have the potential to be disoriented by artificial lighting and fall to the ground or strike tall structures. The U.S. Navy had consulted with the USFWS on the potential effects of KTF launch activities on these ESA-listed seabirds. As part of this consultation, the U.S. Navy has implemented several measures on PMRF to avoid seabird fallout including preferentially scheduling launches for January through early September (outside of the fledgling season), scheduling launches outside of dark moon phases, reducing the use of night lighting, keeping exterior lighting correctly positioned and shielded, and keeping doors and windows shielded when in use during nighttime hours (USFWS 2018b, DOE 2019). With implementation of these measures, the USFWS has determined that activities at PMRF, including launch activities, are not likely to jeopardize the existence of ESA-listed seabirds in the ROI.

Marine Vegetation

Marine vegetation at PMRF would not be impacted by the Proposed Action. Launch emissions would be dispersed in the atmosphere and any chemicals that entered the marine environment would be further diluted by ocean water. As discussed above, no debris is expected during normal flight operations.

Marine Wildlife

Overall, marine wildlife are not expected to be impacted by JFC activities in the PMRF marine ROI. Vehicle launch and overflight would result in elevated noise levels in marine areas, but no marine wildlife would be exposed to artificial lighting or increased levels of human activity and equipment operation.

Vehicle launch and overflight would result in elevated noise levels; however, the expected sound pressure levels in offshore waters would be much lower than those experienced near the launch site. Because of the expected sound intensity loss at the air-water interface, the rapid attenuation of the sound in water, and the short duration of the sound, the low intensity noise is unlikely to impact marine wildlife in the ocean. The vehicle would fly at velocities sufficient to generate sonic booms from close to launch at PMRF and extending downrange. However, evaluation of sonic booms for pervious tests (including STARS) resulted in estimates of maximum sound pressures at the ocean surface well below the threshold levels which would impact marine mammals, sea turtles, or fish (U.S. Navy 2019a, NASA 2019). Increased human and equipment activity, such as vehicles, helicopters, and landing craft, may cause mobile marine wildlife to temporarily leave the area. At most, elevated noise levels might cause temporary disturbance such as changes in swimming direction or speed, feeding, or socializing, that would have no measurable effect on individual animals or their distributions. Given the low density of special-status marine wildlife species in the ROI, even temporary behavioral disturbance is unlikely for these species.

No impacts on marine wildlife due to direct contact or exposure to hazardous chemicals from debris are expected during normal flight operations. The probability for a launch mishap is very low. However, an early flight termination or mishap might cause missile debris to fall along the flight corridor. Given the low density of special-status species, it would be very unlikely that debris would harm individuals of ESA or MMPA protected species. Furthermore, as part of SOPs, launch would be delayed if humpback whales, monk seals, or sea turtles were observed in the offshore launch safety zone (DOE 2019).

No impacts to marine wildlife are expected due to launch emissions. Launch emissions would be dispersed in the atmosphere and any chemicals that entered the marine environment would be further diluted by ocean water. No hazardous chemicals would be expected to be present in concentration which would harm marine wildlife and no indirect effects due to on the food chain due to bioaccumulation would be anticipated from the exhaust emissions (DOE 2019).

Environmentally Sensitive Habitats

No impacts to designated critical habitat for the endangered ‘ohai and lau`ehu are expected due to launch activities at PMRF. Designated critical habitat for these plants occurs north of Pad 42, approximately 180 m (590 ft) away at the closest point (see **Figure 3-1**).

No impacts to EFH are expected for normal flight operations as debris and hazardous chemicals are not expected to enter the marine environment. The chances of a launch mishap which might introduce debris into EFH is very low and any debris would likely be small and widely scattered.

4.1.3 Public Health and Safety (PMRF)

The safety and environmental health analysis contained in the respective sections addresses issues related to the health and well-being of military personnel and civilians living on or in the vicinity of PMRF. Additionally, this section addresses the environmental health and safety risks to children.

4.1.3.1 PMRF – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to public health and safety. Therefore, no significant impacts would occur with implementation of the No Action Alternative.

4.1.3.2 PMRF – Proposed Action

The JFC flight test would include the launch of a two-stage booster AUR vehicle from PMRF. The JFC AUR is still in development, so it will be compared to similar tests that have launched from PMRF. The FE-1, FE-2, FT-2, Advanced Hypersonic Weapon Program, and STS missile tests will be used as a comparison for effects on regional public health and safety since the testing of vehicles at the same site would have a similar potential health and safety impact. The proposed solid propellants would be similar to past launches, although a smaller quantity. For example, the FE-2 total weight of solid propellant was 13,608 kg (30,000 lb) and the JFC AUR will contain 6,804 kg (15,000 lb) of solid propellant. Additionally, the FE-2 vehicle was wider, and had three stages. The JFC AUR is slightly longer, much thinner, and has two stages. The JFC mission personnel would follow the same health and safety procedures developed under existing plans at PMRF. Federal, state, and local regulations as well as PMRF SOPs would be followed for launch site preparation, booster handling, and all hazardous operations. PMRF Missile Flight Analysis, Ground Safety, Range Safety, Ocean Clearance, Transportation Safety, and Fire and Crash Safety procedures would be followed to ensure the safety of workers and members of the public. PMRF would issue NOTAMs and NTMs ahead of any JFC flight test, in accordance with range safety and FAA requirements. Previous NEPA analyses for missile tests at PMRF have determined that there would be no impact to public health and safety as a result of their Proposed Action (U.S. Navy 2017, U.S. Navy 2019a, USASMDC/ARSTRAT 2014, USASMDC/ARSTRAT 2011, USASDC 1992). Due to the significantly smaller size of the JFC AUR in comparison to the FE-1, FE-2, FT-2, Advanced Hypersonic Weapon Program, and STS missile tests, implementation of the Proposed Action would result in no impacts to public health and safety in the PMRF ROI. In accordance with EO 13045, *Protection of Children from Environmental Health and Safety Risks*, the U.S. Navy has determined that since the JFC flight tests would be conducted on DOD property and out in the open ocean, the JFC flight test has no environmental health and safety risks that may disproportionately affect children.

4.1.4 Hazardous Materials and Wastes (PMRF)

The hazardous material and waste analysis contained in the respective sections addresses issues related to the use and management of hazardous materials and wastes as well as the presence and management of specific cleanup sites at PMRF.

4.1.4.1 PMRF – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change associated with hazardous materials and wastes. Therefore, no significant impacts would occur with implementation of the No Action Alternative.

4.1.4.2 PMRF – Proposed Action

The JFC flight test would include the launch of a two-stage booster AUR vehicle from PMRF. The JFC AUR is still in development, so it will be compared to similar tests that have launched from PMRF. The FE-1, FE-2, FT-2, Advanced Hypersonic Weapon Program, and STS missile tests will be used as a comparison for effects on hazardous materials and wastes, since the testing of vehicles at the same site would produce similar hazardous materials and wastes, and potential environmental impacts. As described in **Section 2.1** the JFC AUR vehicle body is 10.2 m (403.2 in) long with a maximum diameter of 0.87 m (34.5 in). The JFC two stage AUR will contain 6,804 kg (15,000 lb) of solid propellant. The FE-2 rocket motor body was approximately 9 m (357 in) long with a maximum diameter of 1.4 m (54 in) (U.S. Navy 2019a). The FE-2 three stage booster carried 13,608 kg (30,000 lb) of solid propellant (U.S. Navy 2019a). The JFC AUR is a smaller sized vehicle and carries less propellant than FE-2. Hazardous material usage and waste generation would continue to be managed by PMRF under appropriate federal, state, local, and DOD requirements. Previous NEPA analyses for missile tests at PMRF have determined that there would be no impact to hazardous materials and wastes as a result of their Proposed Action (U.S. Navy 2017, U.S. Navy 2019a, USASMDC/ARSTRAT 2014, USASMDC/ARSTRAT 2011, USASDC 1992). Due to the significantly smaller size of the JFC AUR in comparison to the FE-1, FE-2, FT-2, Advanced Hypersonic Weapon Program, and STS missile tests, implementation of the Proposed Action would not result in impacts to hazardous material and waste management in the PMRF ROI.

4.2 Wallops Flight Facility

The Proposed Action entails up to six flight test launches annually at up to four different launch locations over the next 10 years. WFF was selected as an alternative test range for the JFC flight test because of its launch pad suitability, data collection and storage capabilities, booster and explosive materials storage capabilities, available timeframe for launch tests, range and explosive safety record, and ability to meet security requirements. The JFC AUR could be launched from a launch stool, a cannister/box launcher, or a transporter erector launcher as shown in **Figure 2-2**.

4.2.1 Cultural Resources (WFF)

4.2.1.1 WFF – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to cultural resources from the baseline conditions described in **Section 3.2.1.2**. Therefore, no significant impacts to cultural resources would occur with implementation of the No Action Alternative.

4.2.1.2 WFF – Proposed Action

The JFC flight test may require modifications to an existing MSS at Launch Pad 0-B. While unlikely, there could be a need for minor trenching in previously disturbed areas to install additional power and communication lines. Grounding rods to arrest lightning and static electricity may be required. Any ground-disturbing activities are not expected to remove vegetation or earth as the modifications to the MSS would be on existing structure. All federal, state, local, and WFF-specific SOPs would be followed during MSS modification to ensure worker and environmental safety.

Federal cultural resource preservation statutes mandate that if prehistoric or historic artifacts are unexpectedly discovered during construction or excavation, such materials would be identified and evaluated by a professional archaeologist. Should human remains or cultural artifacts be encountered, federal statutes specify that work would cease immediately and the proper authorities would be notified. WFF/NASA would consult with the Virginia Department of Historical Resources should unexpected discoveries occur, and project re-commencement would only be authorized once the State Historic Preservation Office clears the site.

Because the Proposed Action would not require new construction at Launch Pad 0-B—only the potential modification on an existing structure—no impacts on cultural resources are anticipated. In addition, the facilities to be used as part of the Proposed Action are not listed or eligible for listing on the National Register of Historic Places. The launch site does not contain a historic or tribal site of significance (NASA 2019). In accordance with the WFF Programmatic Agreement no Section 106 consultation with the Virginia SHPO is required for the Proposed Action.

4.2.2 Biological Resources (WFF)

Potential environmental consequences of the Proposed Action at WFF are similar to those discussed for PMRF in **Section 4.1.2** and are evaluated based on the criteria detailed in **Section 4.1.2**.

4.2.2.1 WFF – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to biological resources from those evaluated in the WFF Site-wide PEIS (NASA 2019). Therefore, no significant impacts to biological resources would occur with implementation of the No Action Alternative.

4.2.2.2 WFF – Proposed Action

The Proposed Action is evaluated for the potential impacts on biological resources in the WFF ROI. Potential impacts of the Action in this area include exposure to elevated sound pressure levels, hazardous chemicals, artificial lighting, and increased human activity and equipment operation. The potential stressors of JFC launch activities at WFF would be the same as those for launch at PMRF described in **Section 4.1.2.2**.

The potential impacts of launches from WFF on biological resources have been addressed in detail for a variety of launch vehicles and fuel types in the WFF Site-wide PEIS (NASA 2019). The WFF Site-wide PEIS analyzed the impact of a variety of orbital and sub-orbital rocket launches from WFF. All JFC vehicle and launch parameters, including noise and emissions, are well within the extent of launch operations previously analyzed in the WFF Site-wide PEIS. No new facilities or structures would be required at WFF. As a result, impacts on biological resources would be similar to those previously analyzed and are expected to be minimal. Additionally, installation personnel would continue to monitor protected species in accordance with the WFF Protected Species Monitoring Plan.

Potential effects of the Proposed Action at WFF on ESA-listed species are covered under programmatic ESA Section 7 consultations and the existing Biological Opinions for launch operations at WFF (USFWS 2019). JFC activities would be conducted within the terms of the Biological Opinion as implemented by NASA for ongoing launch activities at WFF.

Overall, Proposed Action activities are consistent with launch activities analyzed in the WFF Site-wide PEIS (NASA 2019). Therefore, implementation of the Proposed Action at WFF would result in no significant change in biological resources from those analyzed in the WFF Site-wide PEIS (NASA 2019). Impact conclusions are summarized here but detailed analysis in NASA 2019 is incorporated here by reference.

Terrestrial Vegetation

Overall, terrestrial vegetation is not expected to be significantly impacted by Proposed Action launch activities at WFF. No ground clearing or construction is expected for the Proposed Action. The launch would take place at a previously disturbed, previously used, and previously analyzed launch site (NASA 2019). Vegetation near the launch pad could be impacted by the heat generated at launch and small brush fires have been known to occur near Launch Pad 0-B (NASA 2019). However, vegetation is typically cleared from areas adjacent to the launch site and WFF fire units are routinely stationed outside the launch hazard area during launch so that they can respond as soon as the pad is cleared for entry (NASA 2019).

Vegetation may be impacted by deposition of exhaust emissions (specifically HCl and aluminum oxide) associated with solid fueled rockets (NASA 2019). However, as concluded by NASA (2019) for site-wide launch activities, impacts to vegetation would be infrequent and limited to an area approximately 300 m (1,000 ft) around the launch pad. Equipment brought to the launch site at WFF would be inspected prior to loading and upon arrival to reduce the risk of introduction or spread of invasive species. No threatened or endangered plants have been observed on Wallops Island.

Terrestrial Wildlife

Terrestrial wildlife species at WFF such as mammals, birds, reptiles, amphibians, and invertebrates as well as marine organisms that haul out on land (**Table 3-2**) may be impacted by elevated sound pressure levels from launch as well as hazardous chemicals, and artificial lighting. The launch site at WFF is in an area that has routine human activity, equipment operation, and launch activity. Overall, terrestrial wildlife would not be significantly impacted by Proposed Action activities at WFF.

Elevated noise levels are the primary factor resulting from launch activities with the potential to impact terrestrial wildlife. Launch noise may startle or flush mobile species and may cause animals to avoid launch areas (NASA 2019). While the launch noise for the JFC vehicle is not yet known, launch noise is assumed to be similar or less than for previously analyzed rocket launches. Based on the size of the vehicle and propellant mass, the JFC vehicle would be in the category of smaller sub-orbital rockets launched from WFF and launch noise would be within the launch noise envelope analyzed in the WFF Site-wide PEIS (NASA 2019). As analyzed for previous suborbital rocket launches at WFF (NASA 2019), noise from launches and launch related activity may startle nearby wildlife, causing flushing behavior in birds, but this startle reaction would be of short duration. Disturbance to wildlife from launches would be brief and is not expected to have any long-term impacts.

Increased human and equipment activity, such as vehicles, helicopters, and landing craft, may cause birds and other mobile wildlife to temporarily leave the area. It is expected that these individuals would return to the area and to normal activity after the sound-producing activities have ended. Wildlife present in the WFF ROI are likely acclimated to noise and activity levels of ongoing operations and any disturbance is likely to be minor and short-term (NASA 2019).

Launches from Launch Pad 0-B have the potential to impact the ESA-listed piping plover and red knot. Piping plovers are known to nest on sandy beaches on the southern portions of Wallops Island, approximately 1.5 km (0.8 nm) from Launch Pad 0-B (NASA 2017). Red knots occur on Wallops Island beaches only during migration, mostly during the second half of May (NASA 2017). However, most red knots occur on the northern end of Wallops Island and would not be subjected to noise loud enough to impact birds (USFWS 2016). NASA has consulted with the USFWS on the potential effects of launch activities from WFF, including Launch Pad 0-B (USFWS 2019). This consultation included all proposed and ongoing programmatic launch activities at WFF which could take place year-round and any time of the day (USFWS 2019). The USFWS concluded that rocket launches and flights might adversely affect piping plovers and red knots due to hearing impairment; launch noise disrupting normal feeding, resting, or nesting behaviors; and increased structure collision risk due to artificial light attraction (USFWS 2019). The USFWS concluded that take of piping plovers and red knots due to ongoing activities (including launch activities) at WFF is not likely to result in population declines or to jeopardize the continued existence of these species (USFWS 2019). Proposed Action activities would comply with the terms and conditions of the 2019 Biological Opinion (USFWS 2019) as implemented by WFF in their SOPs. Furthermore, WFF would continue to monitor ESA-listed species as part of their Protected Species Management Plan, including post-launch monitoring for injured ESA-listed species within 305 m (1,000 ft) north and south of the launch pad, as soon as the WFF Safety Office clears the area for entry (NASA 2020). Elevated noise levels resulting from Proposed Action launch activities are not expected to significantly impact these or other special-status bird species in the WFF ROI.

NASA has consulted with the USFWS on the potential effects of launch activities at Launch Pad 0-B on nesting and hatchling loggerhead turtles (USFWS 2019). The USFWS concluded that lighting present at launch pads may affect loggerhead turtles at nest sites close to launch pads and that launch noise and vibration may cause hearing impairment or disruption of normal behaviors (USFWS 2019). WFF implements a Protected Species Management Plan (NASA 2020) and also conducts ongoing operations according to the terms and conditions detailed in the 2019 Programmatic Biological Opinion (USFWS 2019). During nesting season, beach surveys would be conducted for injured sea turtles within 305 m (1,000 ft) north and south of the launch pad, as soon as the WFF Safety Office clears the area. If injured protected species are found, the WFF Environmental Office would coordinate with the USFWS (USFWS 2019). Given these measures and that there is limited turtle nesting activity on WFF, the impacts of proposed launch activities on loggerhead populations would be minor.

No impacts on wildlife due to direct contact from debris are expected during normal flight operations. The probability for a launch mishap is very low. However, an early flight termination or mishap would cause missile debris to impact along the flight corridor, likely in offshore waters.

Emissions from vehicle launches would have little effect on wildlife due to the low levels and short duration of emissions. Rocket exhaust from Launch Pad 0-B is directed over the Atlantic Ocean by a vent located in the base of the gantry (USFWS 2019). While heat or emissions from rocket exhaust have the potential to kill or injure wildlife if they are directly exposed to exhaust contamination, such exposure would be localized to the area directly in front of the launch gantry, along with any impacts on vegetation or wildlife.

In general, pre-flight activities, including final vehicle assembly and preflight checks would take place during daylight hours. Launch activities would take place during daylight hours where possible but the potential exists for nighttime launch activities. In the event of nighttime launch activities, the potential exists for sea turtles to be impacted by artificial lighting. If program activities are required to occur at night during the sea turtle nesting season, the U.S. Army would minimize lighting and coordinate these activities through WFF to avoid disorienting hatchling sea turtles with artificial lights. Given the limited time frame of launch activities, sea turtle hatchlings and other terrestrial wildlife species are not likely to be significantly impacted by artificial lighting from proposed activities.

Marine Wildlife

Overall, marine wildlife are not expected to be significantly impacted by the Proposed Action in the WFF ROI. Any impacts, if realized, would likely be limited to short-term startle reactions due to elevated noise levels and marine wildlife would be expected to return to normal behaviors within minutes.

Vehicle launch and overflight would result in elevated noise levels; however, the expected sound pressure levels in offshore waters would be much lower than those experienced near the launch site. The potential impacts of elevated sound pressure levels on marine wildlife species are detailed in the WFF Site-wide PEIS (NASA 2019) as well as in NMFS Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (NOAA 2018b) and are incorporated here by reference. As concluded in the WFF Site-wide PEIS (NASA 2019) and for PMRF in **Section 4.1.2.2**, launch and overflight noise is unlikely to impact marine wildlife. Launch and overflight noise would be short duration and would be subject to attenuation and refraction at the air-water interface which would greatly reduce the sound intensity in marine environments. Increased human and equipment activity, such as vehicles, helicopters, and landing craft, may cause mobile marine wildlife to temporarily leave the area. At most, elevated noise levels might cause temporary disturbance such as changes in swimming direction or speed, feeding, or socializing, that would have no measurable effect on individual animals or their distributions. Given the low density of special-status marine wildlife species in the ROI, even temporary behavioral disturbance is unlikely for these species.

No impacts on marine wildlife due to direct contact or exposure to hazardous chemicals from debris are expected during normal flight operations. The probability for a launch mishap is very low. However, an early flight termination or mishap might cause debris to fall along the flight corridor. Given the low density of special-status species, it would be very unlikely that debris would harm individuals of ESA or MMPA protected species.

No impacts to marine wildlife are expected due to launch emissions. Launch emissions would be dispersed in the atmosphere and any chemicals that entered the marine environment would be further diluted by ocean water. No hazardous chemicals would be expected to be present in concentration which would harm marine wildlife as previous studies of surface waters surrounding launch pads have indicated minimal pH changes after rocket launches (NASA 2019).

No impacts to EFH are expected for normal flight operations as debris and hazardous chemicals are not expected to enter the marine environment. The chance of a launch mishap which might introduce debris into EFH is very low and any debris would not change the quantity or quality of EFH in the ROI.

4.2.3 Public Health and Safety (WFF)

The safety and environmental health analysis contained in the respective sections addresses issues related to the health and well-being of military personnel and civilians living on or in the vicinity of WFF. Additionally, this section addresses the environmental health and safety risks to children.

4.2.3.1 WFF – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to public health and safety. Therefore, no significant impacts would occur with implementation of the No Action Alternative.

4.2.3.2 WFF – Proposed Action

The JFC flight test would include the launch of a two-stage booster AUR vehicle from WFF. The JFC AUR is still in development, so it will be compared to similar tests that have launched from WFF. The FE-2 missile; test parameters described in the WFF Site-wide PEIS; and test parameters described in the Atlantic Fleet Testing and Training EIS will be used as a comparison for effects on regional public health and safety, since the testing of vehicles at the same site would have a similar potential health and safety impact. The proposed solid propellants would be similar to past launches, although a smaller quantity. For example, the FE-2 total weight of solid propellant was 13,608 kg (30,000 lb) and the JFC AUR will contain 6,804 kg (15,000 lb) of solid propellant. Additionally, the FE-2 vehicle was wider, and had three stages. The JFC AUR is slightly longer, much thinner and has two stages. The JFC mission personnel would follow the same health and safety procedures developed under existing plans at WFF. Federal, state, and local regulations as well as WFF SOPs would be followed for launch site preparation, booster handling, and all hazardous operations. The modification of the MSS at the launch pad would have no impact on public health and safety because the modification would occur on NASA property, away from the public. All federal, state, local, and WFF-specific SOPs would be followed during MSS modification to ensure worker safety. WFF Missile Flight Analysis, Ground Safety, Range Safety, Ocean Clearance, Transportation Safety, and Fire and Crash Safety procedures would be followed to ensure the safety of workers and members of the public. WFF would issue NOTAMs and NTMs ahead of any JFC flight test, in accordance with range safety and FAA requirements. Previous NEPA analyses for rocket launches at WFF have determined that there would be no impact to public health and safety as a result of their Proposed Action (U.S. Navy 2019a, NASA 2019, U.S. Navy 2018b). Due to the significantly smaller size of the JFC AUR in comparison to the FE-2 missile, test parameters described in the WFF Site-wide PEIS, and test parameters described in the Atlantic Fleet Testing and Training EIS, implementation of the Proposed Action would result in no impacts to public health and safety in the WFF ROI. In accordance with EO 13045, *Protection of Children from Environmental Health and Safety Risks*, the U.S. Navy has determined that since the JFC flight tests would be conducted on NASA property and out in the open ocean, the JFC flight test has no environmental health and safety risks that may disproportionately affect children.

4.2.4 Hazardous Materials and Wastes (WFF)

The hazardous material and waste analysis contained in the respective sections addresses issues related to the use and management of hazardous materials and wastes as well as the presence and management of specific cleanup sites at WFF.

4.2.4.1 WFF – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change associated with hazardous materials and wastes. Therefore, no significant impacts would occur with implementation of the No Action Alternative.

4.2.4.2 WFF – Proposed Action

The JFC flight test would include the launch of a two-stage booster AUR vehicle from WFF. The JFC AUR is still in development, so it will be compared to similar tests that have launched from WFF. The FE-2 missile, test parameters described in the WFF Site-wide PEIS, and test parameters described in the Atlantic Fleet Testing and Training EIS will be used as a comparison for effects on hazardous materials and wastes, since the testing of vehicles at the same site would produce similar hazardous materials and wastes, and potential environmental impacts. As described in **Section 2.1** the JFC AUR vehicle is body is 10.2 m (403.2 in) long with a maximum diameter of 0.87 m (34.5 in). The JFC two-stage AUR will contain 6,804 kg (15,000 lb) of solid propellant. The FE-2 rocket motor body was approximately 9 m (357 in) long with a maximum diameter of 1.4 m (54 in) (U.S. Navy 2019a). The FE-2 three stage booster carried 13,608 kg (30,000 lb) of solid propellant (U.S. Navy 2019a). The JFC AUR is a smaller sized vehicle and carries less propellant than FE-2. Hazardous material usage and waste generation would continue to be managed by WFF under appropriate federal, state, local and NASA requirements. The modification of the MSS at the launch pad would have no impact on management of hazardous materials and wastes at WFF. All federal, state, local and WFF-specific SOPs would be followed during MSS modification to ensure worker and environmental safety. Previous NEPA analyses for rocket launches at WFF have determined that there would be no impact to hazardous materials and wastes as a result of their Proposed Action (NASA 2019, U.S. Navy 2017, U.S. Navy 2019a, USASMDC/ARSTRAT 2014, USASMDC/ARSTRAT 2011, USASDC 1992). Due to the significantly smaller size of the JFC AUR in comparison to the FE-2 missile, test parameters described in the WFF Site-wide PEIS, and test parameters described in the Atlantic Fleet Testing and Training EIS, implementation of the Proposed Action would not result in impacts to hazardous material and waste management in the WFF ROI.

4.3 Vandenberg Space Force Base

The Proposed Action entails up to six flight test launches annually at up to four different launch locations over the next 10 years. VSFB was selected as an alternative test range for the JFC flight test because of its launch pad infrastructure and suitability, data collection and storage capabilities, booster and explosive materials storage capabilities, available timeframe for launch tests, range and explosive safety record, and ability to meet security requirements. The JFC AUR could be launched from a launch stool, a cannister/box launcher, or a transporter erector launcher as shown in **Figure 2-2**.

4.3.1 Air Quality (VSFB)

4.3.1.1 VSFB – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change associated with air quality at VSFB. Therefore, no significant impacts would occur with implementation of the No Action Alternative.

4.3.1.2 VSFB – Proposed Action

Air emissions were estimated by comparison to Minuteman III emissions for missile launch. The analysis used the prevention of significant deterioration (PSD) permitting threshold of 250 tons per year for all criteria pollutants. For criteria pollutants for which the area has always been in attainment the initial indicator of significance is the PSD threshold. These values are being used as first tier air quality significant indicators for NEPA purposes. Generally, minor emissions of criteria pollutants (i.e., PM_{10}, $PM_{2.5}$, NO_x, SO_x, VOC, and CO) and GHGs (i.e., mostly CO_2e) during the proposed action activities would be expected. Project-specific direct and indirect emissions would primarily be driven by the following activities:

- Pre-test preparation and support
- Flight test
- Post-launch operations

As indicated in **Chapter 2.0**, between FY 2022 and FY 2032 there could be up to 6 flight tests per year for a total of 60 test flights over a 10-year period. Because the JFC missile is still in development there are no estimated emissions; therefore, this analysis uses the emissions from a Minuteman III launch as a surrogate.

The propellant information for Minuteman III and JFC is provided in **Table 4-1** and **Table 4-2**.

Table 4-1. Minuteman III Solid Propellant Rocket Motors

DIMENSIONS			PROPELLANT	
Stage	Diameter (feet)	Length (feet)	Weight (~pounds)	Main Chemical Components
1	5.5	18.6	45,700	▪ Ammonium Perchlorate ▪ Aluminum ▪ Polybutadiene-Acrylic Acid-Acrylonitrile
2	4.3	9.1	13,750	▪ Ammonium Perchlorate ▪ Aluminum ▪ Polybutadiene-Carboxyl Terminated
3	4.3	5.5	7,300	

Source: USAF 2004

The AUR is approximately 34.5 inches in diameter and 33.6 ft in length. The first and second stage include a total of approximately 15,000 lb of solid propellant.

Table 4-2. JFC Solid Propellant Rocket Motors

DIMENSIONS			PROPELLANT	
Stage	Diameter (feet)	Length (feet)	Weight (~pounds)	Main Chemical Components
1 and 2 combined	2.9	33.6	15,000	▪ Ammonium Perchlorate ▪ Aluminum ▪ HTPB Polymer

Source: USAF 2021b

Table 4-3 shows the historical estimated annual emissions for a Minuteman III (JFC Surrogate) launch. **Table 4-4** shows the estimated annual emissions for six flight tests per year over a 10-year period.

Table 4-3. Historical Estimated Emissions for Minuteman III Launches (Tons per Year)

Activity Source	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	Pb	NH_3	CO_2e
Pre-Test Preparation and Support	0.07	0.001	0.13	0.62	0.01	0.01	N/A	N/A	N/A
Launch Activities	0.00	0.002	0.18	0.01	1.84	1.29	N/A	N/A	N/A
Post-Launch Operations	0.06	0.000	0.01	0.07	0.00	0.00	N/A	N/A	N/A
Total (Single Launch)	0.13	0.003	0.32	0.70	1.85	1.30	N/A	N/A	N/A
Significant Indicator Levels (tpy)	250	250	250	250	250	250	25	250	N/A

Source: USAF 2019b

Notes: CO = carbon monoxide, NO_x = oxides of nitrogen, SO_x = oxides of sulfur, 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, VOC = volatile organic compound, CO_2e = carbon dioxide equivalent, HAP = hazardous air pollutant

Table 4-4. Estimated Emissions for Minuteman III Launches from FY2022 – FY2031 (Tons per Year)

Year	Number of Flights	VOC	SO_x	NO_x	CO	PM_{10}	$PM_{2.5}$	Pb	NH_3	CO_2e
FY 2022	6	0.78	0.018	1.92	4.2	11.1	7.8	N/A	N/A	N/A
FY 2023	6	0.78	0.018	1.92	4.2	11.1	7.8	N/A	N/A	N/A
FY 2024	6	0.78	0.018	1.92	4.2	11.1	7.8	N/A	N/A	N/A
FY 2025	6	0.78	0.018	1.92	4.2	11.1	7.8	N/A	N/A	N/A
FY 2026	6	0.78	0.018	1.92	4.2	11.1	7.8	N/A	N/A	N/A
FY 2027	6	0.78	0.018	1.92	4.2	11.1	7.8	N/A	N/A	N/A
FY 2028	6	0.78	0.018	1.92	4.2	11.1	7.8	N/A	N/A	N/A
FY 2029	6	0.78	0.018	1.92	4.2	11.1	7.8	N/A	N/A	N/A
FY 2030	6	0.78	0.018	1.92	4.2	11.1	7.8	N/A	N/A	N/A
FY 2031	6	0.78	0.018	1.92	4.2	11.1	7.8	N/A	N/A	N/A
Significant Indicator Levels (tpy)		250	250	250	250	250	250	25	250	N/A

Source: USAF 2019b

Notes: CO = carbon monoxide, NO_x = oxides of nitrogen, SO_x = oxides of sulfur, 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, VOC = volatile organic compound, CO_2e = carbon dioxide equivalent, HAP = hazardous air pollutant

(1) Only 1st-stage rocket emissions occur within the ROI for VSFB

Based on **Table 4-3** and **Table 4-4,** the estimated annual emissions do not exceed the PSD significant indicator levels for pollutants of concern. Where appliable, launch activities are conducted in compliance with all applicable Santa Barbara County Air Pollution Control District rules and regulations equating to insignificance. Therefore, no significant impacts to air quality are anticipated from flight test.

After each flight test a safety check and cleanup of the launch site is completed (i.e., removal of equipment from the launch site). All estimated emissions from post-test operation are below the significant indicator levels for pollutants of concern and therefore no significant impacts to air quality are anticipated (see **Table 4-3)**.

4.3.2 Cultural Resources (VSFB)

4.3.2.1 VSFB – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to cultural resources from the baseline conditions described in **Section 3.3.2.2**. Therefore, no significant impacts to cultural resources would occur with implementation of the No Action Alternative.

4.3.2.2 VSFB – Proposed Action

Federal cultural resource preservation statutes mandate that if prehistoric or historic artifacts are unexpectedly discovered during construction or excavation, such materials would be identified and evaluated by a professional archaeologist. Should human remains or cultural artifacts be encountered, federal statutes specify that work would cease immediately and the proper authorities would be notified. The USAF has pledged to identify, manage, and maintain important cultural resources in a spirit of stewardship for the benefit of current and future generations (in accordance with AFI 32-7065) (VAFB 2019). The installation has developed an Integrated Cultural Resources Management Plan to comply with mandated cultural resources management requirements (VAFB 2019).

The Proposed Action would not require construction at TP-01; there are no National Historic Register Places eligible at TP-01; and based on information from VSFB (30 CES/CEI) personnel, that the JFC action at VSFB is not subject to Section 106 compliance; then no impacts on cultural resources as a result of this Proposed Action are anticipated. No Section 106 consultation with the California State Historic Preservation Office is required for the Proposed Action.

4.3.3 Biological Resources (VSFB)

Potential environmental consequences of the Proposed Action at VSFB are similar to those discussed for PMRF in **Section 4.1.2** and are evaluated based on the criteria detailed in **Section 4.1.2**.

4.3.3.1 VSFB – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to biological resources from the baseline conditions described in **Section 3.3.3.2** which include ongoing launch operations at VSFB. Therefore, no significant impacts to biological resources would occur with implementation of the No Action Alternative.

4.3.3.2 VSFB – Proposed Action

The Proposed Action is evaluated for the potential impacts on biological resources in the VSFB ROI. Potential impacts of the Proposed Action in this area include exposure to elevated sound pressure levels, hazardous chemicals, artificial lighting, and increased human activity and equipment operation. The potential stressors of proposed launch activities at VSFB would be the same as those for launch at PMRF described in **Section 4.1.2.2**.

The potential impacts of launches from VSFB on biological resources have been addressed in detail for a variety of launch vehicles and fuel types for programs including Minuteman III (USAF 2004, USAF 2020a) and the Ground Based Strategic Deterrent (USAF 2021b). Potential effects of the Proposed Action on ESA-listed species are covered under programmatic ESA Section 7 consultations and the existing Biological Opinions for base-wide operations and maintenance at VSFB (USFWS 2018a) and JFC activities would be conducted within the terms of the Biological Opinion as implemented by the USAF at VSFB. Additionally, installation personnel would continue to manage habitats according to the VSFB INRMP, which is designed to protect and benefit threatened and endangered species.

Terrestrial Vegetation

JFC activities would have no long-term adverse impact on vegetation at VSFB. Vegetation could be temporarily affected by the heat generated at launch and from launch emissions. However, previous analyses of launch activities have concluded that these effects on vegetation are temporary (USAF 2020a). Routine maintenance of firebreaks around the LFs and test pads at VSFB (including TP-01) minimizes the potential for impacts to vegetation by reducing vegetation exposure and reducing the risk of wildfire. Proposed launch activities are not expected to change the abundance or distribution of any plant species or vegetation type at VSFB.

Terrestrial Wildlife

Terrestrial wildlife species at VSFB such as mammals, birds, reptiles, amphibians, and invertebrates as well as marine organisms that haul out on land (**Table 3-2**) may be impacted by elevated sound pressure levels from launch as well as hazardous chemicals, and artificial lighting. The launch site at VSFB is in an area that has routine human activity, equipment operation, and launch activity. Overall, terrestrial wildlife would not be significantly impacted by Proposed Action activities at VSFB.

Elevated noise levels are the primary factor resulting from launch activities with the potential to impact terrestrial wildlife. Launch noise may startle or flush mobile species and may cause animals to avoid launch areas (NASA 2019). While the launch noise for the JFC vehicle is not yet known, launch noise is assumed to be similar or less than for Minute Man III launches. Based on the size of the vehicle and propellant mass, the JFC vehicle would be in the category of smaller sub-orbital rockets launched from VSFB and launch noise would be within the launch noise envelope analyzed in the Minuteman III Modification and Fuze Modernization SEA (USAF 2020a) and GBSD EA/OEA (USAF 2021b). As analyzed for Minute Man III and GBSD launches at VSFB (USAF 2020a; USAF 2021b), noise from launches and launch related activity may startle nearby wildlife, causing flushing behavior in birds, but this startle reaction would be of short duration. Disturbance to wildlife from launches would be brief and is not expected to have any long-term impacts.

Increased human and equipment activity, such as vehicles, helicopters, and landing craft, may cause birds and other mobile wildlife to temporarily leave the area. It is expected that these individuals would return to the area and to normal activity after the sound-producing activities have ended. Wildlife present in the VSFB ROI are likely acclimated to noise and activity levels of ongoing operations and any disturbance is likely to be minor and short-term (NASA 2019).

Launches from Test Pad 01 have the potential to impact the ESA-listed western snowy plover, California least tern, and marbled murrelet. Western snowy plover habitat occurs on all sandy beaches and adjacent coastal dunes from Minuteman Beach to several miles south (USAF 2020a). The brief noise and sight of a missile going in a westerly direction may cause western snowy plovers to flush temporarily, especially during the nesting season. Prior studies that monitored the effects of noise from launch vehicles on western snowy plovers showed no substantial effects, nor any adverse effects on reproductive success. The USFWS concluded, through recent consultations, that such actions would not threaten the continued existence of western snowy plovers, as their population and range would not be lessened beyond its current standing. The “take” of western snowy plovers on base has been allowed by the USFWS, but only within the action areas (USAF 2020a). California least terns occasionally forage in the same areas as western snowy plovers along Minuteman Beach (USAF 2020a). With the exception of two nests on San Antonio Beach in 2002, least terns have only nested at a colony at Purisima Point since 1998 (USAF 2011). The tern colony at Purisima Point is over 6 km (4 mi) from TP-01. Marbled murrelets occur only at-sea in the ROI and are considered rare in nearshore waters off VSFB and in the ROI for launch noise (USAF 2011). Overall, elevated noise levels resulting from Proposed Action launch activities are not expected to significantly impact these or other special-status bird species in the VSFB ROI.

Buckwheat blue butterflies are likely to occur close to TP-01. Flight test activities at TP-01 have the potential to harm buckwheat blue butterflies through physical harm due to blast effects of the vehicle launch or by adversely affecting seacliff buckwheat, the butterflies’ necessary host plant. TP-01 has been and continues to be used for other VSFB mission launches and the USAF has determined that launch activities are unlikely to physically harm butterflies as the vegetation around LFs and TP-01 is maintained as a cleared firebreak and it is unlikely butterflies would be traveling across the firebreak and launch pad area (USFWS 2015, USAF 2010). While acid deposition resulting from vehicle emissions has the potential to adversely affect vegetation in the vicinity of launch pads, previous monitoring of seacliff buckwheat plants after launches has not documented adverse effects from acid deposition (USFWS 2015).

Any California red-legged frogs in the proximity of TP-01 during the brief launch event may be exposed to elevated noise levels. However, it is expected that during launch, red-legged frogs would dive underwater making them less susceptible to acoustic effects. Through recent consultations the USFWS concluded that launch-related activities on base would not hinder the continued existence of red-legged frogs (USAF 2020a).

Marine Wildlife

Overall, marine wildlife are not expected to be significantly impacted by the Proposed Action in the VSFB ROI. Any impacts, if realized, would likely be limited to short-term startle reactions due to elevated noise levels and marine wildlife would be expected to return to normal behaviors within minutes.

Vehicle launch and overflight would result in elevated noise levels; however, the expected sound pressure levels in offshore waters would be much lower than those experienced near the launch site. The potential impacts of elevated sound pressure levels on marine wildlife species have recently been analyzed in the GBSD EA/OEA (USAF 2021b), the Minuteman III Modification and Fuze Modernization SEA (USAF 2020a), and the Conventional Strike Missile Demonstration EA (SMSC 2010) and are incorporated here by reference. As concluded in these recent assessments, launch and overflight noise is unlikely to impact marine wildlife. Launch and overflight noise would be short duration and would be subject to attenuation and refraction at the air-water interface which would greatly reduce the sound intensity in marine environments. Increased human and equipment activity, such as vehicles, helicopters, and landing craft, may cause mobile marine wildlife to temporarily leave the area. At most, elevated noise levels might cause temporary disturbance such as changes in swimming direction or speed, feeding, or socializing, that would have no measurable effect on individual animals or their distributions. Given the low density of special-status marine wildlife species in the ROI, even temporary behavioral disturbance is unlikely for these species.

The JFC launch activities have the potential to harass the MMPA-protected Pacific harbor seal. The NMFS has issued a programmatic “take” permit for launch activities at VSFB which allows Level B harassment of certain pinniped species, including the Pacific harbor seal, elephant seal, northern fur seal, and California sea lion (68 FR 67629-67636). A 5-year take permit, which was renewed in 2019, allows the NMFS to issue a 5-year LOA to VSFB for these harassments. The LOA and programmatic take permit allow VSFB to expose pinnipeds to missile and rocket launches, aircraft flight tests, and helicopter overflights (USAF 2020a, SMSC 2010). NMFS has concluded that any permitted takes by Level B harassment would have no more than a negligible impact on the affected species and stocks (NMFS 2019, USAF 2020a). No significant impacts to hauled out pinnipeds or to other wildlife species are expected to occur as a result of elevated noise levels at VSFB.

Southern sea otters also have the potential to be affected by JFC launch noise; however, monitoring data indicates that launch noise and helicopter overflights do not affect the number or activities of sea otters near VSFB. The USFWS has concluded through recent consultations with the USAF that launch activities “may affect but are not likely to adversely affect” southern sea otters (USAF 2021b, USAF 2020a).

No impacts on marine wildlife due to direct contact or exposure to hazardous chemicals from debris are expected during normal flight operations. The probability for a launch mishap is very low. However, an early flight termination or mishap might cause missile debris to fall along the flight corridor. Given the low density of special-status species, it would be very unlikely that debris would harm individuals of ESA or MMPA protected species.

No impacts to marine wildlife are expected due to launch emissions. Launch emissions would be dispersed in the atmosphere and any chemicals that entered the marine environment would be further diluted by ocean water. No hazardous chemicals would be expected to be present in concentration which would harm marine wildlife as previous studies of surface waters surrounding launch pads have indicated minimal pH changes after rocket launches (NASA 2019).

Environmentally Sensitive Habitats

The Proposed Action is expected to have no effects on leatherback turtle critical habitat, humpback whale critical habitat, or black abalone critical habitat in nearshore waters; or on western snowy plover nesting habitat or California least tern nesting habitat at VSFB. In the unplanned and unlikely event that launch debris would fall within sensitive habitat areas, base biologists would assist in recovery operations and recovery methods that minimize surface disturbance would be used.

Under the Proposed Action, launch emissions are not expected to impact the water quality of local surface waters, including vernal pools (discussed in the “Wildlife” subsection above). If a launch anomaly were to occur, personnel would take immediate action to recover and clean up unburned propellants or any other hazardous materials introduced into terrestrial habitats or in any of the freshwater creeks, retention ponds, wetlands, and shoreline areas (USAF 2020a). As a result, there would be no significant impacts to wetlands or other freshwater habitats on VSFB or to EFH in nearshore waters.

For nominal flight test activities, all post-test human activity and equipment operation would occur within established roadways, launch facilities, or other facilities that are routinely used for mission support operations. These post-test activities would have no significant impacts on vegetation, wildlife, or environmentally sensitive habitats on or near VSFB.

No impacts to EFH are expected for normal flight operations as debris and hazardous chemicals are not expected to enter the marine environment. The chances of a launch mishap which might introduce debris into EFH is very low and any debris would not change the quantity or quality of EFH in the ROI.

4.3.4 Public Health and Safety (VSFB)

The safety and environmental health analysis contained in the respective sections addresses issues related to the health and well-being of military personnel and civilians living on or in the vicinity of VSFB. Additionally, this section addresses the environmental health and safety risks to children.

4.3.4.1 VSFB – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to public health and safety. Therefore, no significant impacts would occur with implementation of the No Action Alternative.

4.3.4.2 VSFB – Proposed Action

The JFC flight test would include the launch of a two-stage booster AUR vehicle from VSFB. The JFC AUR is still in development, so it will be compared to similar tests that have launched from VSFB. The Minuteman III missile tests will be used as a comparison for effects on regional public health and safety since the testing of vehicles at the same site would have a similar potential health and safety impact. The proposed solid propellants would be similar to past launches, although a smaller quantity. For example, the Minuteman III total weight of solid propellant was 30,280 kg (66,755 lb) and the JFC AUR will contain 6,804 kg (15,000 lb) of solid propellant. Additionally, the Minuteman III vehicle was much longer, twice as wide, and had three stages. The JFC AUR is shorter, half as wide, and has two stages. The JFC mission personnel would follow the same health and safety procedures developed under existing plans at VSFB. Federal, state, and local regulations as well as VSFB SOPs would be followed for launch site preparation, booster handling, and all hazardous operations. VSFB Missile Flight Analysis, Ground Safety, Range Safety, Ocean Clearance, Transportation Safety, and Fire and Crash Safety procedures would be followed to ensure the safety of workers and members of the public. VSFB would issue NOTAMs and NTMs ahead of any JFC flight test, in accordance with range safety and FAA requirements. Previous NEPA analyses for missile tests at VSFB have determined that there would be no impact to public health and safety as a result of their Proposed Action (USAF 2004, USAF 2006a, USASMDC/ARSTRAT 2013). Due to the overwhelmingly smaller size of the JFC AUR in comparison to the Minuteman III missile tests, implementation of the Proposed Action would result in no impacts to public health and safety in the VSFB ROI. In accordance with EO 13045, *Protection of Children from Environmental Health and Safety Risks*, the U.S. Navy has determined that since the JFC flight tests would be conducted on DOD property and out in the open ocean, the JFC flight test has no environmental health and safety risks that may disproportionately affect children.

4.3.5 Hazardous Materials and Wastes (VSFB)

The hazardous material and waste analysis contained in the respective sections addresses issues related to the use and management of hazardous materials and wastes as well as the presence and management of specific cleanup sites at VSFB.

4.3.5.1 VSFB – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change associated with hazardous materials and wastes. Therefore, no significant impacts would occur with implementation of the No Action Alternative.

4.3.5.2 VSFB – Proposed Action

The JFC flight test would be subject to routine SOPs and established hazardous waste management procedures at VSFB. All hazardous materials and wastes would be properly managed in accordance with federal, state, local, and DOD regulations. No unmitigable human or environmental health risks are anticipated from pre- and post-test preparation, support, and operations. The JFC AUR is still in development, so it will be compared to similar tests that have launched from VSFB. The Minuteman III missile tests will be used as a comparison for effects on hazardous materials and wastes since the testing of vehicles at the same site would have a similar potential hazardous material and waste impact. The proposed solid propellants would be similar to past launches, although a much smaller quantity. For example, the Minuteman III total weight of solid propellant was 30,280 kg (66,755 lb) and the JFC AUR will contain 6,804 kg (15,000 lb) of solid propellant. Additionally, the Minuteman III vehicle was much longer, twice as wide, and had three stages. The JFC AUR is shorter, half as wide, and has two stages. The launch of the JFC AUR would not create quantities of hazardous waste that would exceed waste handling capacities or exceed permitted waste levels at VSFB. Previous NEPA analyses for missile tests at VSFB have determined that there would be no impact to hazardous materials and wastes as a result of their Proposed Action (USAF 2004, USAF 2006a, USASMDC/ARSTRAT 2013). Due to the smaller size of the JFC AUR in comparison to the Minuteman III missile tests, implementation of the Proposed Action would not result in impacts to hazardous material and waste management in the VSFB ROI.

4.4 Cape Canaveral Space Force Station

The Proposed Action entails up to six flight test launches annually at up to four different launch locations over the next 10 years. CCSFS was selected as an alternative test range for the JFC flight test because of its launch pad suitability, data collection and storage capabilities, booster and explosive materials storage capabilities, available timeframe for launch tests, range and explosive safety record, and ability to meet security requirements. The JFC AUR could be launched from a launch stool, a cannister/box launcher, or a transporter erector launcher as shown in **Figure 2-2**.

4.4.1 Air Quality (CCSFS)

4.4.1.1 CCSFS – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change associated with air quality at CCSFS. Therefore, no significant impacts would occur with implementation of the No Action Alternative.

4.4.1.2 CCSFS – Proposed Action

Air emissions were estimated by comparison to Minuteman III emissions for missile launch. The analysis used the PSD permitting threshold of 250 tons per year for all criteria pollutants. For criteria pollutants for which the area has always been in attainment, the initial indicator of significance is the PSD threshold. These values are being used as first tier air quality significant indicators for NEPA purposes. Generally, minor emissions of criteria pollutants (i.e., PM_{10}, $PM_{2.5}$, NO_x, SO_x, VOC, and CO) and GHGs (i.e., mostly CO_2e) during the Proposed Action activities would be expected. Project-specific direct and indirect emissions would primarily be driven by the following activities:

- Pre-test preparation and support
- Flight test
- Post-launch operations

As indicated in **Chapter 2.0**, between FY 2022 and FY 2032 there could be up to 6 flight tests per year for a total of 60 test flights over a 10-year period. Because the JFC missile is still in development there are no estimated emissions; therefore, this analysis uses the emissions from a Minuteman III launch as a surrogate.

The propellant information for Minuteman III and JFC is provided in **Section 4.3.1.2**, **Table 4-1** and **Table 4-2**. As shown in those tables, the Minuteman III stage 1 contains 20,730 kg (45,700 lb) of propellant and the JFC AUR contains approximately 6,804 kg (15,000 lb) of propellant.

As shown in **Section 4.3.1.2**, **Table 4-3** shows the historical estimated annual emissions for a Minuteman III (JFC Surrogate) launch. **Table 4-4** shows the estimated annual emissions for six flight tests per year over a 10-year period.

Based on **Table 4-3** and **Table 4-4,** the estimated annual emissions do not exceed the PSD significant indicator levels for pollutants of concern. Where appliable, launch activities are conducted in compliance with all applicable Brevard County air quality rules and regulations equating to insignificance. Therefore, no significant impacts to air quality are anticipated from flight test.

After each flight test a safety check and cleanup of the launch site is completed (i.e., removal of equipment from the launch site). All estimated emissions from post-test operation are below the significant indicator levels for pollutants of concern, and therefore no significant impacts to air quality are anticipated (see **Table 4-3**).

4.4.2 Cultural Resources (CCSFS)

4.4.2.1 CCSFS – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to cultural resources from the baseline conditions described in **Section 3.4.2.2**. Therefore, no significant impacts to cultural resources would occur with implementation of the No Action Alternative.

4.4.2.2 CCSFS – Proposed Action

The JFC flight test may require modifications to an existing MSS at LC-46. While unlikely, there could be a need for minor trenching in previously disturbed areas to install additional power and communication lines. Grounding rods to arrest lightning and static electricity may be required. Any ground-disturbing activities are not expected to remove vegetation or earth as the modifications to the MSS would be on existing structure. All federal, state, local, and CCSFS-specific SOPs would be followed during MSS modification to ensure worker and environmental safety.

Federal cultural resource preservation statutes mandate that if prehistoric or historic artifacts are unexpectedly discovered during construction or excavation, such materials would be identified and evaluated by a professional archaeologist. Should human remains or cultural artifacts be encountered, federal statutes specify that work would cease immediately and the proper authorities would be notified. The 45 SW Cultural Resource Manager would work with the State Historic Preservation Office should unexpected discoveries occur, and project re-commencement would only be authorized once the State Historic Preservation Office clears the site.

Because the Proposed Action would not require new construction at LC-46—only the potential modification on an existing structure—no impacts on cultural resources are anticipated. In addition, the facilities to be used as part of the Proposed Action are not listed or eligible for listing on the National Register of Historic Places. The launch site does not contain a historic or tribal site of significance (FAA 2008).

4.4.3 Biological Resources (CCSFS)

Potential environmental consequences of the Proposed Action at CCSFS are similar to those discussed for PMRF in **Section 4.1.2** and are evaluated based on the criteria detailed in **Section 4.1.2**.

4.4.3.1 CCSFS – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to biological resources from the baseline conditions described in **Section 3.4.3.2** which include ongoing launch operations at CCSFS. Therefore, no significant impacts to biological resources would occur with implementation of the No Action Alternative.

4.4.3.2 CCSFS – Proposed Action

The Proposed Action is evaluated for the potential impacts on biological resources in the CCSFS ROI. Potential impacts of the Action in this area include exposure to elevated sound pressure levels, hazardous chemicals, artificial lighting, and increased human activity and equipment operation. The potential stressors of proposed launch activities at CCSFS would be the same as those for launch at PMRF described in **Section 4.1.2.2**.

The potential impacts of vehicle launches from CCSFS on biological resources have been addressed in detail in the Final Supplemental EA for the Space Florida Launch Site Operator License (FAA 2010) and the EA for SpaceX Falcon Launches at KSC and CCSFS (FAA 2020). Potential effects of ongoing operations and launches on ESA-listed species at CCSFS are covered under numerous existing ESA Section 7 consultations and Biological Opinions (see Appendix C of USAF 2020b) and JFC activities would be conducted within the terms of the Biological Opinion as implemented by the USAF at CCSFS. Additionally, installation personnel would continue to manage habitats according to the CCSFS INRMP (USAF 2020b), which is designed to protect and benefit threatened and endangered species.

Terrestrial Vegetation

JFC activities would have no long-term adverse impact on vegetation at CCSFS. Vegetation could be temporarily affected by the heat generated at launch and from launch emissions. However, previous analyses of launch activities have concluded that these effects on vegetation are temporary (FAA 2010). Routine maintenance of firebreaks around the LFs and test pads at CCSFS (including Launch Complex 46 or LC-46) minimizes the potential for impacts to vegetation by reducing vegetation exposure and reducing the risk of wildfire. Proposed launch activities are not expected to change the abundance or distribution of any plant species or vegetation type at CCSFS.

Terrestrial Wildlife

Terrestrial wildlife species at CCSFS such as mammals, birds, reptiles, amphibians, and invertebrates (**Table 3-2**) may be impacted by elevated sound pressure levels from launch as well as hazardous chemicals, and artificial lighting. The launch site at CCSFS is in an area that has routine human activity, equipment operation, and launch activity. Overall, terrestrial wildlife would not be significantly impacted by Proposed Action activities at CCSFS.

Elevated noise levels are the primary factor resulting from launch activities with the potential to impact terrestrial wildlife. Launch noise may startle or flush mobile species and may cause animals to avoid launch areas (NASA 2019). Based on the size of the vehicle and propellant mass, the JFC vehicle would be in the category of smaller sub-orbital rockets launched from CCSFS and launch noise would be within the launch noise envelope analyzed in the INRMP for 45th Space Wing Installations (USAF 2020b) as well as in the EAs for a range of launch program activities (FAA 2020, Space X and USAF 2013, NASA 2011, FAA 2010) at CCSFS. Noise from launches and launch related activity may startle nearby wildlife, causing flushing behavior in birds, but this startle reaction would be of short duration (FAA 2010, NASA 2011) and impacts would be minimal. Disturbance to wildlife from launches would be brief and is not expected to have any long-term impacts.

Increased human and equipment activity, such as vehicles, helicopters, and landing craft, may cause birds and other mobile wildlife to temporarily leave the area. It is expected that these individuals would return to the area and to normal activity after the sound-producing activities have ended. Wildlife present in the CCSFS ROI are likely acclimated to noise and activity levels of ongoing operations and any disturbance is likely to be minor and short-term (USAF 2020b).

Launches from LC-46 have the potential to impact the ESA-listed Florida scrub-jay, red knot, piping plover, wood stork, roseate tern, and Audubon’s crested caracara. The behavior of scrub-jays observed after the launches of Titan, Atlas, and Delta has been normal, indicating no noise-related effects (FAA 2010). All activities conducted under the JFC Proposed Action would be in accordance with the Scrub Jay Management Plan for CCSFS. Impacts on red knot, piping plover, wood stork, roseate tern, and Audubon’s crested caracara would be less than significant.

The ESA-listed Southeastern beach mouse would not be significantly impacted by launch activities at LC-46. Previous consultations for Southeastern beach mice indicate that construction, ground clearing activities, prescribed burns, and pest control operations are likely to impact this species (USAF 2020b). The JFC Proposed Action does not include any of these activities. While mice are known to occur in habitats outside the perimeter fence near LC-46, any impacts to beach mice would be short-term and minor and may include some level of startle response during launches (FAA 2010).

No impacts to gopher tortoises are expected. Gopher tortoises may exhibit short-term startle responses to launch noise and might retreat into burrows. The gopher tortoises at CCSFS are likely accustomed to launch noise and routine human activity and would be expected to return to normal behaviors within minutes.

No impacts on wildlife due to direct contact from debris are expected during normal flight operations. The probability for a launch mishap is very low. An early flight termination or mishap would cause missile debris to impact along the flight corridor but would likely be in offshore waters.

Emissions from vehicle launches would have little effect on wildlife due to the low levels and short duration of emissions. While heat or emissions from rocket exhaust have the potential to kill or injure wildlife if they are directly exposed to exhaust, wildlife are unlikely to be impacted. Based on their distributions and abundance at CCSFS and based on the brief period of potential exposure (the launch vehicles would leave the pad within seconds), special-status species such as Florida scrub-jays and Southeastern beach mice are unlikely to be harmed by vehicle exhaust (USAF 2020b, FAA 2010). Because aluminum oxide and hydrogen chloride do not bioaccumulate, no indirect effects on the food chain are anticipated from these exhaust emissions (U.S. Navy 2019a, DOE 2019). In the unlikely event of an on-pad fire or early flight failure over land of this solid propellant missile, most or all of the fuel would likely burn up before being extinguished. Any remaining fuel would be collected and disposed of as hazardous waste. Soil contamination which could result from such an incident is expected to be localized, along with any impacts on vegetation or wildlife.

In general, pre-flight activities, including final vehicle assembly and preflight checks would take place during daylight hours. Launch activities would take place during daylight hours where possible, but the potential exists for nighttime launch activities. In the event of nighttime launch activities, the potential exists for the ESA-listed loggerhead, green, and leatherback sea turtles to be impacted by artificial lighting. The USAF has implemented a Sea Turtle Preservation Program at CCSFS to minimize impacts on sea turtles, specifically to prevent artificial lighting from altering the behavior and movement of hatchling and adult sea turtles at night (FAA 2010). All activities conducted under the JFC Proposed Action would be in accordance with this program and a USFWS approved Light Management Plan would be in place for the JFC Program prior to launch activities. With a USFWS approved Light Management Plan in place, the potential effects of lighting for launch activities at LC-46 are covered under previous Section 7 consultations with the USFWS (Appendix C of USAF 2020b).

Marine Wildlife

Overall, marine wildlife are not expected to be significantly impacted by the Proposed Action in the CCSFS ROI. Any impacts, if realized, would likely be limited to short-term startle reactions due to elevated noise levels and marine wildlife would be expected to return to normal behaviors within minutes.

Vehicle launch and overflight would result in elevated noise levels; however, the expected sound pressure levels in offshore waters would be much lower than those experienced near the launch site. The potential impacts of elevated sound pressure levels on marine wildlife species have recently been analyzed in the Space Florida EA (FAA 2010) and the SpaceX Falcon Launches EA (FAA 2020) and are incorporated here by reference. As concluded in these recent assessments, launch and overflight noise is unlikely to impact marine wildlife. Launch and overflight noise would be short duration and would be subject to attenuation and refraction at the air-water interface which would greatly reduce the sound intensity in marine environments. Increased human and equipment activity, such as vehicles, helicopters, and landing craft, may cause mobile marine wildlife to temporarily leave the area. At most, elevated noise levels might cause temporary disturbance such as changes in swimming direction or speed, feeding, or socializing, that would have no measurable effect on individual animals or their distributions. Given the low density of special-status marine wildlife species in the ROI, even temporary behavioral disturbance is unlikely for these species.

No impacts on marine wildlife due to direct contact or exposure to hazardous chemicals from debris are expected during normal flight operations. The probability for a launch mishap is very low. However, an early flight termination or mishap might cause missile debris to fall along the flight corridor. Given the low density of special-status species, it would be very unlikely that debris would harm individuals of ESA or MMPA protected species.

No impacts to marine wildlife are expected due to launch emissions. Launch emissions would be dispersed in the atmosphere and any chemicals that entered the marine environment would be further diluted by ocean water. No hazardous chemicals would be expected to be present in concentration which would harm marine wildlife as previous studies of surface waters surrounding launch pads have indicated minimal pH changes after rocket launches (NASA 2019).

Environmentally Sensitive Habitats

West Indian manatee designated critical habitat occurs approximately 6 km (4 mi) to the west of LC-46. The Proposed Action carries the JFC launch vehicle east, over the Atlantic Ocean and away from West Indian manatee critical habitat. Therefore, no impacts to manatee designated critical habitat due to JFC activities are expected.

No impacts to EFH are expected for normal flight operations as debris and hazardous chemicals are not expected to enter the marine environment. The chances of a launch mishap which might introduce debris into EFH is very low and any potential debris would not change the quantity or quality of EFH in the ROI.

4.4.4 Public Health and Safety (CCSFS)

The safety and environmental health analysis contained in the respective sections addresses issues related to the health and well-being of military personnel and civilians living on or in the vicinity of CCSFS. Additionally, this section addresses the environmental health and safety risks to children.

4.4.4.1 CCSFS – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to public health and safety. Therefore, no significant impacts would occur with implementation of the No Action Alternative.

4.4.4.2 CCSFS – Proposed Action

The JFC flight test would include the launch of a two-stage booster AUR vehicle from CCSFS. The JFC AUR is still in development, so it will be compared to similar tests that have launched from CCSFS. Previous launches including Falcon launches out of CCSFS, as well as the tests described in the Atlantic Fleet Testing and Training EIS will be used as a comparison for effects on regional public health and safety, since the testing of vehicles at the same site would have a similar potential health and safety impact. The proposed solid propellants would be similar to past launches, although a smaller quantity. For example, the Falcon 9 Block 5 total weight of liquid propellant was 515,247 kg (1,135,925 lb) and the JFC AUR will contain 6,804 kg (15,000 lb) of solid propellant. Additionally, the Falcon 9 Block 5 was significantly longer and wider and had two stages. The JFC AUR is much shorter, much thinner, and also has two stages.

The JFC mission personnel would follow the same health and safety procedures developed under existing plans at CCSFS. Federal, state, and local regulations as well as CCSFS SOPs would be followed for launch site preparation, booster handling, and all hazardous operations. The modification of the MSS at the launch pad would have no impact on public health and safety on the general public because the modification would occur on DOD property, away from the public. All federal, state, local and CCSFS-specific SOPs would be followed during MSS modification to ensure worker safety. CCSFS Missile Flight Analysis, Ground Safety, Range Safety, Ocean Clearance, Transportation Safety, and Fire and Crash Safety procedures would be followed to ensure the safety of workers and members of the public.

CCSFS would issue NOTAMs and NTMs ahead of any JFC flight test, in accordance with range safety and FAA requirements. Previous NEPA analyses for missile tests at CCSFS have determined that there would be no impact to public health and safety as a result of their Proposed Action (FAA 2020, U.S. Navy 2018b, USAF 2017, USAF 2013, USAF 2007). Due to the significantly smaller size of the JFC AUR in comparison to previous launches including Falcon and Minotaur IV launches out of CCSFS, as well as the tests described in the Atlantic Fleet Testing and Training EIS, implementation of the Proposed Action would result in no impacts to public health and safety in the CCSFS ROI.

In accordance with EO 13045, *Protection of Children from Environmental Health and Safety Risks*, the U.S. Navy has determined that since the JFC flight tests would be conducted on DOD property and out in the open ocean, the JFC flight test has no environmental health and safety risks that may disproportionately affect children.

4.4.5 Hazardous Materials and Wastes (CCSFS)

The hazardous material and waste analysis contained in the respective sections addresses issues related to the use and management of hazardous materials and wastes as well as the presence and management of specific cleanup sites at CCSFS.

4.4.5.1 CCSFS – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change associated with hazardous materials and wastes. Therefore, no significant impacts would occur with implementation of the No Action Alternative.

4.4.5.2 CCSFS – Proposed Action

The JFC flight test would include the launch of a two-stage booster AUR vehicle from CCSFS. The JFC AUR is still in development, so it will be compared to similar tests that have launched from CCSFS. Previous launches including Falcon and Minotaur IV launches out of CCSFS, as well as the tests described in the Atlantic Fleet Testing and Training EIS will be used as a comparison for effects on hazardous materials and wastes, since the testing of vehicles at the same site would produce similar hazardous materials and wastes, and potential environmental impacts. The proposed solid propellants would be similar to past launches, although a much smaller quantity. For example, the Falcon 9 Block 5 total weight of liquid propellant was 515,247 kg (1,135,925 lb) and the JFC AUR will contain 6,804 kg (15,000 lb) of solid propellant. Additionally, the Falcon 9 Block 5 was significantly longer and wider and had two stages. The JFC AUR is much shorter, much thinner, and also has two stages.

Hazardous material usage and waste generation would continue to be managed by CCSFS under appropriate federal, state, local, and DOD requirements. The modification of the MSS at the launch pad would have no impact on management of hazardous materials and wastes at CCSFS. All federal, state, local, and CCSFS-specific SOPs would be followed during MSS modification to ensure worker and environmental safety. Previous NEPA analyses for missile tests at CCSFS have determined that there would be no impact to hazardous materials and wastes as a result of their Proposed Action (FAA 2020, U.S. Navy 2018b, USAF 2017, USAF 2013, USAF 2007). Due to the significantly smaller size of the JFC AUR in comparison to previous launches including Falcon launches out of CCSFS, as well as the tests described in the Atlantic Fleet Testing and Training EIS, implementation of the Proposed Action would not result in impacts to hazardous material and waste management in the CCSFS ROI.

4.4.6 Infrastructure (CCSFS)

The analysis of infrastructure involves consideration of many factors including the locations, the presence or absence of existing facilities and technologies, and the amount of use intended for the Proposed Action.

4.4.6.1 CCSFS – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change associated with infrastructure resources. Therefore, no significant impacts would occur with implementation of the No Action Alternative.

4.4.6.2 CCSFS – Proposed Action

The JFC flight tests would be similar to previous launches including Falcon, and Minotaur IV launches out of CCSFS and tests described in the Atlantic Fleet Testing and Training EIS. The potential impacts on infrastructure would be similar to that described for missile launches in previous environmental documentation (FAA 2020, PAFB 2019, U.S. Navy 2018b, USAF 2017, USAF 2013, USAF 2007).

CCSFS launch pad suitability, data collection and storage capabilities, booster and explosive materials storage capabilities, and security systems were reviewed to be suitable for the JFC Flight Tests. Additionally, as discussed in **Section 3.4.6**, CCSFS power, potable water management, wastewater, and stormwater management resources are numerous and would be capable of absorbing any potential stressors from the JFC Flight Launch.

The JFC flight test may require ground-disturbing activities at CCSFS to modify the MSS at an existing CCSFS launch pad. While unlikely, there could be a need for trenching in previously disturbed areas to install additional power and communication lines. Grounding rods to arrest lightning and static electricity may be required. Any ground-disturbing activities are not expected to remove vegetation or earth as the MSS would modify existing man-made structures. All federal, state, local, and CCSFS-specific SOPs would be followed during MSS modification to ensure worker and environmental safety.

Due to the comparatively smaller size of the JFC AUR to the Falcon, Minotaur, and Centaur Vulcan launches from CCSFS; the numerous launch infrastructure resources available; the facilities infrastructure resources available; and the potential MSS modification to the existing launch pad, there would be no significant impacts to CCSFS infrastructure as a result of the Proposed Action.

4.4.7 Transportation (CCSFS)

The analysis of transportation resources involves consideration of many factors including the locations, the presence or absence of existing motorways, and the amount of use intended for the Proposed Action.

4.4.7.1 CCSFS – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change associated with transportation resources. Therefore, no significant impacts would occur with implementation of the No Action Alternative.

4.4.7.2 CCSFS – Proposed Action

The JFC flight tests would be similar to previous launches including Falcon, and Minotaur IV launches out of CCSFS and tests described in the Atlantic Fleet Testing and Training EIS. The potential impacts on infrastructure would be similar to that described for missile launches in previous environmental documentation (FAA 2020, PAFB 2019, U.S. Navy 2018b, USAF 2017, USAF 2013, USAF 2007).

The proponents would arrange to transport the rocket motors via truck or military aircraft. Once unloaded, they would be placed either in the Trident Magazines or at the MACA Complex building. The transportation network described in **Section 3.4.7** would be capable of absorbing any potential stressors from the JFC Flight Launch. Less than 100 support personnel would be at each JFC Flight Test, and are required to follow all applicable federal, state, DOD and local traffic laws, rules, and regulations.

The JFC flight test may require ground-disturbing activities at CCSFS to modify the MSS at an existing CCSFS launch pad. While unlikely, there could be a need for trenching in previously disturbed areas to install additional power and communication lines. All federal, state, local, and CCSFS-specific SOPs would be followed during MSS modification to ensure worker and environmental safety. The MSS would modify existing man-made structures and would not impact CCSFS transportation network.

Due to the comparatively smaller size of the JFC AUR to the Falcon, Minotaur, and Centaur Vulcan launches from CCSFS; the numerous transportation resources available; the requirement for all JFC Flight Test personnel to obey transportation laws, rules, and regulations; and the potential MSS modification to the existing launch pad, there would be no significant impacts to CCSFS transportation resources as a result of the Proposed Action.

4.5 Pacific Ocean Flight Corridors and Booster Drop/Payload Impact Zones

4.5.1 Air Quality (Pacific Ocean Flight Corridors and Booster Drop/Payload Impact Zones)

Effects on air quality are based on estimated direct and indirect emissions associated with the action alternatives. The ROI for the over-ocean flight corridor is the global upper atmosphere over the Pacific BOA along the flight path from outside the launch area at PMRF to the associated drop zone locations, and/or the launch area at VSFB to the associated drop zone locations. During flight, the emissions within the over-ocean flight corridor from the JFC flight tests have the potential to affect air quality in the global upper atmosphere. Estimated emissions from a proposed federal action are typically compared with the relevant national and state standards to assess the potential for increases in pollutant concentrations.

4.5.1.1 Pacific Ocean – No Action Alternative

Under the No Action Alternative, the JFC flight tests would not occur and there would be no change to baseline air quality. Therefore, no significant impacts to air quality or air resources would occur with implementation of the No Action Alternative.

4.5.1.2 Pacific Ocean – Proposed Action

For both PMRF and VSFB alternatives, the JFC AUR vehicle would launch from the selected launchpad and travel along a predetermined flight corridor over the Pacific BOA before first stage booster, second stage booster, inter-stage, and payload adapter would splashdown in predetermined drop zones. The JFC AUR flight emissions would occur in the over-ocean flight corridor as propellant is burned until exhausted from the rocket motor boosters. The active flight time over the ROI would be measured in minutes.

Exhaust emissions would contain both chlorine compounds and free chlorine, produced primarily as hydrogen chloride at the nozzle. Approximately 1.3 kg (3 lb) of nitrogen gas (**Table 2-1**) are released over a period of minutes. Chlorine and hydrogen chloride would have a tropospheric lifetime long enough to eventually mix with the stratosphere. On a global scale, the quantity of chlorine and hydrogen chloride emissions from the JFC flight tests would represent a negligible fraction of chlorine and hydrogen chloride.

The production of nitrogen oxide species from solid rocket motors is dominated by high-temperature “afterburning” reactions in the exhaust plume. As the temperature of the exhaust decreases with increasing altitude, less nitrogen oxide is formed. Nitrogen oxides are of concern with respect to stratospheric ozone depletion because they contribute to ozone depletion. On a global scale, the quantity of nitrogen oxide emissions from the JFC flight tests would represent a negligible fraction of nitrogen, and diffusion would disperse the nitrogen oxide species so that no effect on ozone levels from nitrogen oxide produced by the JFC flight tests would be expected.

Previous NEPA analyses for missile tests at PMRF and VSFB, respectively, have determined that there would be no impact to air quality in the Pacific Ocean Flight Corridor as a result of their Proposed Actions (U.S. Navy 2017, U.S. Navy 2019a, USASMDC/ARSTRAT 2014, USASMDC/ARSTRAT 2011, USASDC 1992; USAF 2004, USAF 2006a, USASMDC/ARSTRAT 2013). Due to the evidence that the aforementioned NEPA analyses present regarding a lack of environmental effects to air quality in the Pacific BOA, and due to the smaller physical scale of the JFC AUR vehicle than those vehicles previously analyzed, and due to the small quantity of potential flight emissions from the JFC AUR, it can be reasonably determined that this Proposed Action would not impact air quality in the Pacific Ocean Flight Corridor ROI.

4.5.2 Biological Resources (Pacific Ocean Flight Corridors and Booster Drop/Payload Impact Zones)

Potential environmental consequences of the Proposed Action on biological resources are evaluated based on the best available information about species distributions and in the context of the regulatory setting discussed in **Section 3.5.2.1**. The significance of environmental consequences is evaluated based on the criteria detailed in **Section 4.1.2**.

4.5.2.1 Pacific Ocean – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to biological resources from the baseline conditions described in **Section 3.5.2**. Therefore, no significant impacts to biological resources would occur with implementation of the No Action Alternative.

4.5.2.2 Pacific Ocean – Proposed Action

The Proposed Action is evaluated for the potential impacts on marine biological resources in the Pacific over-ocean flight corridors beyond territorial seas (22 km [12 nm] from shore); the stage 1 booster drop zones within the U.S. EEZ near PMRF and VSFB; and the stage 2 booster drop/payload impact zones (primarily in international waters). Potential impacts of the Proposed Action in the ROI include exposure to elevated sound levels, direct contact from launch vehicle components, exposure to hazardous materials, and increased human and vessel activity. This section discusses the environmental consequences of the Proposed Action in proportion to the magnitude of potential impacts and focusing on special-status species and sensitive habitats. The flight corridor would be almost entirely over the drop zones evaluated in this section and the areas that are not would have similar environmental consequences as the closest drop zone to the flight path. The potential effects of the Proposed Action on marine ESA-listed species and designated critical habitat have also been evaluated in detail in the JFC Marine Biological Evaluation (U.S. Army and U.S. Navy 2021).

The Proposed Action may result in elevated noise levels both in-air and underwater due to sonic booms from vehicle overflight and as a result of splashdown of vehicle components. No model estimates are available for sonic boom footprints resulting from JFC flight but similar to other recent flight tests (U.S. Navy 2019a) sonic booms are expected to average 130 dB re 1 micropascal (µPa) for most of the vehicle flight and last no more than 270 milliseconds. Sonic booms generated by the payload near impact may be up to 175 dB re 1 µPa near the impact point and last approximately 75 milliseconds (U.S. Navy 2019a). No model estimates of noise levels are available for splashdown of JFC components; therefore, the peak noise levels have been estimated based on the size characteristics of the vehicle components compared to the component sizes for other test vehicles (U.S. Navy 2019a) for which splashdown noise estimates are available. Using peak sound pressure estimates for the largest FE-2 stage (approximately 1.4 times bigger than JFC stage 1) for the stage 1 booster and the smallest FE-2 stage (approximately the same size as JFC stage 2) for the stage 2 booster, the peak sound pressures are expected to be less than 218 dB re 1 µPa for splashdown of the stage 1 booster and 201 dB re 1 µPa for the stage 2 booster. Similarly, estimated sound levels for impact of the FE-2 payload (U.S. Navy 2019a) are used as a bounding case for the JFC payload. Sound pressures from payload impact are expected to be less than 191 dB in-water (re 1 µPa) at the ocean surface and would last no more than a few seconds. The methodology for estimating the range to potential effects for wildlife are detailed in the FE-2 EA (U.S. Navy 2019a) and are incorporated here by reference.

The potential impact of elevated sound levels on wildlife were based on the standard sound effect thresholds for effects to marine wildlife as detailed by NOAA Fisheries (NOAA 2018b), summarized in environmental analyses for recent tests (U.S. Navy 2019a, USAF and USASMDC 2019), and are incorporated here by reference. In general, a sound level that is sufficient to cause physical injury to auditory receptors is a sound that exceeds an organism's permanent threshold shift (PTS) level. The extent of physical injury depends on the received sound pressure level as well as the anatomy of each species. A temporary threshold shift (TTS) is when an organism is exposed to sound pressures below the threshold of permanent physical injury but loud enough to result in temporary hearing alteration. Sound levels above the TTS threshold have the potential to temporarily impair an animal's ability to communicate, navigate, forage, and detect predators. Another common effect of elevated sound levels is behavioral modification. Most behavioral responses to anthropogenic sounds have been limited to short-term behavioral responses, which include disturbance to feeding, resting, or social interactions (NRC 2005). For marine mammals, behavioral responses may include changes in surfacing, breathing patterns, dive duration, vocalization, and group composition but tend to be highly variable (NRC 2005).

The Proposed Action would result in the spent stage 1 and 2 boosters as well as the payload splashing down in the booster drop zones. These falling components would enter marine habitats and have the potential to directly contact marine organisms. Based on the dimensions of the vehicle components and payload, and the best available information on species density in the booster drop zones (summarized in **Section 3.6.2**) the number of expected marine mammal exposures to direct contact from falling vehicle components was calculated. The estimated number of exposures to direct contact was based on methodology used for other test programs (U.S. Navy 2019a, U.S. Navy 2018, U.S. Navy 2017, U.S. Navy 2015) where the probability of contact is calculated for four impact scenarios and averaged across scenarios. Detailed methodology for estimation of direct contact is available in the FE-2 EA/OEA (U.S. Navy 2019a) and is incorporated by reference.

Marine wildlife have the potential to be exposed to hazardous materials as the vehicle components splash down into the booster drop zones. Any substances of which the spent boosters or payload are constructed or that are contained in the stages and not consumed during flight or jettison (**Table 2-1**, **Table 2-2**) would fall into marine habitats. The propellants would be consumed before splashdown and area affected by the dissolution of chemicals would be relatively small because of the size of the launch vehicle components and the minimal amount of residual materials they contain. Any chemicals introduced to the water column would be quickly diluted and dispersed, and components would sink to the ocean bottom.

The Proposed Action may involve use of sea-based sensors on vessels along the flight path and on self-stationing rafts near the payload impact point. Self-stationing rafts would be deployed from a test support ship, and the ship may be active in the BOA for up to 4 weeks. While these sensors involve vessel traffic in the BOA, operation of the majority of these vessels would be part of existing programs and use of these vessels for the Proposed Action would not meaningfully increase vessel traffic in the BOA. In addition, ship personnel would monitor for marine mammals and sea turtles to avoid potential vessel strikes during travel to and from impact zones and during raft deployment. Vessel operators would adjust vessel speed or delay raft deployment based on expected animal locations, densities, and or lighting and turbidity conditions. Self-stationing rafts would be powered by two small battery-powered trolling motors and would pose very little strike risk for wildlife. No self-stationing raft or other vessel equipment is expected to pose an entanglement risk for wildlife. Vessel traffic as a result of the Proposed Action would have minimal to no impacts on marine biological resources in all BOA areas.

The JFC flight tests are not expected to have a discernable or measurable impact on benthic or planktonic invertebrates because of their abundance, their wide distribution, and the protective influence of the mass of the ocean around them. The potential exists, however, for impacts to larger vertebrates in the open ocean area, particularly those that must come to the surface to breathe (e.g., marine mammals and sea turtles) or that feed at the surface (e.g., seabirds).

4.5.2.3 PMRF Launch Stage 1 Booster Drop Zone

Marine Wildlife

Overall, marine mammals, sea turtles, seabirds, and fish are not expected to be significantly impacted by any JFC activities in the PMRF stage 1 booster drop zone. Any effects, if realized, would likely be limited to short-term startle reactions, and marine wildlife would be expected to return to normal behaviors within minutes.

Elevated sound levels from sonic booms are not expected to adversely impact marine wildlife in the ROI. Maximum sound levels for sonic booms in the ROI (130 dB re 1 μPa) do not exceed the injury (PTS or TTS) or behavioral disturbance thresholds for marine mammals, sea turtles, fish, or seabirds underwater. Sonic booms are unlikely to affect any marine wildlife in the stage 1 booster drop zone and no impact from sonic boom noise would be expected for marine wildlife including ESA-listed species.

Splashdown of the stage 1 booster may create sound pressures above the injury threshold for wildlife but only over small areas (**Table 4-5**). Some common wildlife such as common fish species may be exposed to elevated sound pressures high enough to cause temporary injury or behavioral disturbance. However, elevated sound pressures would not change the population size or distribution of any species and sound impacts would be less than significant. Based on their low densities in the ROI, no special-status species are expected to be injured by elevated sound pressures. While unlikely, based on the low density of special-status species in the ROI and the small number of tests (no more than six per year), any effects of elevated sound levels would be limited to short-duration behavioral responses. Animals would be expected to return to normal behaviors within minutes of the short-duration (no more than a few seconds) sound and no lasting effects are expected. Overall, elevated noise levels would not significantly impact marine wildlife in the ROI.

Direct contact from splashdown of the stage 1 booster is not expected to impact marine mammals, sea turtles, seabirds, or fish in the ROI. Direct contact would not change the population size or distribution of any common wildlife species. The calculated chances of any special-status individual being injured are extremely low (**Table 4-6**) and no animals are expected to be injured. The estimated number of marine mammal exposures to direct contact from falling components for a flight test from PMRF is substantially less than one (maximum of 0.00001 individuals for humpback whales) for all species (**Table 4-6**). Even if the maximum number of six flight tests per year over 10 years is assumed, the number of animal exposures is less than 0.0007 animals for all marine mammal species. Therefore, no direct contact of marine mammals is expected as a result of the Proposed Action. Similarly, the estimated number of sea turtle exposures to direct contact from falling JFC vehicle components in the BOA for a PMRF test is less than 0.00001 per test and 0.00006 individuals summed across all possible tests. As with cetaceans, it is important to note some of the assumptions of this model that may lead to overestimation of effect. The model is based on the best available density data. Since the overlap of density studies with the ROI is limited, maximum density estimates across coverage areas and seasons were used. The model also assumes that the animals are at the surface 100 percent of the time and do not move or exhibit avoidance behaviors.

While density data are not available for special-status fish or seabirds, these species are likely to have very low densities and patchy distributions in the ROI. Given the small direct contact affect area and the low density and patchy distribution of special-status seabirds and fish in the stage 1 booster drop zone, it is very unlikely that special-status fish would be subject to direct contact from JFC vehicle components. Overall, no direct contact of special-status wildlife is expected and wildlife would not be significantly impacted by direct contact from vehicle components in the BOA.

Table 4-5. Distance to Effect Thresholds in Wildlife for Elevated In-Water Sound Levels Resulting from JFC Component Splashdown or Impact.

Functional Hearing Group	Permanent Threshold Shift (PTS)		Temporary Threshold Shift (TTS)			
	Threshold (dB SPL_{peak})	Radial Distance to Threshold from Stage 1 Splashdown meters (feet)	Threshold (dB SPL_{peak})	Radial Distance to Threshold from Splashdown meters (feet)		
				Stage 1	Stage 2	Payload
Low-frequency Cetaceans (*Balaenoptera*, *Eubalaena*, and *Megaptera* whales)	219 dB	-	213 dB	2 (6)	-	-
Mid-frequency Cetaceans (dolphins and *Feresa*, *Globicephala*, *Hyperodon*, *Mesoplodon*, *Orcinus*, *Peponocephala*, *Physeter*, *Pseudorca*, and *Ziphius* whales)	230 dB	-	224 dB	-	-	-
High-frequency Cetaceans (*Kogia* whales and porpoises)	202 dB	6 (21)	196 dB	13 (41)	2 (6)	-
Phocid Pinnipeds (elephant, monk, gray, harbor, harp, and hooded seals)	218 dB	-	212 dB	2 (7)	-	-
Otariid Pinnipeds (fur seals, sea lions)	232 dB	-	226 dB	-	-	-
Sea Turtles	230 dB(1)	-	224 dB	-	-	-
Fish	229 dB(2)	-	186 dB SEL_{cum}(2)	40 (131)	6 (18)	2 (6)

Sources: U.S. Navy 2019a, NMFS 2019, NOAA 2018b, Finneran and Jenkins 2012, Popper et al. 2014

Notes: All sound pressures in this table are in dB SPL_{peak} re 1 μPa unless indicated.

(1) The PTS threshold listed for sea turtles is based on the non-lethal injury threshold in Finneran and Jenkins 2012.

(2) The PTS threshold for fish with swim bladders is based on the mortality/mortal injury threshold in NMFS 2015a and Popper et al. 2014. Thresholds in fish are not specific to auditory injury.

Abbreviations: dB = decibels, SEL = Sound Exposure Level, SPL = Sound Pressure Level

Hazardous material release in the stage 1 booster drop zone is not likely to adversely impact marine mammals, sea turtles, seabirds, or fish. The area affected by the dissolution of chemicals would be relatively small because of the size of the launch vehicle components and the minimal amount of residual materials they contain. Any chemicals introduced to the water column would be quickly diluted and dispersed. Any components or debris would sink to the ocean bottom, where depths in the BOA reach thousands of feet and most special-status marine wildlife and their prey are not likely to occur. Due to the low density and patchy distribution of special-status species in the BOA, the likelihood of an animal coming into contact with hazardous materials from JFC is extremely low and no impacts are expected.

Table 4-6. Maximum Density and Estimated Number of Animal Exposures to Direct Contact from JFC Component Splashdown in the Pacific BOA.

Common Name	Scientific Name	PMRF Launch				VSFB Launch			
		Maximum Density (/km^2)		Estimated Number of Exposures to Direct Contact		Maximum Density (/km^2)		Estimated Number of Exposures to Direct Contact	
		Stage 1 Drop Zone(1)	Stage 2 and Payload Drop Zone(1)	Per Test	6 Tests	Stage 1 Drop Zone(1)	Stage 2 and Payload Drop Zone(1)	Per Test	6 Tests
Cetaceans									
Minke whale	*Balaenoptera acutorostrata*	0.0042	0.0083	3.85E-06	2.31E-05	0.0007	0.0042	1.48E-06	8.90E-06
Sei whale	*Balaenoptera borealis*	0.0002	0.0002	1.97E-07	1.18E-06	0.0001	0.0002	1.19E-07	7.14E-07
Bryde's whale	*Balaenoptera edeni*	0.0001	0.0003	2.04E-07	1.22E-06	<0.0001	0.0001	4.76E-08	2.85E-07
Blue whale	*Balaenoptera musculus*	0.0001	0.0001	8.70E-08	5.22E-07	0.0086	0.0018	8.62E-06	5.17E-05
Omura's whale	*Balaenoptera omurai*	-	<0.0001	1.25E-08	7.49E-08				
Fin whale	*Balaenoptera physalus*	0.0001	0.0001	8.00E-08	4.80E-07	0.0235	0.0036	1.75E-05	1.05E-04
North Pacific right whale	*Eubalaena japonica*	-	<0.0001	4.77E-09	2.86E-08				
Humpback whale	*Megaptera novaeangliae*	0.0211	0.0025	1.14E-05	6.83E-05	0.0090	0.0042	6.42E-06	3.85E-05
Beaked Whale Guild		NA				0.0192	NA	4.20E-06	2.52E-05
Blainville's beaked whale	*Mesoplodon densirostris*	0.0009	0.0009	3.12E-07	1.87E-06	Guild	0.0009	1.40E-07	8.41E-07
Ginkgo-toothed beaked whale	*Mesoplodon ginkgodens*	-	0.0019	3.22E-07	1.93E-06	Guild	-	Guild	Guild
Stejneger's beaked whale	*Mesoplodon stejnegeri*					Guild	-	Guild	Guild
Cuvier's beaked whale	*Ziphius cavirostris*	0.0003	0.0024	6.05E-07	3.63E-06	Guild	0.0003	6.57E-08	3.94E-07
Baird’s beaked whale	*Berardius bairdii*					0.0164	-	6.07E-06	3.64E-05
Longman's beaked whale	*Indopacetus pacificus*	0.0031	0.0031	1.74E-06	1.04E-05	-	0.0031	8.28E-07	4.97E-06
Short-beaked common dolphin	*Delphinus delphis*					4.0997	0.9474	7.91E-04	4.74E-03
Pygmy killer whale	*Feresa attenuata*	0.0044	0.0044	1.25E-06	7.52E-06	0.0007	0.0044	6.57E-07	3.94E-06
Short-finned pilot whale	*Globicephala macrorhynchus*	0.0086	0.0024	2.26E-06	1.36E-05	0.0013	0.0033	8.51E-07	5.11E-06
Risso's dolphin	*Grampus griseus*	0.0047	0.0047	1.56E-06	9.38E-06	0.2217	0.0102	4.26E-05	2.56E-04
Fraser's dolphin	*Lagenodelphis hosei*	0.0210	0.0210	6.07E-06	3.64E-05	-	0.0210	2.62E-06	1.57E-05
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*					0.1006	0.1006	2.83E-05	1.70E-04
Northern right whale dolphin	*Lissodelphis borealis*					0.1395	0.1395	4.06E-05	2.43E-04

Table 4-6. Maximum Density and Estimated Number of Animal Exposures to Direct Contact from JFC Component Splashdown in the Pacific BOA (Continued)

Common Name	Scientific Name	PMRF Launch				VSFB Launch			
		Maximum Density (/km^2)		Estimated Number of Exposures to Direct Contact		Maximum Density (/km^2)		Estimated Number of Exposures to Direct Contact	
		Stage 1 Drop Zone(1)	Stage 2 and Payload Drop Zone(1)	Per Test	6 Tests	Stage 1 Drop Zone(1)	Stage 2 and Payload Drop Zone(1)	Per Test	6 Tests
Cetaceans									
Killer whale	*Orcinus orca*	0.0001	0.0001	3.72E-08	2.23E-07	0.0003	0.0003	1.34E-07	8.04E-07
Melon-headed whale	*Peponocephala electra*	0.0020	0.0033	7.49E-07	4.49E-06	-	0.0020	2.54E-07	1.52E-06
False killer whale	*Pseudorca crassidens*	0.0009	0.0008	3.44E-07	2.06E-06	-	0.0007	1.33E-07	7.99E-07
Pantropical spotted dolphin	*Stenella attenuata*	0.0058	0.0156	2.83E-06	1.70E-05	-	0.0055	6.72E-07	4.03E-06
Striped dolphin	*Stenella coeruleoalba*	0.0036	0.0060	1.31E-06	7.86E-06	0.1382	0.1382	3.94E-05	2.36E-04
Spinner dolphin	*Stenella longirostris*	0.0022	0.0046	8.89E-07	5.33E-06	-	0.0055	6.41E-07	3.84E-06
Rough-toothed dolphin	*Steno bredanensis*	0.0044	0.0013	8.74E-07	5.24E-06	-	0.0008	9.96E-08	5.98E-07
Bottlenose dolphin	*Tursiops truncatus*	0.0028	0.0006	6.13E-07	3.68E-06	0.0683	0.0684	2.27E-05	1.36E-04
Dall's porpoise	*Phocoenoides dalli*					0.2004	0.0558	3.79E-05	2.27E-04
Pygmy sperm whale	*Kogia breviceps*	0.0029	0.0029	8.92E-07	5.35E-06	0.0016	0.0029	6.64E-07	3.98E-06
Dwarf sperm whale	*Kogia sima*	0.0071	0.0071	2.19E-06	1.31E-05	0.0016	0.0071	1.23E-06	7.38E-06
Sperm whale	*Physeter macrocephalus*	0.0016	0.0018	1.44E-06	8.64E-06	0.0113	0.0113	9.51E-06	5.71E-05
Pinnipeds									
Guadalupe fur seal	*Arctocephalus townsendi*					0.0278	0.0278	7.38E-06	4.43E-05
Northern fur seal	*Callorhinus ursinus*					0.02100	0.02100	5.38E-06	3.23E-05
Northern elephant seal	*Mirounga angustirostris*					0.07600	0.07600	2.47E-05	1.48E-04
Hawaiian monk seal	*Neomonachus schauinslandi*	<0.0001	-	4.69E-09	2.81E-08				
California sea lion	*Zalophus californianus*					0.05960	0.05960	1.62E-05	9.70E-05
Sea Turtles									
Turtle Guild		0.0043	0.0043	1.02E-06	6.12E-06	0.00430	0.00430	1.02E-06	6.12E-06

(1) Density estimates from the U.S. Navy's Marine Species Density Databases for the Hawai`i-Southern California (Hanser et al. 2017) and Mariana Islands (U.S. Navy 2018c) Training and Testing Areas.

Based on the analyses in this section and in the JFC Marine Biological Evaluation (U.S. Army and U.S. Navy 2021), the U.S. Navy and U.S. Army have concluded that the Proposed Action with launches from PMRF may affect but is not likely to adversely affect several ESA-listed species in the BOA, including the marine mammals, sea turtles, and fish, listed in **Table 3-5**. The U.S. Navy and U.S. Army have coordinated with cooperating agencies and with NMFS and have consulted with NMFS under Section 7 of the ESA (**Appendix A**). The U.S. Navy and U.S. Army have concluded that the Proposed Action with launches from PMRF would have no discernable effect on ESA-listed seabirds in the BOA and that no consultation with the USFWS is required for JFC activities in the BOA and NMFS concurred with this determination (**Appendix A**).

The Proponents have concluded that the Proposed Action would not result in incidental take of any marine mammal species protected under the MMPA or of birds protected under the MBTA in the BOA.

Environmentally Sensitive Habitats

Essential Fish Habitat. EFH for bottomfish and crustaceans occurs within the deep waters of the stage 1 booster drop zone. The Proposed Action involves up to six tests per year over 10 years; therefore, up to six stage 1 boosters might drop into this area per year. Given the limited size and characteristics of these components and the time between tests, direct contact and hazardous chemicals from the stage 1 boosters would not significantly reduce the quality and/or quantity of EFH. No impacts to EFH are expected as a result of the JFC Action.

Papahānaumokuākea Marine National Monument. The flight path would cross over the Papahānaumokuākea Marine National Monument. However, the stage 1 booster drop zone does not occur in the Marine National Monument and no part of the Proposed Action would impact the monument.

4.5.2.4 VSFB Launch Stage 1 Booster Drop Zone

Marine Wildlife

Overall, marine mammals, sea turtles, seabirds, and fish are not expected to be significantly impacted by any JFC activities in the VSFB stage 1 booster drop zone. Any effects, if realized, would likely be limited to short-term startle reactions, and marine wildlife would be expected to return to normal behaviors within minutes.

Elevated sound levels from sonic booms are not expected to adversely impact marine wildlife in the ROI. Maximum sound levels for sonic booms in the ROI (130 dB re 1 μPa) do not exceed the injury (PTS or TTS) or behavioral disturbance thresholds for marine mammals, sea turtles, fish, or seabirds underwater. Sonic booms are unlikely to affect any marine wildlife in the stage 1 booster drop zone and no impact from sonic boom noise would be expected for marine wildlife including ESA-listed species.

Splashdown of the stage 1 booster may create sound pressures above the injury threshold for wildlife but only over small areas (**Table 4-5**). Some common wildlife such as common fish species may be exposed to elevated sound pressures high enough to cause temporary injury or behavioral disturbance. However, elevated sound pressures would not change the population size or distribution of any species and sound impacts would be less than significant. Based on their low densities in the ROI, no special-status species are expected to be injured by elevated sound pressures. While unlikely, based on the low density of special-status species in the ROI and the small number of tests (no more than six per year), any effects of elevated sound levels would be limited to short-duration behavioral responses. Animals would be expected to return to normal behaviors within minutes of the short-duration (no more than a few seconds) sound and no lasting effects are expected. Overall, elevated noise levels would not significantly impact marine wildlife in the ROI.

Direct contact from splashdown of the stage 1 booster is not expected to impact marine mammals, sea turtles, seabirds, or fish in the ROI. Direct contact would not change the population size or distribution of any common wildlife species. The calculated chances of any special-status individual being injured are extremely low (**Table 4-6**) and no animals are expected to be injured. The estimated number of marine mammal exposures to direct contact from all falling components for a flight test from VSFB is substantially less than one for all species (**Table 4-6**; maximum of 0.0008 individuals for short-beaked common dolphins). Even if the maximum number of six flight tests per year over 10 years is assumed, the number of animal exposures is less than 0.047 animals for all marine mammal species. Therefore, no direct contact of marine mammals is expected as a result of the Proposed Action. Similarly, the estimated number of sea turtle exposures to direct contact from falling JFC vehicle components in the BOA for a VSFB test is less than 0.00001 per test and 0.00006 individuals summed across all possible tests. As discussed in **Section 4.5.2.3**, several conservative assumptions were used in this model that may lead to overestimation of effects.

Density data are not available for special-status fish or seabirds in the ROI but these species are likely to have very low densities and patchy distributions. Given the small direct contact affect area and the low density and patchy distribution of special-status seabirds and fish in the stage 1 booster drop zone, it is very unlikely that special-status fish would be subject to direct contact from JFC vehicle components. Overall, no direct contact of special-status wildlife is expected and wildlife would not be significantly impacted by direct contact from vehicle components in the BOA.

Hazardous material release in the stage 1 booster drop zone is not likely to adversely impact marine mammals, sea turtles, seabirds, or fish. The area affected by the dissolution of chemicals would be relatively small because of the size of the launch vehicle components and the minimal amount of residual materials they contain. Any chemicals introduced to the water column would be quickly diluted and dispersed and components would sink to the ocean bottom, where depths in the BOA reach thousands of feet and most special-status marine wildlife and their prey are not likely to occur. Due to the low density and patchy distribution of special-status species in the BOA, the likelihood of an animal coming into contact with hazardous materials from JFC is extremely low and no impacts are expected.

Based on the analyses in this section and in the JFC Marine Biological Evaluation (U.S. Army and U.S. Navy 2021), the U.S. Navy and U.S. Army have concluded that the Proposed Action with launches from VSFB may affect but is not likely to adversely affect several ESA-listed species in the BOA, including the marine mammals, sea turtles, and fish listed in **Table 3-14**. The U.S. Navy and U.S. Army have coordinated with cooperating agencies and with NMFS and have consulted with NMFS under Section 7 of the ESA (**Appendix A**). The U.S. Navy and U.S. Army have concluded that the Proposed Action with launches from VSFB would have no discernable effect on ESA-listed seabirds in the BOA and that no consultation with the USFWS is required for JFC activities in the BOA and NMFS concurred with this determination (**Appendix A**).

The U.S. Navy and U.S. Army have also concluded that the Proposed Action would not result in incidental take of any marine mammal species protected under the MMPA or bird species protected under the MBTA in the BOA.

Environmentally Sensitive Habitats

<u>Critical Habitat</u>. Critical habitat for leatherback sea turtles occurs in a portion of the VSFB stage 1 booster drop zone. Hazardous materials, debris, and vessel traffic would not change leatherback prey distributions or densities in this critical habitat area in any measurable way. Therefore, the Proposed Action is not likely to affect the primary constituent elements necessary for leatherback conservation in this critical habitat area and there would be no impact.

Critical habitat for two DPSs of humpback whales occurs in the VSFB stage 1 booster drop zone. Hazardous materials, debris, and vessel traffic would not change euphausiid or small pelagic schooling fish distributions or densities in these critical habitat areas in any measurable way. Therefore, the Proposed Action is not likely to affect the essential features necessary for humpback whale conservation in these critical habitat areas and there would be no impact.

<u>Essential Fish Habitat</u>. The stage 1 booster drop zone occurs in the U.S. EEZ, the only portion of the ROI where EFH is designated. The waters of the stage 1 booster drop zone consist of deep ocean waters approximately 600 to 4,200 m (1,970 to 13,780 ft) deep. EFH for coastal pelagic species, groundfish, and highly migratory species occurs within the stage 1 booster drop zone as detailed in **Section 3.5.2.4**. The Proposed Action involves up to six tests per year, for multiple years; therefore, up to six stage 1 boosters will drop into this area per year. Given the limited size and characteristics of these components and the time between tests, direct contact and hazardous chemicals from the stage 1 boosters would not significantly reduce the quality and/or quantity of EFH, including HAPCs. No impacts to EFH are expected as a result of the JFC Action.

4.5.2.5 Pacific BOA Stage 2 Booster Drop/Payload Impact Zones

Marine Wildlife

Overall, marine mammals, sea turtles, seabirds, and fish are not expected to be significantly impacted by any JFC activities in the Pacific stage 2 booster drop/payload impact zones. Any effects, if realized, would likely be limited to short-term startle reactions, and marine wildlife would be expected to return to normal behaviors within minutes.

Elevated sound levels from sonic booms are not expected to adversely impact marine wildlife in the ROI. Maximum sound levels for sonic booms in the ROI (175 dB re 1 μPa) do not exceed the injury thresholds (PTS or TTS) for marine mammals, sea turtles, fish, or seabirds underwater. Some common wildlife may be exposed to sonic boom sound pressures high enough to cause behavioral disturbance, but any change in activity would be temporary and no adverse impacts to animals or populations would be expected. Sonic booms are unlikely to affect special-status marine wildlife given the low density of these species in the deep offshore waters where sonic booms might occur, the short duration of elevated sound pressures, and the attenuation of sounds that occurs at the air-water interface. Noise impacts from sonic booms would be insignificant for biological resources including ESA-listed species.

Splashdown of the stage 2 booster and payload may create sound pressures above the temporary injury threshold (TTS) for wildlife but only over small areas (**Table 4-5**). Sound pressures in the stage 2 booster drop/payload impact zones are not expected to permanently injure (PTS threshold level or above) any wildlife (**Table 4-5**). As with sonic booms, some common wildlife such as common fish species may be exposed to elevated sound pressures high enough to cause temporary injury or behavioral disturbance. However, elevated sound pressures would not change the population size or distribution of any species and sound impacts would be less than significant. Based on their low densities in the ROI, no special-status species are expected to be injured by elevated sound pressures. While unlikely, based on the low density of special-status species in the ROI and the small number of tests (no more than six per year), any effects of elevated sound levels would be limited to short-duration behavioral responses. Animals would be expected to return to normal behaviors within minutes of the short-duration (no more than a few seconds) sound and no lasting effects are expected. Overall, elevated noise levels would not significantly impact marine wildlife in the ROI.

Direct contact from splashdown of the stage 2 booster and payload are not expected to impact marine mammals, sea turtles, seabirds, or fish in the ROI. Direct contact would not change the population size of any common wildlife species. The calculated chances of any special-status individual being injured by falling components are extremely low (**Table 4-6**) and no animals are expected to be injured. The estimated number of marine mammal and sea turtle exposures to direct contact is the same as discussed in **Sections 4.5.2.3** for tests with PMRF launch and **Section 4.5.2.4** for tests with VSFB launch.

While density data are not available for special-status fish or seabirds, these species are likely to have very low densities and patchy distributions in the ROI. Given the small direct contact affect area and the low density and patchy distribution of special-status seabirds and fish in the stage 2 booster drop/payload impact zone, it is very unlikely that special-status fish would be subject to direct contact from JFC vehicle components. Overall, no direct contact of special-status wildlife is expected and wildlife would not be significantly impacted by direct contact from vehicle components in the BOA.

Hazardous material release in the stage 2 booster drop/payload impact zone is not likely to adversely impact marine mammals, sea turtles, seabirds, or fish. The area affected by the dissolution of chemicals would be relatively small because of the size of the test components and the minimal amount of residual materials they contain. Any chemicals introduced to the water column would be quickly diluted and dispersed. Test components would sink to the ocean bottom, where depths in the BOA reach thousands of feet and most special-status marine wildlife and their prey are not likely to occur. Due to the low density and patchy distribution of special-status species in the BOA, the likelihood of an animal coming into contact with hazardous materials from JFC is extremely low and no impacts are expected.

Based on the analyses in this section and in the JFC Marine Biological Evaluation (U.S. Army and U.S. Navy 2021), the U.S. Navy and U.S. Army have concluded that Proposed Action activities may affect but are not likely to adversely affect several ESA-listed species in the BOA, including the marine mammals, sea turtles, and fish listed in **Table 3-14**. The U.S. Navy and U.S. Army have coordinated with cooperating agencies and with NMFS and have consulted with NMFS under Section 7 of the ESA (**Appendix A**). The U.S. Navy and U.S. Army have concluded that the Proposed Action with launches from PMRF or VSFB would have no discernable effect on ESA-listed seabirds in the BOA and that no consultation with the USFWS is required for JFC activities in the BOA and NMFS concurred with this determination (**Appendix A**).

The U.S. Navy and U.S. Army have also concluded that the Proposed Action would not result in incidental take or harassment of any marine mammal species protected under the MMPA or bird species protected under the MBTA in the BOA.

Environmentally Sensitive Habitats

The flight path would cross over the Papahānaumokuākea Marine National Monument and may cross over portions of the Remote Pacific Islands Marine National Monument. However, the stage 2 booster drop/payload impact zone does not occur in the either of these Marine National Monuments and no part of the Proposed Action would impact these monuments.

4.6 Atlantic Ocean Flight Corridors and Booster Drop/Payload Impact Zones

4.6.1 Air Quality (Atlantic Ocean Flight Corridors and Booster Drop/Payload Impact Zones)

Effects on air quality are based on estimated direct and indirect emissions associated with the action alternatives. The ROI for the over-ocean flight corridor is the global upper atmosphere over the Atlantic BOA along the flight path from outside the launch area at WFF to the associated drop zone locations, and/or the launch area at CCSFS to the associated drop zone locations. During flight, the emissions within the over-ocean flight corridor from the JFC flight tests have the potential to affect air quality in the global upper atmosphere. Estimated emissions from a proposed federal action are typically compared with the relevant national and state standards to assess the potential for increases in pollutant concentrations.

4.6.1.1 Atlantic Ocean – No Action Alternative

Under the No Action Alternative, the JFC flight tests would not occur and there would be no change to baseline air quality. Therefore, no significant impacts to air quality or air resources would occur with implementation of the No Action Alternative.

4.6.1.2 Atlantic Ocean – Proposed Action

For both WFF and CCSFS alternatives, the JFC AUR vehicle would launch from the selected launchpad and travel along a predetermined flight corridor over the Atlantic BOA before first stage booster, second stage booster, inter-stage, and payload adapter would splashdown in predetermined drop zones. The JFC AUR flight emissions would occur in the over-ocean flight corridor as propellant is burned until exhausted from the rocket motor boosters. The active flight time over the ROI would be measured in minutes.

Exhaust emissions would contain both chlorine compounds and free chlorine, produced primarily as hydrogen chloride at the nozzle. Approximately 1.3 kg (3 lb) of nitrogen gas (**Table 2-1**) are released over a period of minutes. Chlorine and hydrogen chloride would have a tropospheric lifetime long enough to eventually mix with the stratosphere. On a global scale, the quantity of chlorine and hydrogen chloride emissions from the JFC flight tests would represent a negligible fraction of chlorine and hydrogen chloride.

The production of nitrogen oxide species from solid rocket motors is dominated by high-temperature "afterburning" reactions in the exhaust plume. As the temperature of the exhaust decreases with increasing altitude, less nitrogen oxide is formed. Nitrogen oxides are of concern with respect to stratospheric ozone depletion because they contribute to ozone depletion. On a global scale, the quantity of nitrogen oxide emissions from the JFC flight tests would represent a negligible fraction of nitrogen, and diffusion would disperse the nitrogen oxide species so that no effect on ozone levels from nitrogen oxide produced by the JFC flight tests would be expected.

Previous NEPA analyses for missile tests at WFF and CCSFS, respectively, have determined that there would be no impact to air quality in the Atlantic Ocean Flight Corridor as a result of their Proposed Actions (NASA 2019, U.S. Navy 2017, U.S. Navy 2019a, USASMDC/ARSTRAT 2014, USASMDC/ARSTRAT 2011, USASDC 1992, FAA 2020, U.S. Navy 2018b, USAF 2017, USAF 2013, USAF 2007). Due to the evidence that the aforementioned NEPA analyses present regarding a lack of environmental effects to air quality in the Atlantic BOA, and due to the smaller physical scale of the JFC AUR vehicle than those vehicles previously analyzed, and due to the small quantity of potential flight emissions from the JFC AUR, it can be reasonably determined that this Proposed Action would not impact air quality in the Atlantic Ocean Flight Corridor ROI.

4.6.2 Biological Resources (Atlantic Ocean Flight Corridors and Booster Drop/Payload Impact Zones)

Potential environmental consequences of the Proposed Action on biological resources are evaluated based on the best available information about species distributions and in the context of the regulatory setting discussed in **Section 3.6.2.1**. The significance of environmental consequences is evaluated based on the criteria detailed in **Section 4.1.2**.

4.6.2.1 Atlantic Ocean – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to biological resources from the baseline conditions described in **Section 3.6.2**. Therefore, no significant impacts to biological resources would occur with implementation of the No Action Alternative.

4.6.2.2 Atlantic Ocean – Proposed Action

The Proposed Action is evaluated for the potential impacts on marine biological resources in the Atlantic over-ocean flight corridors beyond territorial seas (22 km [12 nm] from shore); the stage 1 booster drop zones within the U.S. EEZ near WFF and CCSFS; and the stage 2 booster drop/payload impact zones (primarily in international waters). Potential impacts of the Proposed Action in the ROI include exposure to elevated sound levels, direct contact from launch vehicle components, exposure to hazardous materials, and increased human and vessel activity as described in **Section 4.5.2**. This section discusses the environmental consequences of the Proposed Action in proportion to the magnitude of potential impacts and focusing on special-status species and sensitive habitats. The flight corridor would be almost entirely over the drop zones evaluated in this section and the areas that are not would have similar environmental consequences as the closest drop zone to the flight path. The potential effects of the Proposed Action on marine ESA-listed species and designated critical habitat have also been evaluated in detail in the JFC Marine Biological Evaluation (U.S. Army and U.S. Navy 2021).

The JFC flight tests are not expected to have a discernable or measurable impact on benthic or planktonic invertebrates because of their abundance, their wide distribution, and the protective influence of the mass of the ocean around them. The potential exists, however, for impacts to larger vertebrates in the open ocean area, particularly those that must come to the surface to breathe (e.g., marine mammals and sea turtles) or that feed at the surface (e.g., seabirds).

4.6.2.3 WFF Launch Stage 1 Booster Drop Zone

Marine Wildlife

Overall, marine mammals, sea turtles, seabirds, and fish are not expected to be significantly impacted by any JFC activities in the WFF stage 1 booster drop zone. Any effects, if realized, would likely be limited to short-term startle reactions, and marine wildlife would be expected to return to normal behaviors within minutes.

Elevated sound levels from sonic booms are not expected to adversely impact marine wildlife in the ROI. Maximum sound levels for sonic booms in the ROI (130 dB re 1 μPa) do not exceed the injury (PTS or TTS) or behavioral disturbance thresholds for marine mammals, sea turtles, fish, or seabirds underwater. Sonic booms are unlikely to affect any marine wildlife in the stage 1 booster drop zone and no impact from sonic boom noise would be expected for marine wildlife including ESA-listed species.

Splashdown of the stage 1 booster may create sound pressures above the injury threshold for wildlife but only over small areas (**Table 4-5**). Some common wildlife such as common fish species may be exposed to elevated sound pressures high enough to cause temporary injury or behavioral disturbance. However, elevated sound pressures would not change the population size or distribution of any species and sound impacts would be less than significant. Based on their low densities in the ROI, no special-status species are expected to be injured by elevated sound pressures. While unlikely, based on the low density of special-status species in the ROI and the small number of tests (no more than six per year), any effects of elevated sound levels would be limited to short-duration behavioral responses. Animals would be expected to return to normal behaviors within minutes of the short-duration (no more than a few seconds) sound and no lasting effects are expected. Overall, elevated noise levels would not significantly impact marine wildlife in the ROI.

Direct contact from splashdown of the stage 1 booster is not expected to impact marine mammals, sea turtles, seabirds, or fish in the ROI. Direct contact would not change the population size of any common wildlife species and the calculated chances of any special-status individual being injured are extremely low (see **Table 4-7**) and no animals are expected to be injured. The estimated number of marine mammal exposures to direct contact from all falling components for a flight test from WFF is substantially less than one for all species (maximum of 0.0001 individuals for short-beaked common dolphins) (see **Table 4-7**). Even if the maximum number of six flight tests per year over 10 years is assumed, the number of animal exposures is less than 0.007 animals for all marine mammal species. Therefore, no direct contact of marine mammals is expected as a result of the Proposed Action. Similarly, the estimated number of sea turtle exposures to direct contact from falling JFC vehicle components in the BOA for a WFF test is less than 0.0001 individuals per test for all species combined. Summed across all possible tests (six per year over 10 years) the number of sea turtle exposures is still substantially less than one (0.006 individuals) for all species combined. Model assumptions that may lead to overestimation of potential effects are discussed in **Section 4.5.2.3**.

Density data are not available for special-status fish or seabirds in the ROI, but these species are likely to have very low densities and patchy distributions. Given the small direct contact affect area and the low density and patchy distribution of special-status seabirds and fish in the stage 1 booster drop zone, it is very unlikely that special-status fish would be subject to direct contact from JFC vehicle components. Overall, no direct contact of special-status wildlife is expected and wildlife would not be significantly impacted by direct contact from vehicle components in the BOA.

Hazardous material release in the stage 1 booster drop zone is not likely to adversely impact marine mammals, sea turtles, seabirds, or fish. The area affected by the dissolution of chemicals would be relatively small because of the size of the launch vehicle components and the minimal amount of residual materials they contain. Any chemicals introduced to the water column would be quickly diluted and dispersed and components would sink to the ocean bottom. Most wildlife, including special-status wildlife are not likely to come into contact with components on the ocean floor because most species and their prey are not likely to occur at these depths. Due to the low density and patchy distribution of special-status species in the BOA, the likelihood of an animal coming into contact with hazardous materials from JFC is extremely low.

Based on the analyses in this section and in the JFC Marine Biological Evaluation (U.S. Army and U.S. Navy 2021), the U.S. Navy and U.S. Army have concluded that the Proposed Action with launches from WFF may affect but is not likely to adversely affect several ESA-listed species in the BOA, including the marine mammals, sea turtles, and fish listed in **Table 3-16**. The U.S. Navy and U.S. Army have coordinated with cooperating agencies and with NMFS and have consulted with NMFS under Section 7 of the ESA (**Appendix A**). NMFS concurred with the U.S. Navy and U.S. Army determination that the Proposed Action may affect but is not likely to adversely affect marine ESA-listed species (**Appendix A**). The U.S. Navy and U.S. Army have concluded that the Proposed Action with launches from WFF would have no discernable effect on ESA-listed seabirds in the BOA and that no consultation with the USFWS is required for JFC activities in the BOA. The Proponents have also concluded that the Proposed Action would not result in incidental take of any marine mammal species protected under the MMPA or of birds protected under the MBTA in the BOA.

Table 4-7. Maximum Density and Estimated Number of Animal Exposures to Direct Contact from JFC Component Splashdown in the Atlantic BOA.

Common Name	Scientific Name	WFF Launch				CCSFS Launch			
		Maximum Density (/km²)		Estimated Number of Exposures to Direct Contact		Maximum Density (/km²)		Estimated Number of Exposures to Direct Contact	
		Stage 1 Drop Zone(1)	Stage 2 and Payload Drop Zone(1)	Per Test	6 Tests	Stage 1 Drop Zone(1)	Stage 2 and Payload Drop Zone(1)	Per Test	6 Tests
Cetaceans									
Minke whale	*Balaenoptera acutorostrata*	0.0012	0.0005	5.49E-07	3.30E-06	0.0022	0.0005	8.56E-07	5.14E-06
Sei whale	*Balaenoptera borealis*	0.0002	0.0002	2.13E-07	1.28E-06	0.0001	0.0003	2.49E-07	1.49E-06
Bryde's whale	*Balaenoptera edeni*	<0.0001	0.0001	5.79E-08	3.47E-07	0.0001	0.0001	7.43E-08	4.46E-07
Blue whale	*Balaenoptera musculus*	<0.0001	<0.0001	1.91E-08	1.15E-07	<0.0001	<0.0001	1.91E-08	1.15E-07
Fin Whale	*Balaenoptera physalus*	0.0127	0.0002	8.24E-06	4.95E-05	0.0001	0.0007	5.86E-07	3.51E-06
North Atlantic right whale	*Eubalaena glacialis*	0.0002	<0.0001	8.11E-08	4.86E-07	0.0001	<0.0001	5.03E-08	3.02E-07
Humpback whale	*Megaptera novaeangliae*	0.0020	0.0006	1.27E-06	7.61E-06	0.0001	0.0005	3.08E-07	1.85E-06
Northern bottlenose whale	*Hyperoodon ampullatus*	0.0002	<0.0001	6.05E-08	3.63E-07		<0.0001	7.38E-09	4.43E-08
Beaked Whale Guild	Includes *Mesoplodon bidens*, *M. densirostris*, *M. europaeus*, *M. mirus*, and *Ziphius cavirostris*	0.0225	0.0060	6.00E-06	3.60E-05	0.0012	0.0106	2.18E-06	1.31E-05
Short-beaked common dolphin	*Delphinus delphis*	0.6434	0.0003	1.06E-04	6.33E-04	0.0091	0.0084	2.54E-06	1.53E-05
Pygmy killer whale	*Feresa attenuata*	0.0007	0.0019	3.57E-07	2.14E-06	0.0022	0.0016	5.51E-07	3.31E-06
Pilot whales	*Globicephala macrorhynchus* and *G. melas*	0.0385	0.0498	1.74E-05	1.04E-04	0.0079	0.0425	9.42E-06	5.65E-05
Risso's dolphin	*Grampus griseus*	0.0324	0.0010	6.14E-06	3.68E-05	0.0081	0.0026	1.89E-06	1.13E-05
Fraser's dolphin	*Lagenodelphis hosei*	0.0001	0.0032	4.12E-07	2.47E-06	0.0011	0.0025	4.88E-07	2.93E-06
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	0.0435	0.0049	7.70E-06	4.62E-05	0.0001	0.0154	1.92E-06	1.15E-05
White-beaked dolphin	*Lagenorhynchus albirostris*	<0.0001		3.57E-09	2.14E-08	<0.0001	<0.0001	1.35E-09	8.08E-09
Killer whale	*Orcinus orca*	<0.0001	<0.0001	9.11E-09	5.47E-08	<0.0001	<0.0001	9.62E-09	5.77E-08
Melon-headed whale	*Peponocephala electra*	0.0038	0.0112	2.04E-06	1.22E-05	0.0130	0.0092	3.32E-06	1.99E-05
False killer whale	*Pseudorca crassidens*	0.0007	0.0026	6.42E-07	3.85E-06	0.0028	0.0021	1.01E-06	6.06E-06
Pantropical spotted dolphin	*Stenella attenuata*	0.0361	0.0303	9.51E-06	5.70E-05	0.0693	0.0379	1.58E-05	9.48E-05

Table 4-7. Maximum Density and Estimated Number of Animal Exposures to Direct Contact from JFC Component Splashdown in the Atlantic BOA (Continued)

Common Name	Scientific Name	WFF Launch				CCSFS Launch			
		Maximum Density (/km²)		Estimated Number of Exposures to Direct Contact		Maximum Density (/km²)		Estimated Number of Exposures to Direct Contact	
		Stage 1 Drop Zone(1)	Stage 2 and Payload Drop Zone(1)	Per Test	6 Tests	Stage 1 Drop Zone(1)	Stage 2 and Payload Drop Zone(1)	Per Test	6 Tests
Cetaceans (Cont.)									
Clymene dolphin	*Stenella clymene*	0.0134	0.0250	4.79E-06	2.88E-05	0.0222	0.0236	5.97E-06	3.58E-05
Striped dolphin	*Stenella coeruleoalba*	0.2243	0.0136	3.80E-05	2.28E-04	0.0007	0.0320	4.05E-06	2.43E-05
Atlantic spotted dolphin	*Stenella frontalis*	0.0980	0.0270	1.86E-05	1.12E-04	0.0139	0.0293	5.64E-06	3.38E-05
Spinner dolphin	*Stenella longirostris*	0.0069	0.0218	3.63E-06	2.18E-05	0.0259	0.0178	6.13E-06	3.68E-05
Rough toothed dolphin	*Steno bredanensis*	0.0014	0.0056	9.27E-07	5.56E-06	0.0069	0.0045	1.69E-06	1.02E-05
Bottlenose dolphin	*Tursiops truncatus*	0.0909	0.0175	1.94E-05	1.17E-04	0.0724	0.0153	1.57E-05	9.41E-05
Harbor porpoise	*Phocoena phocoena*	0.0446	<0.0001	6.47E-06	3.88E-05	-	0.0049	5.19E-07	3.12E-06
Pygmy and dwarf sperm whales	*Kogia breviceps and K. sima*	0.0008	0.0009	2.65E-07	1.59E-06	0.0061	0.0008	1.16E-06	6.94E-06
Sperm whale	*Physeter macrocephalus*	0.0129	0.0042	7.24E-06	4.34E-05	0.0006	0.0063	2.91E-06	1.74E-05
Pinnipeds									
Seals (Gray and Harbor)	*Halichoerus grypus* and *Phoca vitulina*	<0.0001	-	3.05E-10	1.83E-09	-	0.0006	7.22E-08	4.33E-07
Harp seal	*Pagophilus groenlandicus*					-	0.0172	1.88E-06	1.13E-05
Hooded seal	*Cystophora cristata*					-	0.0027	3.45E-07	2.07E-06
Sea Turtles									
Hard shell turtles	*Chelonia mydas* and *Eretmochelys imbricata*	0.1533	0.0598	2.54E-05	1.52E-04	0.2687	0.0657	4.07E-05	2.44E-04
Loggerhead turtle	*Caretta caretta*	0.2994	0.0900	4.63E-05	2.78E-04	0.3430	0.1028	5.30E-05	3.18E-04
Leatherback turtle	*Dermochelys coriacea*	0.0117	0.1355	1.87E-05	1.12E-04	0.0440	0.1732	2.82E-05	1.69E-04
Kemp's ridleys turtle	*Lepidochelys kempii*	0.0767	0.0027	8.75E-06	5.25E-05	0.0022	0.0009	3.11E-07	1.86E-06

(1) Density estimates from the U.S. Navy's Marine Species Density Databases for the Atlantic Fleet Training and Testing Study Area (U.S. Navy 2017).

Environmentally Sensitive Habitats

Critical Habitat. No impacts are anticipated to the designated critical habitat for loggerhead sea turtles. Proposed Action activities would not significantly impact or alter the primary constituent elements necessary for loggerhead conservation.

Biologically Important Areas. No adverse impacts are anticipated for the Frank R. Lautenberg Deep Sea Coral Protection Area. The Proposed Action involves up to six tests per year, for multiple years; therefore, up to six stage 1 boosters may drop into this area per year. Given the limited size and characteristics of these components and the relatively small number of tests (up to six per year), direct contact and hazardous chemicals from the stage 1 boosters would not substantially alter the characteristics of this Coral Protection Area or its ability to support sensitive biological resources.

Essential Fish Habitat. The stage 1 booster drop zone occurs in the U.S. EEZ, with water depths ranging from 30 m to 2,600 m (100 ft to 8,500 ft). EFH for numerous species occurs within the stage 1 booster drop zone as detailed in **Section 3.6.2.3**. The Proposed Action involves up to six tests per year, for multiple years; therefore, up to six stage 1 boosters will drop into this area per year. Given the limited size and characteristics of these components and the time between tests, direct contact and hazardous chemicals from the stage 1 boosters would not significantly reduce the quality and/or quantity of EFH, including HAPCs. No impacts to EFH are expected as a result of the JFC Action.

4.6.2.4 CCSFS Launch Stage 1 Booster Drop Zone

Marine Wildlife

Overall, marine mammals, sea turtles, seabirds, and fish are not expected to be significantly impacted by any JFC activities in the CCSFS stage 1 booster drop zone. Any effects, if realized, would likely be limited to short-term startle reactions, and marine wildlife would be expected to return to normal behaviors within minutes.

Elevated sound levels from sonic booms are not expected to adversely impact marine wildlife in the ROI. Maximum sound levels for sonic booms in the ROI (130 dB re 1 μPa) do not exceed the injury (PTS or TTS) or behavioral disturbance thresholds for marine mammals, sea turtles, fish, or seabirds underwater. Sonic booms are unlikely to affect any marine wildlife in the stage 1 booster drop zone and no impact from sonic boom noise would be expected for marine wildlife including ESA-listed species.

Splashdown of the stage 1 booster may create sound pressures above the injury threshold for wildlife but only over small areas (**Table 4-5**). Some common wildlife such as common fish species may be exposed to elevated sound pressures high enough to cause temporary injury or behavioral disturbance. However, elevated sound pressures would not change the population size or distribution of any species and sound impacts would be less than significant. Based on their low densities in the ROI, no special-status species are expected to be injured by elevated sound pressures. While unlikely, based on the low density of special-status species in the ROI and the small number of tests (no more than six per year), any effects of elevated sound levels would be limited to short-duration behavioral responses. Animals would be expected to return to normal behaviors within minutes of the short-duration (no more than a few seconds) sound and no lasting effects are expected. Overall, elevated noise levels would not significantly impact marine wildlife in the ROI.

Direct contact from splashdown of the stage 1 booster is not expected to impact marine mammals, sea turtles, seabirds, or fish in the ROI. Direct contact would not change the population size or distribution of any common wildlife species. The calculated chances of any special-status individual being injured are extremely low (**Table 4-7**) and no animals are expected to be injured. The estimated number of marine mammal exposures to direct contact from all falling components for a flight test from CCSFS is substantially less than one for all species (maximum of 0.00002 individuals for bottlenose dolphin) (**Table 4-7**). Even if the maximum number of six flight tests per year over 10 years is assumed, the number of animal exposures is less than 0.0009 animals for all marine mammal species. Therefore, no direct contact of marine mammals is expected as a result of the Proposed Action. Similarly, the estimated number of sea turtle exposures to direct contact from falling JFC vehicle components in the BOA for a CCSFS test is less than 0.0001 individuals per test for all species combined. Summed across all possible tests (six per year over 10 years), the estimated number of sea turtle exposures is still less than one (0.008 individuals). The assumptions of the model are discussed in **Section 4.5.2.3**.

While density data are not available for special-status fish or seabirds, these species are likely to have very low densities and patchy distributions in the ROI. Given the small direct contact affect area and the low density and patchy distribution of special-status seabirds and fish in the stage 1 booster drop zone, it is very unlikely that special-status fish would be subject to direct contact from JFC vehicle components. Overall, no direct contact of special-status wildlife is expected and wildlife would not be significantly impacted by direct contact from vehicle components in the BOA.

Hazardous material release in the stage 1 booster drop zone is not likely to adversely impact marine mammals, sea turtles, seabirds, or fish. The area affected by the dissolution of chemicals would be relatively small because of the size of the launch vehicle components and the minimal amount of residual materials they contain. Any chemicals introduced to the water column would be quickly diluted and dispersed. Test components would sink to the ocean bottom, where depths in the BOA reach thousands of feet and most special-status marine wildlife and their prey are not likely to occur. Due to the low density and patchy distribution of special-status species in the BOA, the likelihood of an animal coming into contact with hazardous materials from JFC is extremely low.

Based on the analyses in this section and in the JFC Marine Biological Evaluation (U.S. Army and U.S. Navy 2021), the U.S. Navy and U.S. Army have concluded that the Proposed Action with launches from CCSFS may affect but is not likely to adversely affect several ESA-listed species in the BOA, including the marine mammals, sea turtles, and fish listed in **Table 3-16**. The U.S. Navy and U.S. Army have coordinated with cooperating agencies and with NMFS and have consulted with NMFS under Section 7 of the ESA (**Appendix A**). NMFS concurred with the U.S. Navy and U.S. Army determination that the Proposed Action may affect but is not likely to adversely affect marine ESA-listed species (**Appendix A**). The U.S. Navy and U.S. Army have concluded that the Proposed Action with launches from CCSFS would have no discernable effect on ESA-listed seabirds in the BOA and that no consultation with the USFWS is required for JFC activities in the BOA.

The Proponents have concluded that the Proposed Action would not result in incidental take of any marine mammal species protected under the MMPA or of birds protected under the MBTA in the BOA.

Environmentally Sensitive Habitats

<u>*Critical Habitat*</u>*.* The pelagic *Sargassum* designated critical habitat for the loggerhead turtle overlaps the stage 1 motor drop zone. This critical habitat area allows *Sargassum* growth in concentrations that support adequate prey abundance and cover for young loggerhead turtles (79 FR 39856 [July 10, 2014]). The JFC Action has the potential to affect loggerhead critical habitat through direct contact or introduction of hazardous chemicals from stage 1 splashdown. Given the small area of critical habitat within the drop zone, the small area which would be subject to direct contact from stage 1 (28 square meters or 81 square feet), and the low chances of the booster falling into the critical habitat area, it is not likely that splashdown of the stage 1 motor would alter critical habitat for loggerhead turtles.

<u>*Biologically Important Areas*</u>*.* North Atlantic right whale calving BIA overlaps slightly with the stage 1 booster drop zone. Given the limited size and characteristics of JFC components and the time between tests, direct contact and hazardous chemicals from the stage 1 boosters would not reduce the suitability of this BIA for supporting North Atlantic right whale calving. No impacts to BIAs are expected as a result of the JFC Action.

<u>*Essential Fish Habitat*</u>*.* Water depths in the stage 1 booster drop zone range from 70 to 900 m (230 to 2,950 ft). EFH for numerous species and HAPC for offshore hard bottom and Oculina occurs within the stage 1 booster drop zone as detailed in **Section 3.6.2.4**. The Proposed Action involves up to six tests per year, for multiple years; therefore, up to six stage 1 boosters might drop into this area per year. Given the limited size and characteristics of these components and the time between tests, direct contact and hazardous chemicals from the stage 1 boosters would not significantly reduce the quality and/or quantity of EFH and HAPCs. No impacts to EFH and HAPCs are expected as a result of the JFC Action.

4.6.2.5 Atlantic BOA Stage 2 Booster Drop/Payload Impact Zones

Marine Wildlife

Overall, marine mammals, sea turtles, seabirds, and fish are not expected to be significantly impacted by any JFC activities in the Atlantic stage 2 booster drop/payload impact zones. Any effects, if realized, would likely be limited to short-term startle reactions, and marine wildlife would be expected to return to normal behaviors within minutes.

Elevated sound levels from sonic booms are not expected to adversely impact marine wildlife in the ROI. Maximum sound levels for sonic booms in the ROI (175 dB re 1 μPa) do not exceed the injury thresholds (PTS or TTS) for marine mammals, sea turtles, fish, or seabirds underwater. Some common wildlife may be exposed to sonic boom sound pressures high enough to cause behavioral disturbance but any change in activity would be temporary and no adverse impacts to animals or populations would be expected. Sonic booms are unlikely to affect special-status marine wildlife given the low density of these species in the deep offshore waters where sonic booms might occur, the short duration of elevated sound pressures, and the attenuation of sounds that occurs at the air-water interface. Noise impacts from sonic booms would be insignificant for biological resources including ESA-listed species.

Splashdown of the stage 2 booster and payload may create sound pressures above the injury threshold for wildlife but only over small areas (**Table 4-5**). As with sonic booms, some common wildlife such as common fish species may be exposed to elevated sound pressures high enough to cause temporary injury or behavioral disturbance. However, elevated sound pressures would not change the population size or distribution of any species and sound impacts would be less than significant. Based on their low densities in the ROI, no special-status species are expected to be injured by elevated sound pressures. While unlikely, based on the low density of special-status species in the ROI and the small number of tests (no more than six per year), any effects of elevated sound levels would be limited to short-duration behavioral responses. Animals would be expected to return to normal behaviors within minutes of the short-duration (no more than a few seconds) sound and no lasting effects are expected. Overall, elevated noise levels would not significantly impact marine wildlife in the ROI.

Direct contact from splashdown of the stage 2 booster and payload are not expected to impact marine mammals, sea turtles, seabirds, or fish in the ROI. Direct contact would not change the population size of any common wildlife species. The estimated chances of any special-status individual being injured by falling test components are extremely low (**Table 4-7**) and no animals are expected to be injured. The estimated number of marine mammal and sea turtle exposures to direct contact is the same as discussed in **Sections 4.6.2.3** for tests with WFF launch and **Section 4.6.2.4** for tests with CCSFS launch.

While density data are not available for special-status fish or seabirds, these species are likely to have very low densities and patchy distributions in the ROI. Given the small direct contact affect area and the low density and patchy distribution of special-status seabirds and fish in the stage 2 booster drop/payload impact zone, it is very unlikely that special-status fish would be subject to direct contact from JFC vehicle components. Overall, no direct contact of special-status wildlife is expected and wildlife would not be significantly impacted by direct contact from vehicle components in the BOA.

Hazardous material release in the stage 2 booster drop/payload impact zone is not likely to adversely impact marine wildlife. The area affected by the dissolution of chemicals would be relatively small because of the size of the launch vehicle and payload components and the minimal amount of residual materials they contain. Any chemicals introduced to the water column would be quickly diluted and dispersed and components would sink to the ocean bottom, where depths in the BOA reach thousands of feet and ESA-listed marine wildlife are not likely to occur. Due to the low density and patchy distribution of special-status marine wildlife in the BOA, the likelihood of an animal coming into contact with hazardous materials from JFC is extremely low and no impacts are expected.

Based on the analyses in this section and in the JFC Marine Biological Evaluation (U.S. Army and U.S. Navy 2021), the U.S. Navy and U.S. Army have concluded that Proposed Action activities may affect but is not likely to adversely affect several ESA-listed species in the BOA, including the marine mammals, sea turtles, fish, and seabirds listed in **Table 3-7**. The U.S. Navy and U.S. Army have coordinated with cooperating agencies and with NMFS and have consulted with NMFS under Section 7 of the ESA (**Appendix A**). NMFS concurred with the U.S. Navy and U.S. Army determination that the Proposed Action may affect but is not likely to adversely affect marine ESA-listed species (**Appendix A**). The U.S. Navy and U.S. Army have concluded that the Proposed Action with launches from WFF or CCSFS would have no discernable effect on ESA-listed seabirds in the BOA and that no consultation with the USFWS is required for JFC activities in the BOA. The U.S. Navy and U.S. Army have also concluded that the Proposed Action would not result in incidental take or harassment of any marine mammal species protected under the MMPA or bird species protected under the MBTA in the BOA.

Environmentally Sensitive Habitats

The flight path may cross over the Northeast Canyons and Seamounts Marine National Monument. However, the stage 2 booster drop/payload impact zone does not occur in this Marine National Monument and no part of the Proposed Action would impact this monument.

4.7 Summary of Potential Impacts to Resources and Impact Avoidance and Minimization

A summary of the potential impacts associated with each of the action alternatives and the No Action Alternative and impact avoidance are presented in **Table 4-8**. Minimization measures for each alternative are presented in **Table 4-9** through **Table 4-14**.

Table 4-8. Potential Impacts Associated with the No Action Alternative and the Alternative Locations

Location	Resource Area	No Action Alternative	JFC Flight Test Alternatives
PMRF	Cultural Resources	There would be no change to cultural resources, and therefore, no significant impacts to cultural resources from implementation of the No Action Alternative.	Federal cultural resource preservation statutes mandate that if prehistoric or historic artifacts are unexpectedly discovered during construction or excavation, such materials would be identified and evaluated by a professional archaeologist. Should human remains or cultural artifacts be encountered, federal statutes specify that work would cease immediately and the proper authorities would be notified. If during the performance of an undertaking, historic properties, including submerged archaeological sites and traditional cultural properties, are discovered or unanticipated effects are found, or a previously unidentified property which may be eligible for listing on the National Register of Historic Places is discovered, Commander, Navy Region Hawaii would take all reasonable measures to avoid harm to the property until it concludes consultation with the SHPO and any Native Hawaiian organization, including Oahu Council of Hawaiian Civic Clubs, which has made known to Commander, Navy Region Hawaii that it attaches religious and cultural significance to the historic property (U.S. Navy 2018a). The Proposed Action would not require construction at KTF Pad 42 or PMRF THAAD Launch Site. There are no properties eligible for listing on the National Register of Historic Places at either launch site. No impacts on cultural resources would be expected as a result of this Proposed Action. Therefore, no Section 106 consultation with the Hawai`i SHPD is required for the Proposed Action.
	Biological Resources	There would be no change to biological resources, and therefore, no significant impacts to biological resources from implementation of the No Action Alternative.	The potential impacts of the Proposed Action on terrestrial biological resources are expected to be minimal. No ground clearing or construction is expected and no long-term adverse impacts on vegetation are expected. Noise from launches may startle nearby wildlife but impacts would be minimal and short-term. The launch site at KTF is in an area that has routine human activity, equipment operation, and launch activity. Emissions from vehicle launches would have little effect on wildlife due to the low levels and short duration of emissions. Because aluminum oxide and hydrogen chloride do not bioaccumulate, no indirect effects on the food chain are anticipated from these exhaust emissions.

Table 4-8. Potential Impacts Associated with the No Action Alternative and the Alternative Locations (Continued)

Location	Resource Area	No Action Alternative	JFC Flight Test Alternatives
PMRF (Cont.)	Biological Resources (Continued)		Impacts to ESA-listed species would be minimal and short-term and are not expected to be different than those of ongoing operations at SNL/KTF or PMRF. With the exception of vehicle launch, the potential effects of JFC activities on terrestrial ESA-listed species are covered under Section 7 consultations and the existing Biological Opinion for base-wide operations at PMRF. Vehicle launch may affect but is not likely to adversely affect some terrestrial ESA-listed species at PMRF including Hawaiian hoary bats and nēnē, The DOE has consulted with the USFWS on the potential effects of ongoing launch activities (including launch noise, heat, and emissions) at KTF on terrestrial ESA-listed species. If the THAAD launch site were selected for JFC launches, additional coordination and/or consultation may be required prior to launch. Marine wildlife are not expected to be impacted by JFC activities at PMRF or in nearshore waters. Vehicle launch and overflight would result in elevated noise levels in marine areas, but no marine wildlife would be exposed to artificial lighting or increased levels of human activity and equipment operation. At most, elevated noise levels might cause temporary behavioral disturbance. No impacts on marine wildlife due to direct contact from debris are expected during normal flight operations.
	Public Health and Safety	There would be no significant change to public health and safety. No significant impacts to public health and safety would result from the No Action Alternative.	Launch of the JFC AUR from the same site as previous STARS booster launches (FE-2, etc.) would have a similar potential health and safety impacts as those described in previous NEPA analyses. The proposed solid propellants would be similar to past launches, but lesser in quantity, and would follow the same health and safety procedures developed under existing plans. In accordance with EO 13045, Protection of Children from Environmental Health and Safety Risks, the U.S. Navy has determined that since the JFC flight tests would be conducted on DOD property and out in the open ocean, the JFC flight test has no environmental health and safety risks that may disproportionately affect children. The Proposed Action would not impact public health and safety at PMRF.
	Hazardous Materials and Wastes	There would be no change to hazardous materials and wastes, and, therefore, no significant impacts from hazardous materials and wastes that would result from implementation of the No Action Alternative.	The JFC flight test launch would use similar hazardous materials and produce similar hazardous waste as previous STARS launches (FE-2, etc.). Hazardous material usage and waste generation would continue to be managed by PMRF or KTF under appropriate local, state, and federal requirements. The JFC flight tests would not exceed hazardous material and waste limits that PMRF or KTF is capable of handling or add to environmental risks. The Proposed Action would not impact hazardous materials and wastes at PMRF or KTF.

Table 4-8. Potential Impacts Associated with the No Action Alternative and the Alternative Locations (Continued)

Location	Resource Area	No Action Alternative	JFC Flight Test Alternatives
WFF	Cultural Resources	There would be no change to cultural resources, and therefore, no significant impacts to cultural resources from implementation of the No Action Alternative.	The JFC flight test may require modifications to an existing MSS at Launch Pad 0-B. While unlikely, there could be a need for minor trenching in previously disturbed areas to install additional power and communication lines. Grounding rods to arrest lightning and static electricity may be required. Any ground-disturbing activities are not expected to remove vegetation or earth as the modifications to the MSS would be on existing structure. All federal, state, local, and WFF-specific SOPs would be followed during MSS modification to ensure worker and environmental safety. Federal cultural resource preservation statutes mandate that if prehistoric or historic artifacts are unexpectedly discovered during construction or excavation, such materials would be identified and evaluated by a professional archaeologist. Should human remains or cultural artifacts be encountered, federal statutes specify that work would cease immediately and the proper authorities would be notified. WFF/NASA would consult with the Virginia Department of Historical Resources should unexpected discoveries occur, and project re-commencement would only be authorized once the State Historic Preservation Office clears the site. Because the Proposed Action would not require new construction at Launch Pad 0-B—only the potential modification on an existing structure—no impacts on cultural resources are anticipated. In addition, the facilities to be used as part of the Proposed Action are not listed or eligible for listing on the National Register of Historic Places. The launch site does not contain a historic or tribal site of significance (NASA 2019). In accordance with the WFF Programmatic Agreement, no Section 106 consultation with the Virginia SHPO is required for the Proposed Action.
	Biological Resources	There would be no change to biological resources, and therefore, no significant impacts to biological resources from implementation of the No Action Alternative.	Terrestrial vegetation would not be significantly impacted. No ground clearing or construction is expected for the Proposed Action and the launch would take place at a location routinely used for launch activities. Terrestrial wildlife species have the potential to be impacted by elevated sound pressure levels from launch as well as hazardous chemicals, and artificial lighting. The launch site at WFF is in an area that has routine human activity, equipment operation, and launch activity. Noise from launches and launch related activity may startle nearby wildlife but any disturbance would be brief with no long-term impacts. Emissions from vehicle launches would have little effect on wildlife due to the low levels and short duration of emissions. No impacts on wildlife due to direct contact from debris are expected during normal flight operations. Vibrations from launches and lighting present at launch pads may affect loggerhead turtles at nest sites close to launch pads but the impacts of launch activities on loggerhead populations would be

Table 4-8. Potential Impacts Associated with the No Action Alternative and the Alternative Locations (Continued)

Location	Resource Area	No Action Alternative	JFC Flight Test Alternatives
WFF (Cont.)	Biological Resources (Cont.)		minor. Overall, terrestrial wildlife would not be significantly impacted by activities at WFF. Impact to ESA-listed species would be minimal and short-term and are not expected to be different than those of ongoing operations at WFF. Any potential effects on ESA-listed species as a result of the Proposed Action are covered under Section 7 consultations and the existing Biological Opinion for ongoing launch operations at WFF. Marine wildlife are not expected to be significantly impacted by the Proposed Action. Any impacts, if realized, would likely be limited to short-term startle reactions due to elevated noise levels and marine wildlife would be expected to return to normal behaviors within minutes. Noise from launches and launch related activity may startle nearby wildlife, but this startle reaction would be of short duration and no injury would occur. No impacts on marine wildlife due to direct contact or exposure to hazardous chemicals from debris are expected during normal flight operations.
	Public Health and Safety	There would be no significant change to public health and safety. No significant impacts to public health and safety would result from the No Action Alternative.	JFC launch activities would follow established protocols at WFF and would involve risks to safety that are similar to those previously analyzed in NEPA documents (FE-2, etc.). WFF would implement protective measures to ensure risks to personnel and the general public from these operations are minimized. In accordance with EO 13045, Protection of Children from Environmental Health and Safety Risks, NASA and the JFC proponents have determined that since the JFC flight tests would be conducted on NASA property and out in the open ocean, the JFC flight test has no environmental health and safety risks that may disproportionately affect children. The Proposed Action would not impact health and safety in the WFF ROI.
	Hazardous Materials and Wastes	There would be no change to hazardous materials and wastes, and, therefore, no significant impacts from hazardous materials and wastes that would result from implementation of the No Action Alternative.	The types of hazardous materials, substances, and hazardous waste that may occur during the JFC flight tests would be similar to those analyzed in previous NEPA documents for similar missile launch operations at WFF (FE-2, etc.). All hazardous materials and wastes would continue to be managed according to standard procedures and in accordance with local, state, and federal regulations in place to protect human health and the environment. The JFC flight tests would not exceed hazardous material and waste limits that WFF is capable of handling or add to environmental risks. The Proposed Action would not impact hazardous materials and wastes at WFF.

Table 4-8. Potential Impacts Associated with the No Action Alternative and the Alternative Locations (Continued)

Location	Resource Area	No Action Alternative	JFC Flight Test Alternatives
VSFB	Air Quality	Under the No Action Alternative, the Proposed Action would not occur and there would be no change associated with air quality at VSFB. Therefore, no significant impacts would occur with implementation of the No Action Alternative.	Air emissions were estimated by comparison to Minuteman III emissions for missile launch. The analysis used the prevention of significant deterioration (PSD) permitting threshold of 250 tons per year for all criteria pollutants. For criteria pollutants for which the area has always been in attainment the initial indicator of significance is the PSD threshold. These values are being used as first tier air quality significant indicators for NEPA purposes. Generally, minor emissions of criteria pollutants (i.e., PM_{10}, $PM_{2.5}$, NOx, SOx, VOC, and CO) and GHGs (i.e., mostly CO_2e) during the proposed action activities would be expected. Project-specific direct and indirect emissions would primarily be driven by the following activities: pre-test preparation and support, flight test, and post-launch operations. As indicated in Chapter 2.0, between FY 2022 and FY 2032 there could be up to 6 flight tests per year for a total of 60 test flights over a 10-year period. Because the JFC missile is still in development there are no estimated emissions; therefore, this analysis uses the emissions from a Minuteman III launch as a surrogate. The AUR is approximately 34.5 inches in diameter and 33.6 ft in length. The first and second stage include a total of approximately 15,000 pounds (lb) of solid propellant. The estimated annual emissions do not exceed the PSD significant indicator levels for pollutants of concern. Where appliable, launch activities are conducted in compliance with all applicable Santa Barbara County Air Pollution Control District rules and regulations equating to insignificance. Therefore, no significant impacts to air quality are anticipated from flight test. After each flight test a safety check and cleanup of the launch site is completed (i.e., removal of equipment from the launch site). All estimated emissions from post-test operation are below the significant indicator levels for pollutants of concern and therefore no significant impacts to air quality are anticipated.
	Cultural Resources	There would be no change to cultural resources, and therefore, no significant impacts to cultural resources from implementation of the No Action Alternative.	Federal cultural resource preservation statutes mandate that if prehistoric or historic artifacts are unexpectedly discovered during construction or excavation, such materials would be identified and evaluated by a professional archaeologist. Should human remains or cultural artifacts be encountered, federal statutes specify that work would cease immediately and the proper authorities would be notified. The USAF has pledged to identify, manage, and maintain important cultural resources in a spirit of stewardship for the benefit of current and future generations (in accordance with AFI 32-7065) (VAFB 2019). The installation has developed an Integrated Cultural Resources Management Plan to comply with mandated cultural resources management requirements (VAFB 2019). The Proposed Action would not require construction at TP-01; there are no properties eligible for listing on the National Register of Historic

Table 4-8. Potential Impacts Associated with the No Action Alternative and the Alternative Locations (Continued)

Location	Resource Area	No Action Alternative	JFC Flight Test Alternatives
VSFB (Cont.)	Cultural Resources (Cont.)		Places at TP-01; and based on information from VSFB (30 CES/CEI) personnel, that the JFC action at VSFB is not subject to Section 106 compliance; then no impacts on cultural resources as a result of this Proposed Action are anticipated. No Section 106 consultation with the California State Historic Preservation Office is required for the Proposed Action.
	Biological Resources	There would be no change to biological resources, and therefore, no significant impacts to biological resources from implementation of the No Action Alternative.	JFC activities would have no long-term adverse impact on vegetation. Vegetation could be temporarily affected by the heat generated at launch and from launch emissions. However, these effects on vegetation would be temporary. Terrestrial wildlife may be impacted by elevated sound pressure levels from launch as well as hazardous chemicals, and artificial lighting. The launch site is in an area that has routine human activity, equipment operation, and launch activity. Noise from launches and launch related activity may startle nearby wildlife but disturbance to wildlife from launches would be brief and is not expected to have any long-term impacts. Wildlife are not likely to be physically harmed by heat or emissions during launch. Overall, terrestrial wildlife would not be significantly impacted by Proposed Action activities. Impacts to ESA-listed species would be minimal and short-term and are not expected to be different than those of ongoing operations at VSFB. Any potential effects on ESA-listed species as a result of the Proposed Action are covered under Section 7 consultations and the existing Biological Opinion for ongoing launch operations at VSFB. Marine wildlife are not expected to be significantly impacted by the Proposed Action. Any impacts, if realized, would likely be limited to short-term startle reactions due to elevated noise levels and marine wildlife would be expected to return to normal behaviors within minutes.
	Public Health and Safety	There would be no significant change to public health and safety. No significant impacts to public health and safety would result from the No Action Alternative.	JFC launch activities would follow established protocols at VSFB and would involve risks to safety that are similar to those previously analyzed in NEPA documents. VSFB would implement protective measures to ensure risks to personnel and the general public from these operations are minimized. In accordance with EO 13045, Protection of Children from Environmental Health and Safety Risks, the U.S. Navy has determined that since the JFC flight tests would be conducted on DOD property and out in the open ocean, the JFC flight test has no environmental health and safety risks that may disproportionately affect children. The Proposed Action would not impact health and safety in the VSFB ROI.

Table 4-8. Potential Impacts Associated with the No Action Alternative and the Alternative Locations (Continued)

Location	Resource Area	No Action Alternative	JFC Flight Test Alternatives
VSFB (Cont.)	Hazardous Materials and Wastes	There would be no change to hazardous materials and wastes, and, therefore, no significant impacts from hazardous materials and wastes that would result from implementation of the No Action Alternative.	The types of hazardous materials, substances, and hazardous waste that may occur during the JFC flight tests would be similar to those analyzed in previous NEPA documents for similar missile launch operations at VSFB. All hazardous materials and wastes would continue to be managed according to standard procedures and in accordance with local, state, and federal regulations in place to protect human health and the environment. The JFC flight tests would not exceed hazardous material and waste limits that VSFB is capable of handling or add to environmental risks. The Proposed Action would not impact hazardous materials and wastes at VSFB.
CCSFS	Air Quality	Under the No Action Alternative, the Proposed Action would not occur and there would be no change associated with air quality at CCSFS. Therefore, no significant impacts would occur with implementation of the No Action Alternative.	Air emissions were estimated by comparison to Minuteman III emissions for missile launch. The analysis used the PSD permitting threshold of 250 tons per year for all criteria pollutants. For criteria pollutants for which the area has always been in attainment, the initial indicator of significance is the PSD threshold. These values are being used as first tier air quality significant indicators for NEPA purposes. Generally, minor emissions of criteria pollutants (i.e., PM_{10}, $PM_{2.5}$, NOx, SOx, VOC, and CO) and GHGs (i.e., mostly CO_2e) during the Proposed Action activities would be expected. Project-specific direct and indirect emissions would primarily be driven by the following activities: pre-test preparation and support, flight test, and post-launch operations. As indicated in Chapter 2.0, between FY 2022 and FY 2032 there could be up to 6 flight tests per year for a total of 60 test flights over a 10-year period. Because the JFC missile is still in development there are no estimated emissions; therefore, this analysis uses the emissions from Minuteman III launch as a surrogate. The propellant information for Minuteman III and JFC is provided in Section 4.3.1.2. The Minuteman III stage 1 contains 20,730 kg (45,700 lb) of propellant and the JFC AUR contains approximately 6,804 kg (15,000 lb) of propellant. The estimated annual emissions do not exceed the PSD significant indicator levels for pollutants of concern. Where applicable, launch activities are conducted in compliance with all applicable Brevard County air quality rules and regulations equating to insignificance. Therefore, no significant impacts to air quality are anticipated from flight test. After each flight test a safety check and cleanup of the launch site is completed (i.e., removal of equipment from the launch site). All estimated emissions from post-test operation are below the significant indicator levels for pollutants of concern and therefore no significant impacts to air quality are anticipated.

Table 4-8. Potential Impacts Associated with the No Action Alternative and the Alternative Locations (Continued)

Location	Resource Area	No Action Alternative	JFC Flight Test Alternatives
CCSFS (Cont.)	Cultural Resources	There would be no change to cultural resources, and therefore, no significant impacts to cultural resources from implementation of the No Action Alternative.	The JFC flight test may require modifications to an existing MSS at LC-46. While unlikely, there could be a need for minor trenching in previously disturbed areas to install additional power and communication lines. Grounding rods to arrest lightning and static electricity may be required. Any ground-disturbing activities are not expected to remove vegetation or earth as the modifications to the MSS would be on existing structure. All federal, state, local, and CCSFS-specific SOPs would be followed during MSS modification to ensure worker and environmental safety. Federal cultural resource preservation statutes mandate that if prehistoric or historic artifacts are unexpectedly discovered during construction or excavation, such materials would be identified and evaluated by a professional archaeologist. Should human remains or cultural artifacts be encountered, federal statutes specify that work would cease immediately and the proper authorities would be notified. The 45 SW Cultural Resource Manager would work with the State Historic Preservation Office should unexpected discoveries occur, and project re-commencement would only be authorized once the State Historic Preservation Office clears the site. Because the Proposed Action would not require new construction at LC-46—only the potential modification on an existing structure—no impacts on cultural resources are anticipated. In addition, the facilities to be used as part of the Proposed Action are not listed or eligible for listing on the National Register of Historic Places. The launch site does not contain a historic or tribal site of significance (FAA 2008).
	Biological Resources	There would be no change to biological resources, and therefore, no significant impacts to biological resources from implementation of the No Action Alternative.	Terrestrial vegetation near the launch complex may be temporarily affected by heat and launch emissions. However, impacts would be minimal and short-term. Terrestrial wildlife may be impacted by elevated sound pressure levels from launch as well as hazardous chemicals, and artificial lighting. The launch site is in an area that has routine human activity, equipment operation, and launch activity. Noise from launches and launch related activity may startle nearby wildlife but disturbance to wildlife from launches would be brief and is not expected to have any long-term impacts. Wildlife are not likely to be physically harmed by heat or emissions during launch. Overall, terrestrial wildlife would not be significantly impacted. Impacts to ESA-listed species would be minimal and short-term and are not expected to be different than those of ongoing operations at CCSFS. Any potential effects on ESA-listed species as a result of the Proposed Action are covered under numerous Section 7 consultations and existing Biological Opinions for ongoing launch operations at CCSFS.

Table 4-8. Potential Impacts Associated with the No Action Alternative and the Alternative Locations (Continued)

Location	Resource Area	No Action Alternative	JFC Flight Test Alternatives
CCSFS (Cont.)	Biological Resources		Marine wildlife are not expected to be significantly impacted by the Proposed Action. Any impacts, if realized, would likely be limited to short-term startle reactions due to elevated noise levels and marine wildlife would be expected to return to normal behaviors within minutes. No impacts on marine wildlife due to direct contact or exposure to hazardous chemicals from debris are expected during normal flight operations.
	Public Health and Safety	There would be no significant change to public health and safety. No significant impacts to public health and safety would result from the No Action Alternative.	JFC launch activities would follow established protocols at CCSFS and would involve risks to safety that are similar to those previously analyzed in NEPA documents. CCSFS would implement protective measures to ensure risks to personnel and the general public from these operations are minimized. In accordance with EO 13045, Protection of Children from Environmental Health and Safety Risks, the U.S. Navy has determined that since the JFC flight tests would be conducted on DOD property and out in the open ocean, the JFC flight test has no environmental health and safety risks that may disproportionately affect children. The Proposed Action would not impact health and safety in the CCSFS ROI.
	Hazardous Materials and Wastes	There would be no change to hazardous materials and wastes, and, therefore, no significant impacts from hazardous materials and wastes that would result from implementation of the No Action Alternative.	The types of hazardous materials, substances, and hazardous waste that may occur during the JFC flight tests would be similar to those analyzed in previous NEPA documents for similar missile launch operations at CCSFS. All hazardous materials and wastes would continue to be managed according to standard procedures and in accordance with local, state, and federal regulations in place to protect human health and the environment. The JFC flight tests would not exceed hazardous material and waste limits that CCSFS is capable of handling or add to environmental risks. The Proposed Action would not impact hazardous materials and wastes at CCSFS.
	Infrastructure	Under the No Action Alternative, the Proposed Action would not occur and there would be no change associated with infrastructure resources. Therefore, no significant impacts would occur with implementation of the No Action Alternative.	The JFC flight tests would be similar to previous launches including Falcon, and Minotaur IV launches out of CCSFS and tests described in the Atlantic Fleet Testing and Training EIS. The potential impacts on infrastructure would be similar to that described for missile launches in previous environmental documentation (FAA 2020, PAFB 2019, U.S. Navy 2018b, USAF 2017, USAF 2013, USAF 2007). CCSFS launch pad suitability, data collection and storage capabilities, booster and explosive materials storage capabilities, and security systems were reviewed to be suitable for the JFC Flight Tests. CCSFS power, potable water management, wastewater, and stormwater management resources are numerous and would be capable of absorbing any potential stressors from the JFC Flight Launch. The JFC flight test may require ground-disturbing activities at CCSFS to modify the MSS at an existing CCSFS launch pad. While unlikely, there could be a need for trenching in previously disturbed areas to install

Table 4-8. Potential Impacts Associated with the No Action Alternative and the Alternative Locations (Continued)

Location	Resource Area	No Action Alternative	JFC Flight Test Alternatives
CCSFS (Cont.)	Infrastructure (Cont.)		additional power and communication lines. Grounding rods to arrest lightning and static electricity may be required. Any ground-disturbing activities are not expected to remove vegetation or earth as the MSS would modify existing man-made structures. All federal, state, local, and CCSFS-specific SOPs would be followed during MSS modification to ensure worker and environmental safety. Due to the comparatively smaller size of the JFC AUR to the Falcon, Minotaur, and Centaur Vulcan launches from CCSFS; the numerous launch infrastructure resources available; the facilities infrastructure resources available; and the potential MSS modification to the existing launch pad, there would be no significant impacts to CCSFS infrastructure as a result of the Proposed Action.
	Transportation	Under the No Action Alternative, the Proposed Action would not occur and there would be no change associated with transportation resources. Therefore, no significant impacts would occur with implementation of the No Action Alternative.	The JFC flight tests would be similar to previous launches including Falcon, and Minotaur IV launches out of CCSFS and tests described in the Atlantic Fleet Testing and Training EIS. The potential impacts on infrastructure would be similar to that described for missile launches in previous environmental documentation (FAA 2020, PAFB 2019, U.S. Navy 2018b, USAF 2017, USAF 2013, USAF 2007). The proponents would arrange to transport the rocket motors via truck or military aircraft. Once unloaded, they would be placed either in the Trident Magazines or at the MACA Complex building. The transportation network described in Section 3.4.7 would be capable of absorbing any potential stressors from the JFC Flight Launch. Less than 100 support personnel would be at each JFC Flight Test, and are required to follow all applicable federal, state, DOD and local traffic laws, rules, and regulations. The JFC flight test may require ground-disturbing activities at CCSFS to modify the MSS at an existing CCSFS launch pad. While unlikely, there could be a need for trenching in previously disturbed areas to install additional power and communication lines. All federal, state, local, and CCSFS-specific SOPs would be followed during MSS modification to ensure worker and environmental safety. The MSS would modify existing man-made structures and would not impact the CCSFS transportation network. Due to the comparatively smaller size of the JFC AUR to the Falcon, Minotaur, and Centaur Vulcan launches from CCSFS; the numerous transportation resources available; the requirement for all JFC Flight Test personnel to obey transportation laws, rules, and regulations; and the potential MSS modification to the existing launch pad, there would be no significant impacts to CCSFS transportation resources as a result of the Proposed Action.

Table 4-8. Potential Impacts Associated with the No Action Alternative and the Alternative Locations (Continued)

Location	Resource Area	No Action Alternative	JFC Flight Test Alternatives
Pacific Ocean Flight Corridors and Booster Drop/ Payload Impact Zones	Air Quality	Under the No Action Alternative, the JFC flight test would not occur and there would be no change to baseline air quality in the over-ocean flight corridor. No significant impacts to air quality or air resources would occur with implementation of the No Action Alternative.	Under the Proposed Action, following the JFC flight test, the majority of aluminum oxide would be removed from the stratosphere through dry deposition and precipitation. Emissions from a JFC launch launch (using STARS vehicle emissions as a surrogate) would be relatively small compared to all emissions released on a global scale. The large air volume over which the JFC emissions are spread, and the dispersion of the emissions by stratospheric winds would reduce potential impacts. Ozone-depleting gas emissions from up to six flight tests per year over the next 10 years would represent such a minute increase that any incremental effects on the global atmosphere would be discountable and insignificant. The Proposed Action would not have a significant impact on stratospheric ozone or on the upper atmosphere. The amount of GHG emissions that would be released from activities associated with up to six JFC flight tests is assumed to be negligible based on the small number of vessels and aircraft utilized and the short period of time for conducting each flight test. This limited amount of emissions would not likely contribute to global warming and climate change to any discernable extent. Implementation of the Proposed Action would not result in significant impacts to air quality or GHG emissions.
	Biological Resources	There would be no change to biological resources, and therefore, no significant impacts to biological resources from implementation of the No Action Alternative.	The Proposed Action would have minimal to no impacts on marine wildlife in the BOA. The potential exists for exposure to elevated sound levels, direct contact from expended test components, hazardous materials, and vessel traffic. Based on the expected sound pressure levels and estimated density of special-status wildlife, no injury from elevated sound levels is expected. Any effects due to sound would likely be limited to short-duration behavioral response with no long-term impacts. Based on the available animal densities in the Pacific BOA and on the size and number of expended test components, no physical injury to special-status species is expected as a result of direct contact. Any hazardous chemicals introduced to the water column would be quickly diluted and dispersed, and are not likely to impact marine wildlife or their habitats. Any test components or debris would sink to the ocean floor where most marine wildlife would not come into contact with it. The Proposed Action would not meaningfully increase vessel traffic in the BOA and vessel traffic would have minimal to no impacts. The Proposed Action may affect but is not likely to adversely affect marine ESA-listed species and some designated critical habitats in the BOA. The U.S. Navy and U.S. Army have consulted with NMFS under Section 7 of the ESA. No incidental take or harassment of marine mammals protected under the MMPA is expected. No impacts to environmentally sensitive habitats are expected, including some designated critical habitat, EFH, HAPCs, marine national monuments, national marine sanctuaries, and BIAs.

Table 4-8. Potential Impacts Associated with the No Action Alternative and the Alternative Locations (Continued)

Location	Resource Area	No Action Alternative	JFC Flight Test Alternatives
Atlantic Ocean Flight Corridors and Booster Drop/ Payload Impact Zones	Air Quality	Under the No Action Alternative, the JFC flight test would not occur and there would be no change to baseline air quality in the over-ocean flight corridor. No impacts to air quality or air resources would occur with implementation of the No Action Alternative.	Under the Proposed Action, following the JFC flight test, the majority of aluminum oxide would be removed from the stratosphere through dry deposition and precipitation. Emissions from a JFC vehicle launch (using STARS vehicle emissions as a surrogate) would be relatively small compared to all emissions released on a global scale. The large air volume over which the JFC emissions are spread, and the dispersion of the emissions by stratospheric winds would reduce potential impacts. Ozone-depleting gas emissions from up to six flight tests per year over the next 10 years would represent such a minute increase that any incremental effects on the global atmosphere would be discountable and insignificant. The Proposed Action would not have a significant impact on stratospheric ozone or on the upper atmosphere. The amount of GHG emissions that would be released from activities associated with up to six JFC flight tests is assumed to be negligible based on the small number of vessels and aircraft utilized and the short period of time for conducting a JFC flight test. This limited amount of emissions would not likely contribute to global warming and climate change to any discernable extent. Implementation of the Proposed Action would not result in significant impacts to air quality or GHG emissions.
	Biological Resources	There would be no change to biological resources, and therefore, no significant impacts to biological resources from implementation of the No Action Alternative.	The Proposed Action would have minimal to no impacts on marine wildlife in the BOA. The potential exists for exposure to elevated sound levels, direct contact from expended test components, hazardous materials, and vessel traffic. Based on the expected sound pressure levels and estimated density of special-status wildlife, no injury from elevated sound levels is expected Any effects due to sound would likely be limited to short-duration behavioral response with no long-term impacts. Based on the available animal densities in the Atlantic BOA and on the size and number of expended test components, no physical injury to special-status species is expected as a result of direct contact. Any hazardous chemicals introduced to the water column would be quickly diluted and dispersed, and are not likely to impact marine wildlife or their habitats. Any test components or debris would sink to the ocean floor where most marine wildlife would not come into contact with it. The Proposed Action would not meaningfully increase vessel traffic in the BOA and vessel traffic would have minimal to no impacts. The Proposed Action may affect but is not likely to adversely affect marine ESA-listed species and some designated critical habitats in the BOA. The U.S. Navy and U.S. Army have consulted with NMFS under Section 7 of the ESA. No incidental take or harassment of marine mammals protected under the MMPA is expected. No impacts to environmentally sensitive habitats are expected, including some designated critical habitat, EFH, HAPCs, marine national monuments, national marine sanctuaries, and BIAs.

Table 4-9. Impact Avoidance and Minimization Measures—JFC PMRF Launch

Location	Measure	Anticipated Benefit	Evaluating Effectiveness	Implementing and Monitoring	Responsibility
PMRF	Transportation, handling, and storage of rocket motors and other ordnance would occur in accordance with DOD, Army, Navy, and U.S. DOT policies and regulations	Safeguard the materials from fire or other mishap	Determine the rate of successful compliance and incident prevention	Recordkeeping in accordance with DOD, Army, Navy, and U.S. DOT policies and regulations	Navy SSP, USAF
	Shipments would be inspected for species of plants and animals that are not native to the environment at Hawai`i	Prevent the introduction of non-native species of plants and animals at Hawai`i	Determine the rate of successful prevention, identifying the need for treatment applications, as necessary	Recordkeeping of all inspections and outcomes	Navy SSP
	Sandia National Laboratories (SNL) personnel at KTF would conduct range responsibilities	Ensure appropriate launch preparation, including explosive safety, support to PMRF range safety and inter-range coordination	Determine the rate of successful compliance and incident prevention	Recordkeeping in accordance with DOD, DOE, Navy, and other applicable policies and regulations	SNL, DOE
	Publication and circulation of Notices to Airmen (NOTAMs) and Notices to Mariners (NTMs) prior to launch	Provide safety and warning to personnel, including private citizens and commercial entities, concerning any potential hazard areas that should be avoided; ensure the clearance of non-critical personnel, vessels, or aircraft in the vicinity	Determine the rate of successful compliance and incident prevention	Recordkeeping in accordance with DOD, Navy, and DOE policies and regulations	Navy SSP, SNL, DOE
	Check launch pad area for safe access after vehicle liftoff	Ensure worker safety for post-launch inspection, clean-up, and maintenance	Determine the rate of successful compliance and incident prevention	Recordkeeping in accordance with DOD, Navy, and DOE policies and regulations	SNL, DOE

Table 4-10. Impact Avoidance and Minimization Measures – WFF Launch

Location	Measure	Anticipated Benefit	Evaluating Effectiveness	Implementing and Monitoring	Responsibility	Estimated Completion Date
WFF	Transportation, handling, and storage of rocket motors and other ordnance would occur in accordance with DOD, NASA, Army, Navy, and U.S. DOT policies and regulations	Safeguard the materials from fire or other mishap	Determine the rate of successful compliance and incident prevention	Recordkeeping in accordance with NASA, DOD, Army, Navy, and U.S. DOT policies and regulations	Navy SSP, Army, NASA	Within 10 years after the FONSI/FONSH is signed
	WFF qualified personnel would conduct range responsibilities	Ensure appropriate launch preparation, including explosive safety, support to WFF range safety and inter-range coordination	Determine the rate of successful compliance and incident prevention	Recordkeeping in accordance with DOD, Army, Navy, NASA, and other applicable policies and regulations	Navy SSP, Army, NASA	Within 10 years after the FONSI/FONSH is signed
	Publication and circulation of Notices to Airmen (NOTAMs) and Notices to Mariners (NTMs) prior to launch	Provide safety and warning to personnel, including private citizens and commercial entities, concerning any potential hazard areas that should be avoided; ensure the clearance of non-critical personnel, vessels, or aircraft in the vicinity	Determine the rate of successful compliance and incident prevention	Recordkeeping in accordance with DOD, Army, Navy, and NASA policies and regulations	Navy SSP, Army, NASA	Within 10 years after the FONSI/FONSH is signed
	Check launch pad area for safe access after vehicle liftoff	Ensure worker safety for post-launch inspection, clean-up, and maintenance	Determine the rate of successful compliance and incident prevention	Recordkeeping in accordance with NASA, DOD, and Navy policies and regulations	Navy SSP, Army, NASA	Within 10 years after the FONSI/FONSH is signed

Table 4-11. Impact Avoidance and Minimization Measures – VSFB

Location	Measure	Anticipated Benefit	Evaluating Effectiveness	Implementing and Monitoring	Responsibility
VSFB	Transportation, handling, and storage of rocket motors and other ordnance would occur in accordance with DOD, Army, Navy, Air Force and U.S. DOT policies and regulations	Safeguard the materials from fire or other mishap	Determine the rate of successful compliance and incident prevention	Recordkeeping in accordance with DOD, Army, Navy, Air Force and U.S. DOT policies and regulations	Navy SSP, Army, USAF
	Publication and circulation of Notices to Airmen (NOTAMs) and Notices to Mariners (NTMs) prior to launch	Provide safety and warning to personnel, including private citizens and commercial entities, concerning any potential hazard areas that should be avoided; ensure the clearance of non-critical personnel, vessels, or aircraft in the vicinity	Determine the rate of successful compliance and incident prevention	Recordkeeping in accordance with DOD, Army, Navy, and USAF policies and regulations	Navy SSP, Army, USAF
	Check launch pad area for safe access after vehicle liftoff	Ensure worker safety for post-launch inspection, clean-up, and maintenance	Determine the rate of successful compliance and incident prevention	Recordkeeping in accordance with DOD, Army, Navy and USAF policies and regulations	Navy SSP, Army, USAF

Table 4-12. Impact Avoidance and Minimization Measures – CCSFS

Location	Measure	Anticipated Benefit	Evaluating Effectiveness	Implementing and Monitoring	Responsibility	Estimated Completion Date
CCSFS	Transportation, handling, and storage of rocket motors and other ordnance would occur in accordance with DOD, USAF, Army, Navy, and U.S. DOT policies and regulations	Safeguard the materials from fire or other mishap	Determine the rate of successful compliance and incident prevention	Recordkeeping in accordance with DOD, USAF, Army, Navy, and U.S. DOT policies and regulations	Navy SSP, USSF, Army	Within 10 years after the FONSI/FONSH is signed
	CCSFS qualified personnel would conduct range responsibilities	Ensure appropriate launch preparation, including explosive safety, support to WFF range safety and inter-range coordination	Determine the rate of successful compliance and incident prevention	Recordkeeping in accordance with DOD, USAF, Army, Navy and other applicable policies and regulations	Navy SSP, USSF, Army	Within 10 years after the FONSI/FONSH is signed
	Publication and circulation of Notices to Airmen (NOTAMs) and Notices to Mariners (NTMs) prior to launch	Provide safety and warning to personnel, including private citizens and commercial entities, concerning any potential hazard areas that should be avoided; ensure the clearance of non-critical personnel, vessels, or aircraft in the vicinity	Determine the rate of successful compliance and incident prevention	Recordkeeping in accordance with DOD, USAF, Army, and Navy policies and regulations	Navy SSP, USSF, Army	Within 10 years after the FONSI/FONSH is signed
	Check launch pad area for safe access after vehicle liftoff	Ensure worker safety for post-launch inspection, clean-up, and maintenance	Determine the rate of successful compliance and incident prevention	Recordkeeping in accordance with DOD, USAF, Army, and Navy policies and regulations	Navy SSP, USSF, Army	Within 10 years after the FONSI/FONSH is signed
	A Light Management Plan for the launch complex would be developed and approved by the USFWS prior to launch activities at CCSFS	Avoid impacts to protected species, including nesting and hatchling sea turtles	Ensure Light Management Plan is compliant with existing Biological Opinions on light management and has been approved by USFWS prior to launch activities	Plan to be developed in coordination with the CCSFS Environmental Division, the launch site operator, and the USFWS	Navy SSP, Army, USSF	Prior to first JFC launch campaign at CCSFS

Table 4-13. Impact Avoidance and Minimization Measures – Pacific Ocean Flight Corridors and Booster Drop Zones

Location	Measure	Anticipated Benefit	Evaluating Effectiveness	Implementing and Monitoring	Responsibility	Estimated Completion Date
Pacific Over-Ocean Flight Corridors and Booster Drop/ Payload Impact Zones	Payload's flight path would avoid flying over the Northwestern Hawaiian Islands	Avoid impacts to protected species and habitats	Determine that actual flight path complies	Recordkeeping and reporting in accordance with DOD, Army, Navy, USAF, and DOE range and flight safety policies and regulations	Navy SSP, Army, USAF, SNL	Within 10 years after the FONSI/FONSH is signed
	During travel in the BOA, ship personnel would monitor for marine mammals and sea turtles to avoid potential ship strikes. Vessel operators would adjust speed based on expected animal locations, densities, and or lighting and turbidity conditions when possible.	Avoid impact on marine mammals and sea turtles.	Although unlikely, any dead or injured marine mammals or sea turtles sighted by post-flight personnel would be reported to USASMDC, who would then inform NMFS and USFWS.	Recordkeeping and reporting to the appropriate authorities	Navy SSP, Army, USAF, SNL	Within 10 years after the FONSI/FONSH is signed
	Computer-monitored destruct lines, based on no-impact lines, are preprogrammed into flight safety software	Avoid debris falling on inhabited areas, ensure compliance with Space System Software Safety Engineering protocols and U.S. range operation standards and practices	Determine the rate of successful compliance and incident prevention	Recordkeeping and reporting in accordance with DOD, Army, Navy, USAF, and DOE range and flight safety policies and regulations	Navy SSP, Army, USAF, SNL	Within 10 years after the FONSI/FONSH is signed
	USAF and SNL would conduct range responsibilities	Ensure appropriate launch preparation, including explosive safety, support to U.S. Navy SSP and inter-range coordination	Determine the rate of successful compliance and incident prevention	Recordkeeping in accordance with NASA, DOD, DOE, and U.S. Navy applicable policies and regulations	Navy SSP, Army, USAF, SNL	Within 10 years after the FONSI/FONSH is signed

Table 4-13. Impact Avoidance and Minimization Measures – Pacific Ocean Flight Corridors and Booster Drop Zones (Continued)

Location	Measure	Anticipated Benefit	Evaluating Effectiveness	Implementing and Monitoring	Responsibility	Estimated Completion Date
Pacific Over-Ocean Flight Corridors and Booster Drop/ Payload Impact Zones (Cont.)	During travel to and from impact zones, and during raft deployment, ship personnel would monitor for marine mammals and sea turtles to avoid potential vessel strikes. Vessel operators would adjust speed or raft deployment based on expected animal locations, densities, and/or lighting and turbidity conditions.	Avoid impact on marine mammals and sea turtles	Although unlikely, any dead or injured marine mammals or sea turtles sighted by post-flight personnel would be reported to USASMDC, who would then inform NMFS. Navy aircraft pilots otherwise flying in the vicinity of the impact and test support areas would also similarly report any opportunistic sightings of dead or injured marine mammals or sea turtles.	If personnel observe sea turtles or marine mammals in potential impact zones, sightings would be reported to appropriate test personnel for consideration in launch planning, recordkeeping and reporting in accordance with DOD, DOE, and U.S. Navy policies and regulations	Navy SSP, Army, USAF, SNL	Within 10 years after the FONSI/FONSH is signed
	Vessel and equipment operations would not involve any intentional discharges of fuel, toxic wastes, or plastics and other solid wastes that could harm terrestrial or marine life. Hazardous materials would be handled in adherence to the hazardous material and waste management systems of PMRF or VSFB. Hazardous material releases would comply with the emergency procedures set out in the PMRF or VSFB regulations.	Avoid introduction of hazardous chemicals into terrestrial and marine environments	Determine the rate of successful compliance and incident prevention	Vessel and heavy equipment operators would inspect and clean equipment for fuel or fluid leaks prior to use or transport, recordkeeping of all incidents and outcomes	Navy SSP, Army, USAF, SNL	Within 10 years after the FONSI/FONSH is signed

Table 4-13. Impact Avoidance and Minimization Measures – Pacific Ocean Flight Corridors and Booster Drop Zones (Continued)

Location	Measure	Anticipated Benefit	Evaluating Effectiveness	Implementing and Monitoring	Responsibility	Estimated Completion Date
Pacific Over-Ocean Flight Corridors and Booster Drop/ Payload Impact Zones (Cont.)	Publication and circulation of Notices to Airmen (NOTAMs) and Notices to Mariners (NTMs) prior to launch	Provide safety and warning to personnel, including private citizens and commercial entities, concerning any potential hazard areas that should be avoided; ensure the clearance of non-critical personnel, vessels, or aircraft in the vicinity	Determine the rate of successful compliance and incident prevention	Recordkeeping in accordance with, DOD, DOE, USAF, and Navy policies and regulations	Navy SSP, Army, USAF, SNL	Within 10 years after the FONSI/FONSH is signed
	FTS on the payload would include a failsafe operation	Further ensure the safety of the Bahamas and avoid debris falling on inhabited areas or any protected area, ensure compliance with Space System Software Safety Engineering protocols and U.S. range operation standards and practices	Determine the rate of successful compliance and incident prevention	Recordkeeping in accordance with DOE, DOD, USAF, and Navy policies and regulations	Navy SSP, Army, USAF, SNL	Within 10 years after the FONSI/FONSH is signed

Table 4-13. Impact Avoidance and Minimization Measures – Pacific Ocean Flight Corridors and Booster Drop Zones (Continued)

Location	Measure	Anticipated Benefit	Evaluating Effectiveness	Implementing and Monitoring	Responsibility	Estimated Completion Date
Pacific Over-Ocean Flight Corridors and Booster Drop/ Payload Impact Zones (Cont.)	Any observations of stranded, injured, or dead ESA-listed species would be immediately reported to NMFS or USFWS as appropriate	Protect ESA-listed species, comply with terms of consultation (Appendix A)	Any observations would be immediately reported to appropriate test personnel	Personnel would be informed of monitoring and reporting requirement and report observations to appropriate test personnel who would immediately report to USASMDC. USASMDC would inform NMFS or USFWS as appropriate. NMFS reports submitted to: https://www.fisheries. noaa.gov/report.	Navy SSP, Army	Within 10 years after the FONSI/FONSH is signed
	An annual review of JFC activities would be provided to NMFS within 30 days of October 14 each year.	Protect ESA-listed species, comply with terms of consultation (Appendix A)	Annual report submitted by October 13 each year	An annual report will be prepared to include: the annual number of launches, and any launch failures, associated with the JFC activities from each launch facility, along with any associated recovery operations; and information regarding observations of ESA-listed species under NMFS jurisdiction during JFC activities, including the time of year.	Navy SSP, Army	Annually and within 10 years after the FONSI/FONSH is signed

Table 4-14. Impact Avoidance and Minimization Measures – Atlantic Ocean Flight Corridors and Booster Drop/Payload Impact Zones

Location	Measure	Anticipated Benefit	Evaluating Effectiveness	Implementing and Monitoring	Responsibility	Estimated Completion Date
Atlantic Over-Ocean Flight Corridors and Booster Drop/Payload Impact Zones	Payload's flight path would avoid flying over the Bahamas	Avoid impacts to protected species and habitats	Determine that actual flight path complies	Recordkeeping and reporting in accordance with NASA, DOD, Army, USAF and Navy range and flight safety policies and regulations, USFWS regulations, and the ESA and MMPA	Navy SSP, Army, USSF, NASA	Within 10 years after the FONSI/FONSH is signed
	During travel in the BOA, ship personnel would monitor for marine mammals and sea turtles to avoid potential ship strikes. Vessel operators would maneuver and adjust speed to maintain a 460 m (500 yard) mitigation zone around whales and a 180 m (200 yard) zone around other marine mammals (except bow-riding dolphins) when possible.	Avoid impact on marine mammals and sea turtles.	Although unlikely, any dead or injured marine mammals or sea turtles sighted by post-flight personnel would be reported to OPNAV (N45) and USASMDC, who would then inform NMFS and USFWS.	Recordkeeping and reporting in accordance with NASA, DOD, Army, USAF and Navy policies and regulations.	Navy SSP, Army, USSF, NASA	Within 10 years after the FONSI/FONSH is signed
	During pre-launch surveillance and post-launch recovery, spotter aircraft will ascend to higher altitudes after lines of communication are established with intruding	Avoid impact on marine mammals and sea turtles.	Although unlikely, any dead or injured marine mammals or sea turtles sighted by post-flight personnel would be reported to OPNAV (N45) and USASMDC, who would then inform NMFS and USFWS.	Recordkeeping and reporting in accordance with NASA, DOD, Army, USAF and Navy policies and regulations.	Navy SSP, Army, USSF, NASA	Within 10 years after the FONSI/FONSH is signed

Table 4-14. Impact Avoidance and Minimization Measures – Atlantic Ocean Flight Corridors and Booster Drop/Payload Impact Zones (Continued)

Location	Measure	Anticipated Benefit	Evaluating Effectiveness	Implementing and Monitoring	Responsibility	Estimated Completion Date
Atlantic Over-Ocean Flight Corridors and Booster Drop/Payload Impact Zones (Cont.)	vessels and will limit their amount of time at any single location. Additionally, aircraft will not fly in circles if marine mammals are spotted to avoid any type of harassing behavior.					
	Computer-monitored destruct lines, based on no-impact lines, are pre-programmed into flight safety software	Avoid debris falling on inhabited areas, ensure compliance with Space System Software Safety Engineering protocols and U.S. range operation standards and practices	Determine the rate of successful compliance and incident prevention	Recordkeeping and reporting in accordance with NASA, DOD, Army, USAF, and Navy range and flight safety policies and regulations	Navy SSP, Army, USAF, NASA	Within 10 years after the FONSI/FONSH is signed
	At CCSFS, USAF would conduct range responsibilities. At WFF, NASA would conduct range responsibilities.	Ensure appropriate launch preparation, including explosive safety, support to Navy SSP and inter-range coordination	Determine the rate of successful compliance and incident prevention	Recordkeeping in accordance with NASA, DOD, Army, USAF and Navy applicable policies and regulations	Navy SSP, Army, USSF, NASA	Within 10 years after the FONSI/FONSH is signed
	Vessel and equipment operations would not involve any intentional discharges of fuel, toxic wastes, or plastics and other solid wastes that could harm terrestrial or marine life.	Avoid introduction of hazardous chemicals into terrestrial and marine environments.	Determine the rate of successful compliance and incident prevention	Vessel and heavy equipment operators would inspect and clean equipment for fuel or fluid leaks prior to use or transport, recordkeeping of all incidents and outcomes	Navy SSP, Army, USSF, NASA	Within 10 years after the FONSI/FONSH is signed

Table 4-14. Impact Avoidance and Minimization Measures – Atlantic Ocean Flight Corridors and Booster Drop/Payload Impact Zones (Continued)

Location	Measure	Anticipated Benefit	Evaluating Effectiveness	Implementing and Monitoring	Responsibility	Estimated Completion Date
Atlantic Over-Ocean Flight Corridors and Booster Drop/Payload Impact Zones (Cont.)	Hazardous materials would be handled in adherence to the hazardous material and waste management systems of WFF or CCSFS. Hazardous material releases would comply with the emergency procedures set out in the WFF or CCSFS regulations.					
	Publication and circulation of Notices to Airmen (NOTAMs) and Notices to Mariners (NTMs) prior to launch	Provide safety and warning to personnel, including private citizens and commercial entities, concerning any potential hazard areas that should be avoided; ensure the clearance of non-critical personnel, vessels or aircraft in the vicinity	Determine the rate of successful compliance and incident prevention	Recordkeeping in accordance with NASA, DOD, Army, USAF and Navy policies and regulations	Navy SSP, Army, USSF, NASA	Within 10 years after the FONSI/FONSH is signed
	FTS on the payload would include a failsafe operation	Further ensure the safety of the Bahamas and avoid debris falling on inhabited areas or any protected area, ensure compliance with Space System Software Safety Engineering protocols and U.S. range operation standards and practices	Determine the rate of successful compliance and incident prevention	Recordkeeping in accordance with NASA, DOD, Army, USAF, and Navy policies and regulations	Navy SSP, Army, USSF, NASA	Within 10 years after the FONSI/FONSH is signed

Table 4-14. Impact Avoidance and Minimization Measures – Atlantic Ocean Flight Corridors and Booster Drop/Payload Impact Zones (Continued))

Location	Measure	Anticipated Benefit	Evaluating Effectiveness	Implementing and Monitoring	Responsibility	Estimated Completion Date
Atlantic Over-Ocean Flight Corridors and Booster Drop/Payload Impact Zones (Cont.)	Any observations of stranded, injured, or dead ESA-listed species would be immediately reported to NMFS or USFWS as appropriate	Protect ESA-listed species, comply with terms of consultation (Appendix A)	Any observations would be immediately reported to appropriate test personnel	Personnel would be informed of the monitoring and reporting requirement and report observations to appropriate test personnel who would immediately report to USASMDC. USASMDC would inform NMFS or USFWS as appropriate. NMFS reports submitted to: https://www.fisheries.noaa.gov/report.	Navy SSP, Army	Within 10 years after the FONSI/FONSH is signed
	An annual review of JFC activities would be provided to NMFS within 30 days of October 14 each year.	Protect ESA-listed species, comply with terms of consultation (Appendix A)	Annual report submitted by October 13 each year	An annual report will be prepared to include: the annual number of launches, and any launch failures, associated with the JFC activities from each launch facility, along with any associated recovery operations; and information regarding observations of ESA-listed species under NMFS jurisdiction during JFC activities, including the time of year.	Navy SSP, Army	Annually and within 10 years after the FONSI/FONSH is signed

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5.0 Cumulative Impacts

Chapter 5.0 (1) defines cumulative impacts; (2) describes past, present, and reasonably foreseeable future actions relevant to cumulative impacts; (3) analyzes the incremental environmental impacts the Proposed Action may have with other actions; and (4) evaluates cumulative impacts potentially resulting from these interactions.

5.1 Definition of Cumulative Impacts

The approach taken in the analysis of cumulative impacts follows the objectives of NEPA, CEQ regulations, and CEQ guidance. Cumulative impacts are defined in 40 CFR Section 1508.7 as the impact on the environment that results from the incremental impact of the action when added to the other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over time.

To determine the scope of environmental effects, agencies shall consider cumulative actions, which when viewed with other proposed actions have cumulatively significant impacts and should therefore be discussed in the same impact document.

In addition, CEQ and USEPA have published guidance addressing implementation of cumulative impact analyses—Guidance on the Consideration of Past Actions in Cumulative Effects Analysis (CEQ 2005) and Consideration of Cumulative Impacts in USEPA Review of NEPA Documents (USEPA 1999). CEQ guidance entitled Considering Cumulative Impacts Under NEPA (1997) states that cumulative impact analyses should:

> "…determine the magnitude and significance of the environmental consequences of the proposed action in the context of the cumulative impacts of other past, present, and reasonably foreseeable future actions...identify significant cumulative impacts… [and]…focus on truly meaningful impacts."

Cumulative impacts are most likely to arise when a relationship or synergism exists between a Proposed Action and other actions expected to occur in a similar location or during a similar time period. Actions overlapping with or near to the Proposed Action would be expected to have more potential for a relationship than those more geographically separated. Similarly, relatively concurrent actions would tend to offer a higher potential for cumulative impacts. To identify cumulative impacts, the analysis needs to address the following three questions.

- Does a relationship exist such that affected resource areas of the Proposed Action might interact with the affected resource areas of past, present, or reasonably foreseeable actions?

- If one or more of the affected resource areas of the Proposed Action and another action could be expected to interact, would the Proposed Action affect or be affected by impacts of the other action?
- If such a relationship exists, does an assessment reveal any potentially significant impacts not identified when the Proposed Action is considered alone?

5.2 Scope of Cumulative Impacts Analysis

The scope of the cumulative impacts analysis involves both the geographic extent of the effects and the time frame in which the effects could be expected to occur. For this EA/OEA, the study area would include those areas previously identified in **Chapter 4.0** for each resource area. The time frame for cumulative impacts centers on the timing of the Proposed Action, in this case an initial flight test in the second half of FY 2022 and up to six flight tests annually for the next 10 years.

Another factor influencing the scope of cumulative impacts analysis involves identifying other actions to consider. Beyond determining that the geographic scope and time frame for the actions interrelate to the Proposed Action, the analysis employs the measure of “reasonably foreseeable” to include or exclude other actions. For the purposes of this analysis, public documents prepared by federal, state, and local government agencies form the primary sources of information regarding reasonably foreseeable actions. Documents used to identify other actions include notices of intent for EISs, notices of availability of EAs, management plans, land use plans, and other planning related studies.

5.3 Past, Present, and Reasonably Foreseeable Actions

This section focuses on past, present, and reasonably foreseeable future actions at and near PMRF, WFF, VSFB, CCSFS, the Pacific flight corridor and booster/payload impact zones, and the Atlantic flight corridor and booster/payload impact zones. In determining which projects to include in the cumulative impacts analysis, a preliminary determination was made regarding the past, present, or reasonably foreseeable action. Actions included in this cumulative impact analysis are listed in **Table 5-1** and briefly described in the following subsections.

Table 5-1. Actions Considered in Cumulative Impacts Evaluation for JFC Flight Tests

Location	Action	Level of NEPA Analysis Completed
Pacific Missile Range Facility (PMRF) and Pacific BOA	Past Actions	
	Strategic Target System Launches	EIS/ROD
	Navy FE-1 and FE-2	EA/OEA
	Navy Testing and Training	EIS/OEIS/ROD
	Present and Reasonably Foreseeable Future Actions	
	Homeland Defense Radar–Hawaii	Draft EIS
	Hawai`i-Southern California Testing and Training	EIS/OEIS/ROD
	Navy Testing and Training	EIS/OEIS/ROD
	Advanced Hypersonic Weapon Flight Testing	EA/FONSI
	U.S. Air Force Air-Launched Rapid Response (ARRW)	EA/FONSI
Wallops Flight Facility (WFF) and Atlantic BOA	Past Actions	
	Site-wide Environmental Assessment, WFF	EA/FONSI
	Orbital/Sub-Orbital Program EA	EA/FONSI
	Expansion of the WFF Launch Range	EA/FONSI
	EA for Launch of NASA Routine Payloads	EA/FONSI
	U.S. Navy Atlantic Fleet Training and Testing	EIS/OEIS
	Present and Reasonably Foreseeable Future Actions	
	Orbital/Sub-Orbital Program EA	EA/FONSI
	EA for Launch of NASA Routine Payloads	EA/FONSI
	U.S. Navy Testing of Hypervelocity Projectiles and an Electromagnetic Railgun	EA/FONSI
	U.S. Navy Atlantic Fleet Training and Testing	EIS/OEIS
	NASA WFF Site-wide Programmatic EIS	Final EIS
Vandenberg Space Force Base (VSFB) and Pacific BOA	Past Actions	
	Minuteman III Flight Test—2004, 2006, 2013	EA/FONSI
	Present and Reasonably Foreseeable Future Actions	
	Hawai`i-Southern California Testing and Training	EIS/OEIS/ROD
	Minuteman III Flight Test	EA/FONSI
	GBSD Flight Test	EA/FONSI
	Commercial Launch Vehicles	EA/FONSI

Table 5-1. Actions Considered in Cumulative Impacts Evaluation for JFC Flight Tests (Continued)

Location	Action	Level of NEPA Analysis Completed
Cape Canaveral Space Force Station (CCSFS) and Atlantic BOA	Past Actions	
	Falcon 1 and Falcon 9 Space Vehicles – 2007, 2009, 2013, 2015	EA/FONSI
	Present and Reasonably Foreseeable Future Actions	
	Falcon 1 and Falcon 9 Space Vehicles – 2007, 2009, 2013, 2015	EA/FONSI
	Programmatic Environmental Assessment for the Shuttle Landing Facility Reentry Site Operator License—2020	EA/FONSI
	Environmental Assessment for the Reconstitution and Enhancement of the Space Launch Complex 20 Multi-User Launch Operations at Cape Canaveral Air Force Station, Florida—2020	Final EA
	U.S. Air Force Integrated Natural Resources Management Plan—2020	Final
	Virginia Capes Range Complex Final EIS/OEIS	Final EIS
	U.S. Navy Atlantic Fleet Training and Testing	EIS/OEIS

5.3.1 Past Actions

5.3.1.1 Past Actions PMRF

There have been fewer than 10 STARS launches in the last 25 years from KTF. The Advanced Hypersonic Weapon program had a single payload that previously impacted at Illeginni Islet following a launch using a STARS booster from SNL/KTF. More recent STARS launches from SNL/KTF with an impact at Illeginni Islet were in 2017 for FE-1 and 2020 for FE-2. Other past actions have included testing and training for U.S. Navy and other Government agencies. Actions have included RDT&E activities in the HRC, Major Exercises, and maintenance of the technical and logistical facilities that support these activities and exercises.

5.3.1.2 Past Actions WFF

Past actions include launch and related NASA operations at WFF and non-NASA actions nearby that have been covered by numerous EAs and most recently in the Final WFF Site-wide PEIS. Numerous orbital and suborbital launches have been conducted each year from WFF.

5.3.1.3 Past Actions VSFB

Past actions at VSFB include commercial and military rocket launches such as Minuteman III, SpaceX launches and landings, and USAF-sponsored military and commercial rocket launches. VSFB also hosts regular aircraft take-offs and landings. Other past actions have included testing and training for U.S. Navy and other Government agencies. Actions have included RDT&E

activities in the Southern California coastal area, Major Exercises, and maintenance of the technical and logistical facilities that support these activities and exercises.

5.3.1.4 Past Actions CCSFS

Past actions include launches and landings of NASA operations and non-NASA operations. These include Shuttle, Delta IV, Atlas V, Falcon 9, Falcon Heavy, and USAF-sponsored military and commercial rocket launches.

5.3.2 Present and Reasonably Foreseeable Actions

5.3.2.1 Present and Reasonably Foreseeable Future Actions PMRF

The actions associated with testing and training for U.S. Navy and other Government agencies are still occurring and are expected to occur well into the future. The actions that include RDT&E activities in the HRC, Major Exercises, and maintenance of the technical and logistical facilities that support these activities and exercises are also still occurring and are expected to continue. The U.S. Air Force Air-Launched Rapid Response Weapon (ARRW) flight test is expected to be similar to FE-1 and FE-2 with a launch from SNL/KTF and impact at Illeginni Islet. The Homeland Defense Radar–Hawaii Draft EIS is being prepared. It is a discrimination radar, capable of identifying and classifying specific missile threats. As of February 2021, MDA has reopened the public scoping process for this EIS.

5.3.2.2 Present and Reasonably Foreseeable Future Actions WFF

Present and reasonably foreseeable launches include a maximum of 18 orbital-class launches per year from MARS LC-0 distributed among several launch pads, and up to 60 launches of sounding rockets/suborbital rockets. The U.S. Navy/Army JFC is expected to be similar to the suborbital rockets and could launch from Wallops with an impact in the BOA.

Military readiness training and research, development, testing, and evaluation activities are conducted within the Atlantic Fleet Training and Testing study area (U.S. Navy 2018b). As it relates to this EA, the Atlantic Fleet Training and Testing study area includes the VACAPES Range Complex.

5.3.2.3 Present and Reasonably Foreseeable Future Actions VSFB

Present and reasonably foreseeable future actions include the Ground Based Strategic Deterrent Test Program launches, the Minuteman III flight test program, Fuze Modernization flight tests, and various MDA missile flight tests. Other programs include SpaceX Falcon 9, ULA Delta IV, Taurus, and commercial spaceport launces. Potentially future launches include Firefly Alpha, Blue Origin New Glenn, and the Small Launch Vehicle Capability program. The actions associated with testing and training for U.S. Navy and other Government agencies are still occurring and are expected to occur well into the future. The actions that include RDT&E activities in the Southern

California coastal area, Major Exercises, and maintenance of the technical and logistical facilities that support these activities and exercises are also still occurring and are expected to continue.

5.3.2.4 Present and Reasonably Foreseeable Future Actions CCSFS

Present and reasonably foreseeable future actions include 1 Delta IV launch, 21 Terran 1 launches, 17 Atlas V/Vulcan launches, 215 Falcon 9 and Falcon Heavy launches, and 30 Blue Origin launches, totaling 284 planned launches between 2020 and 2023.

5.4 Cumulative Impact Analysis

For most resources included for analysis, quantifiable data are not available, and a qualitative analysis was undertaken. In addition, where an analysis of potential environmental effects for future actions has not been completed, assumptions were made regarding cumulative impacts related to this EA/OEA where possible. The analytical methodology presented in **Chapter 4.0**, which was used to determine potential impacts to the various resources analyzed in this document, was also used to determine cumulative impacts.

5.4.1 Pacific Missile Range Facility

5.4.1.1 Description of Geographic Study Area

The study area includes SNL/KTF and PMRF on the western coast of Kauai in the Hawaiian Islands. SNL/KTF has been an active rocket launching facility since 1962. Most of these launches are targeted to various areas of the South Pacific, including USAG-KA in the RMI.

5.4.1.2 Relevant Past, Present, and Future Actions

The launching of missiles both from PMRF and ships offshore would continue as part of the RDT&E and training mission of PMRF. Several DOD branches would continue to launch missiles that are similar in size and potential impacts as the JFC AUR. The future location of the Homeland Defense Radar–Hawaii has not been established at this time.

5.4.1.3 Cumulative Impact Analysis

PMRF and SNL/KTF SOPs would be followed for launch site preparation, booster handling, and all hazardous operations. PMRF Missile Flight Analysis, Ground Safety, Range Safety, Ocean Clearance, Transportation Safety, and Fire and Crash Safety procedures would be followed to ensure the safety of workers and members of the public. Therefore, implementation of the Proposed Action would not result in cumulative impacts to health and safety.

Impacts from the JFC launch when combined with various planned KTF launches would not create cumulative impacts to air quality because of the limited quantity and prompt dispersion of exhaust products.

Based on previous analysis and sampling for exhaust constituents, the Proposed Action activities, when added to other planned launches at KTF would not adversely affect water resources. Therefore, implementation of the Proposed Action would not result in cumulative impacts to water resources.

Proposed Action activities should have negligible cumulative impact to terrestrial and marine biological resources at PMRF. Up to six test events per year over 10 years may occur at PMRF. The ROI consists of a previously disturbed area, and there is no evidence of bioaccumulation or long-term impacts of chemicals associated with similar launches from PMRF. While the potential exists for disturbance from human activity to result in cumulative impacts to terrestrial wildlife, the launch site at PMRF is in an area of routine human activity, and the limited amount and time frame of human activity for the Proposed Action is not expected to contribute to any cumulative impacts. As discussed in **Section 4.1.2.2**, Newell's shearwaters have the potential to be impacted by artificial lighting from various activities and given the small population size of this species, any effects are important to consider. The Proposed Action is not likely to impact Newell's shearwaters or other bird species and is not expected to contribute to cumulative impacts to Newell's shearwaters. Launch noise has the potential to result in cumulative impacts to terrestrial birds and mammals near the launch sites which might result in long-term changes in distributions. SNL/KTF and other sites on PMRF have been and continue to be used regularly for launch activities. The Proposed Action is not likely to impact terrestrial bird and mammal (including ESA-listed species) distributions and is not expected to contribute to any cumulative impacts due to noise at PMRF.

KTF supports a variety of occasional missile launches that produce high-intensity, short-duration sound events. Data collected in the nearest town of Kekaha indicated that levels were no louder than noise generated from passing vehicles on a nearby highway. No noise-sensitive land uses are affected by existing noise levels. The JFC launch when combined with other discrete missile launch events would not result in cumulative noise impacts.

No past, present, or reasonably foreseeable actions have been identified that might interact with the affected resource areas of the Proposed Action and result in significant impacts.

5.4.2 Wallops Flight Facility

5.4.2.1 Description of Geographic Study Area

The geographic study area includes the missile receiving, assembly, and launch facilities analyzed in **Chapter 3.0**.

5.4.2.2 Relevant Past, Present, and Future Actions

The Proposed Action identified in the WFF Site-wide PEIS would result in a maximum of 18 orbital-class launches per year from MARS LC-0 distributed among several launch pads. Site improvements would include construction of a dedicated payload fueling facility, construction of new roads and minor upgrades to existing roads, and minor interior modifications to launch support facilities. Additional launches of sub-orbital and sounding rockets would also occur.

5.4.2.3 Cumulative Impact Analysis

Proposed Action activities are expected to have negligible cumulative impact to terrestrial and marine biological resources at WFF. Up to six test events per year over 10 years may occur at WFF. These six events would be included either within the set of 18 expendable launch vehicle launches per year or within the set of 60 sounding rocket launches per year described for WFF, as this is a similarly sized vehicle. The ROI consists of a previously disturbed area, and there is no evidence of bioaccumulation or long-term impacts of chemicals associated with similar launches from WFF. While the potential exists for disturbance from human activity to result in cumulative impacts to terrestrial wildlife, the launch site at WFF is in an area of routine human activity and the limited amount and time frame of human activity for the Proposed Action is not expected to contribute to any cumulative impacts.

Negligible cumulative impacts to health and safety are anticipated from a single JFC launch and flight test. Expansion of the existing permanent danger zone as proposed by the USACE would further increase safety.

Established procedures for the managing of hazardous materials, toxic substances, and hazardous waste at WFF would continue to be followed. Any potential increase in the amount of hazardous materials used or hazardous waste generated would continue to be managed using existing procedures, resulting in negligible cumulative impacts to hazardous material and waste management.

5.4.3 Vandenberg Space Force Base

5.4.3.1 Description of Geographic Study Area

The geographic study area includes the missile receiving, assembly, and launch facilities analyzed in **Chapter 3.0**.

5.4.3.2 Relevant Past, Present, and Future Actions

The launching of missiles, commercial rockets, and DOD rockets from VSFB would continue as part of the mission of VSFB. Several DOD branches would continue to launch missiles that are similar in size and potential impacts as the JFC AUR; military and commercial launches would include launches and landings that are larger in size and potential impacts than the JFC AUR.

5.4.3.3 Cumulative Impact Analysis

VSFB SOPs would be followed for launch site preparation, booster handling, and all hazardous operations. VSFB's Missile Flight Analysis, Ground Safety, Range Safety, Ocean Clearance, Transportation Safety, and Fire and Crash Safety procedures would be followed to ensure the safety of workers and members of the public. Therefore, implementation of the Proposed Action would not result in cumulative impacts to health and safety.

Impacts from the JFC launch when combined with various planned VSFB launches would not create cumulative impacts to air quality because of the limited quantity and prompt dispersion of exhaust products.

Based on the analysis of JFC exhaust constituents the Proposed Action activities, when added to other planned launches at VSFB, would not adversely affect water resources. Therefore, implementation of the Proposed Action would not result in cumulative impacts to water resources.

VSFB supports a variety of occasional missile and rocket launches that produce high-intensity, short-duration sound events. Larger launches from VSFB may result in short-term, minor impacts to the noise environment, but the sonic boom expected from JFC should occur over the Pacific Ocean and leave land-based receptors unaffected. The JFC launch when combined with other discrete missile launch events would not result in cumulative noise impacts.

No past, present, or reasonably foreseeable actions have been identified that might interact with the affected resource areas of the Proposed Action and result in significant impacts.

5.4.4 Cape Canaveral Space Force Station

5.4.4.1 Description of Geographic Study Area

The geographic study area includes the missile receiving, assembly, and launch facilities analyzed in **Chapter 3.0**.

5.4.4.2 Relevant Past, Present, and Future Actions

The launching of missiles, commercial rockets, and DOD rockets from CCSFS would continue as part of the mission of CCSFS. Several DOD branches would continue to launch missiles that are similar in size and potential impacts as the JFC AUR; military and commercial launches would include launches and landings that are larger in size and potential impacts than the JFC AUR.

5.4.4.3 Cumulative Impact Analysis

CCSFS SOPs would be followed for launch site preparation, booster handling, and all hazardous operations. CCSFS's Missile Flight Analysis, Ground Safety, Range Safety, Ocean Clearance, Transportation Safety, and Fire and Crash Safety procedures would be followed to ensure the safety of workers and members of the public. Therefore, implementation of the Proposed Action would not result in cumulative impacts to health and safety.

Impacts from the JFC launch when combined with various planned CCSFS launches would not create cumulative impacts to air quality because of the limited quantity and prompt dispersion of exhaust products. The addition of emissions from the JFC to the 284 planned rockets to be launched and occasionally landed at CCSFS between 2020 and 2023 would be negligible.

Similarly, the estimated output of JFC exhaust constituents for this Proposed Action, combined with other planned launches at CCSFS, would not adversely affect water resources. Implementation of the Proposed Action would not result in cumulative impacts to water resources.

CCSFS supports a variety of occasional missile and rocket launches that produce high-intensity, short-duration sound events. Larger launches from CCSFS may result in short-term, minor impacts to the noise environment, but the sonic boom expected from JFC should occur over the Atlantic Ocean and leave land-based receptors unaffected. The JFC launch when combined with other discrete missile launch events would not result in cumulative noise impacts.

No past, present, or reasonably foreseeable actions have been identified that might interact with the affected resource areas of the Proposed Action and result in significant impacts.

5.4.5 Pacific Ocean Flight Corridors and Booster Drop/Payload Impact Zones

5.4.5.1 Description of Geographic Study Area

The over-ocean flight corridor and booster drop/payload impact zones shown in **Figure 1-1** and **Figure 1-3** are the geographic study area for cumulative impacts from JFC and other relevant past, present, and future actions. There has been no known significant change in air quality or biological resources within the over-ocean flight corridor.

5.4.5.2 Relevant Past, Present, and Future Actions

Minuteman III ICBM missile testing between VSFB, California, and the BOA has occurred and will continue to occur on an annual basis. Up to four Minuteman III missile flight tests would be conducted annually through 2030, and four Fuze Modernization flight tests would occur over a 4-year period. EAs with FONSIs were prepared for the Minuteman III missile testing in 2001 and 2004. An additional Supplemental EA was completed for the Modification and Fuze Modernization flight tests through 2030. The trajectory for these flights overlaps the over-ocean flight corridor.

In November 2011, USASMDC/ARSTRAT performed a test flight of the Advanced Hypersonic Weapon concept. The test vehicle was launched from KTF to RTS. The flight path for this flight test was the over-ocean flight corridor between KTF and RTS. In October 2017 and January 2020, the U.S. Navy SSP performed the FE-1 and FE-2 flight tests with essentially the same over-ocean flight corridor between KTF and RTS.

5.4.5.3 Cumulative Impact Analysis

Although there have been several missile flight tests within the same or part of the same over-ocean flight corridor as JFC, most of these flight tests used the STARS boosters or a launch vehicle of comparable size. As described in **Section 4.1.2.2**, the STARS booster (used as a surrogate for the JFC AUR emissions) is relatively small, and on a global scale the level of emissions from each STARS booster would not be statistically significant. Because the emissions of hydrogen chloride, aluminum oxide, and nitrogen oxides from each launch of a JFC AUR would be relatively small, the air volume over which these emissions are spread is large, the emissions are dispersed by stratospheric winds, and the length of time between discrete launches is measured in months or years, these missile flight tests within the over-ocean flight corridor would not have a significant cumulative impact. Therefore, cumulative impacts from the JFC flight test and the other evaluated flight tests would not be expected to have a significant impact on the upper atmosphere or stratospheric ozone depletion.

Impacts to biological resources within the over-ocean flight corridor for past and future missile flight tests were not identified as being significant. As with the Proposed Action, the potential for impacts from noise or direct contact from boosters or other missile components for these past, present, and future activities was extremely low given the size of the area, the size of missile components, and the low densities of marine species across the corridor. None of these actions are expected to interact to produce cumulative effects for biological resources.

No past, present, or reasonably foreseeable actions have been identified in the over-ocean flight corridor that might interact with the affected resource areas of the JFC Proposed Action and result in significant cumulative impacts.

5.4.6 Atlantic Ocean Flight Corridors and Booster Drop/Payload Impact Zones

5.4.6.1 Description of Geographic Study Area

The geographic study area includes the missile flight corridor, booster drop zones, and impact areas analyzed in **Chapter 3.0**.

5.4.6.2 Relevant Past, Present, and Future Actions

The U.S. Navy Atlantic Fleet Training and Testing EIS/OEIS evaluated the potential environmental effects associated with military readiness training and research, development, testing, and evaluation activities conducted within the VACAPES Range Complex. The EIS/OEIS was prepared to renew and combine current regulatory permits and authorizations; address evolving training and testing requirements; update existing analyses with the best available science and most current acoustic analysis methods to evaluate the potential effects of training and testing activities on the marine environment; and obtain those permits and authorizations necessary to support force structure changes and emerging and future training and testing requirements, including those associated with the introduction of new ships, aircraft, and weapon systems (U.S. Navy 2018b).

In its November 2013 Record of Decision (ROD), the U.S. Navy selected to implement the EIS/OEIS Proposed Action Alternative 2, which added additional types of training and testing activities, adjusted the location and levels of current activities, and allowed for range enhancements and infrastructure requirements (U.S. Navy 2018b). The Atlantic Fleet Training and Testing EIS/OEIS will be renewed every 5 years; the current phase covers years 2019 to 2024. The U.S. Navy released the Atlantic Fleet Training and Testing Final EIS/OEIS in September 2018 (U.S. Navy 2018b).

Launch vehicles discussed in the Atlantic Fleet Training and Testing EIS/OEIS include booster drops and missile flights within the flight corridor used for JFC.

5.4.6.3 Cumulative Impact Analysis

There have been and will continue to be several missile flight tests within the same or part of the same BOA as JFC. These flight tests use boosters and launch vehicles smaller, comparable, and larger than the JFC AUR. As described in **Section 4.1.2.2**, the JFC AUR is relatively small and on a global scale the level of emissions from the STARS booster (JFC surrogate) would not be statistically significant. Because the emissions of hydrogen chloride, aluminum oxide, and nitrogen oxides from up to six launches per year of a JFC AUR would be relatively small, the air volume over which these emissions are spread is large, the emissions are dispersed by stratospheric winds, and the lengths of time between discrete launches similar in size to the JFC are measured in weeks, these missile flight tests within the BOA flight corridor would not have a significant cumulative impact. Therefore, cumulative impacts from the JFC flight test and the other evaluated flight tests would not be expected to have a significant impact on the upper atmosphere or stratospheric ozone depletion.

Impacts to biological resources within the BOA for the referenced missile flight tests were not identified as being significant. The potential for impacts from noise or direct contact from boosters or other missile components was extremely low given the size of the area, the size of missile components, and the low densities of marine mammals across the corridor. The JFC flight test is not expected to significantly impact marine biological resources, and no interactions between this and past, present, or future actions have been identified. The potential for impacts from noise or direct contact from boosters or payload components for the JFC action is extremely low given the size of the area, the size of components, and the low densities of marine organisms across the BOA. No interactions that would produce cumulative effects for biological resources are expected.

There are no significant impacts anticipated on the BOA from hazardous materials and wastes for the JFC flight test. No other activities have been identified within the BOA that would combine or interact with the JFC flight test to result in cumulative impacts related to hazardous materials and wastes.

6.0 Other Considerations Required by NEPA

6.1 Consistency with Other Federal, State, and Local Laws, Plans, Policies, and Regulations

In accordance with 40 CFR Section 1502.16(c), analysis of environmental consequences shall include discussion of possible conflicts between the Proposed Action and the objectives of federal, regional, state, and local land use plans, policies, and controls. **Table 6-1** identifies the principal federal and state laws and regulations that are applicable to the Proposed Action and indicates if the Proposed Action would comply with these laws and regulations.

6.1.1 Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (EO 12898)

An Environmental Justice analysis is included in this document to comply with the intent of EO 12898, and U.S. Army and DOD guidance. The EO states that “each Federal agency shall make achieving environmental justice part of its 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, the EO requires that minority and low-income populations be given access to information and opportunities to provide input to decision making on federal actions.

This EA/OEA has identified no human health or environmental effects by the Proposed Action that would result in disproportionately high or adverse effect on minority or low income-populations in the locations evaluated. This analysis was bolstered by using the EPA’s EJSCREEN tool to determine how each selected location’s environmental and demographic indicators (EJ indexes) compared nationally. The Proposed Action activities also would be conducted in a manner that would not exclude persons from participating in, deny persons the benefits of, or subject persons to discrimination because of their race, color, national origin, or socioeconomic status.

6.1.2 Federal Actions to Address Protection of Children from Environmental Health Risks and Safety Risks (EO 13045, as Amended by EO 13229 and 13296)

This EA/OEA has not identified any environmental health and safety risks that may disproportionately affect children, in compliance with EO 13045, as amended by EO 13229 and 13296.

Table 6-1. Principal Federal and State Laws Applicable to the Proposed Action

Federal, State, Local, and Regional Land Use Plans, Policies, and Controls	Status of Compliance
National Environmental Policy Act (NEPA) (42 USC Section 4321 et seq.); CEQ NEPA implementing regulations (40 CFR Parts 1500-1508); Army Procedures for Implementing NEPA (32 CFR Part 651)	Compliant
Clean Air Act (42 USC Section 7401 et seq.)	Compliant
Clean Water Act (33 USC Section 1251 et seq.)	Compliant
Coastal Zone Management Act (16 USC Section 1451 et seq.)	Compliant
National Historic Preservation Act (Section 106, 16 USC Section 470 et seq.)	Compliant
Endangered Species Act (16 USC Section 1531 et seq.)	Compliant
Marine Mammal Protection Act (16 USC Section 1361 et seq.)	Compliant
Migratory Bird Treaty Act (16 USC Sections 703-712)	Compliant
Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (16 USC Section 1801 et seq.)	Compliant
U.S. Public Law 108-188, Compact of Free Association Amendments Act of 2003	Compliant
Executive Order 11988, Floodplain Management	Compliant
Executive Order 12088, Federal Compliance with Pollution Control Standards	Compliant
Executive Order 12114, Environmental Effects Abroad of Major Federal Actions	Compliant
Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations	Compliant
Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks	Compliant
Executive Order 13089, Coral Reef Protection	Compliant
Executive Order 13990, Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis	Compliant
Executive Order 13175, Consultation and Coordination with Indian Tribal Governments	Compliant

6.2 Coastal Zone Management

The federal CZMA of 1972 establishes a federal–state partnership to provide for the comprehensive management of coastal resources. Coastal states and territories develop site-specific coastal management programs based on enforceable policies and mechanisms to balance resource protection and coastal development needs. Under the Act, federal activity in, or affecting, a coastal zone requires preparation of a Coastal Zone Consistency Determination or a Negative Determination. Any federal agency proposing to conduct or support an activity within or outside the coastal zone that will affect any land or water use or natural resource of the coastal zone is required to do so in a manner consistent with the CZMA or applicable state coastal zone program to the maximum extent practicable.

If the proposed federal activity affects coastal resources or uses beyond the boundaries of the federal property (i.e., has spillover effects), the CZMA Section 307 federal consistency requirement applies. As a federal agency, the U.S. Army is required to determine whether its proposed activities would affect the coastal zone. This takes the form of either a Negative Determination or a Consistency Determination.

The analysis within this EA/OEA has not identified any coastal resources that would be impacted as a result of the Proposed Action at any of the four proposed locations. All potential actions to be taken for the JFC would occur on existing federal property with NEPA documentation to support operations and flight testing.

Military testing and training at PMRF have been included in a list of U.S. Navy de minimis activities under the CZMA (U.S. Navy 2019a). The Hawai`i CZM program determined the listed activities "are expected to have insignificant direct or indirect (cumulative and secondary) coastal effects and should not be subject to further review by the Hawai`i CZM program" (U.S. Navy 2019a). Because the JFC Proposed Action does not encompass new ground-breaking activities at PMRF, and based on the existing NEPA documentation for other similar actions (U.S. Navy 2008, DOE 2019), it has been determined that no coastal resources would be impacted as a result of this Proposed Action.

The 2019 WFF Site-wide Programmatic EIS (NASA 2019) Appendix G provides the Commonwealth of Virginia with NASA's Consistency Determination under Coastal Zone Management Act Section 307(c)(1) and Title 15 CFR Part 930, Subpart C, for implementation of the Proposed Actions analyzed in the NASA WFF Site-wide PEIS. The information in this Consistency Determination is provided pursuant to 15 CFR Section 930.39. The actions described in this JFC EA/OEA could be covered under the existing Consistency Determination. However, since this action would not result in new ground-breaking activities, and there were no coastal resources identified in this EA/OEA that would be impacted as a result of the Proposed Action, and with existing NEPA documentation to support operations and flight testing (NASA 2017, U.S. Navy 2018b, NASA 2019), association with the existing Consistency Determination would be unnecessary.

Based on discussions with VSFB representatives, a Negative Determination under the CZMA will be submitted to the California Coastal Commission. Until this action takes place, and concurrence is received from the California Coastal Commission, VSFB is not included in the Preferred Alternative.

The Florida Coastal Management Program was approved by NOAA in 1981 and is codified in Chapter 380, Part II, Florida Statutes. Florida's Coastal Management Program, executed by the Florida Department of Environmental Protection, oversees activities occurring in or affecting the coastal zone and is based on a network of agencies implementing 24 statutes protecting coastal resources. The federal consistency review for proposals in Florida is coordinated through the

Florida State Clearinghouse (FAA 2019). Florida's coastal zone is the area encompassed by the entire state and its territorial seas (FAA 2019). The seaward boundary extends 4.8 km (3 mi) into the Atlantic Ocean (FAA 2019). According to the most recent CCSFS INRMP (USAF 2020b), new facility development or construction along the Atlantic Coast has the largest potential for affecting coastal resources. Because the JFC Proposed Action is a federal undertaking, a federal consistency review will be pursued through the Florida State Clearinghouse. The Consistency Determination for CCSFS is included as **Appendix C**. Results of the Florida Clearinghouse review are included in **Appendix C**.

6.3 Relationship Between Short-Term Use of the Environment and Long-Term Productivity

NEPA requires an analysis of the relationship between a project's short-term impacts on the environment and the effects that these impacts may have on the maintenance and enhancement of the long-term productivity of the affected environment. Impacts that narrow the range of beneficial uses of the environment are of concern. This refers to the possibility that choosing one site reduces future flexibility in pursuing other options, or that using a parcel of land or other resources often eliminates the possibility of other uses at that site.

The short-term impacts of the JFC flight tests documented in this EA/OEA are negligible in their potential impacts to the environment. Therefore, the potential for impacts on the maintenance of the affected environment and the long-term productivity of the affected environment is negligible as well. No Proposed Actions would degrade beneficial uses of the local environments analyzed in this EA/OEA.

7.0 References

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9.0 Distribution List

The following were sent a copy of the Draft EA/OEA and the Draft FONSI/FONSH:

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A

Agency Correspondence

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DEPARTMENT OF THE ARMY
ARMY RAPID CAPABILITIES AND CRITICAL TECHNOLOGIES OFFICE
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REDSTONE ARSENAL, AL 35898

SAAL-RCH-T 14 August 2020

From: Army Hypersonic Project Office and U.S. Navy Conventional Prompt Strike Program Office

To: National Aeronautics and Space Administration, Wallops Flight Facility, Wallops Island, Virginia (Attn: Ms. Sheri Miller, Environmental Planning Lead)

Subj: COOPERATING AGENCY FOR JOINT FLIGHT CAMPAIGN PROGRAMMATIC LAND-BASED ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT

Encl: (1) JFC Programmatic Land-Based Project Schedule

1. U.S. Navy Strategic Systems Programs (SSP) and U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) are preparing a Programmatic Environmental Assessment (EA)/Overseas Environmental Assessment (OEA) to evaluate potential environmental impacts from the proposed testing of the Joint Flight Campaign (JFC). The Programmatic JFC Program is supported by the Office of the Under Secretary of Defense for Research and Engineering Department and is separated by land-based and sea-based launches. The National Aeronautics and Space Administration's (NASA) Wallops Flight Facility (WFF) has been identified as a potential launch site for the JFC flight test. Per 40 CFR Part 1501 and Council on Environmental Quality Cooperating Agency guidance, SSP and RCCTO requests NASA WFF to participate as a Cooperating Agency for the development of the JFC Programmatic Land-Based EA/OEA.

2. The Proposed Action consists of up to six flight test launches at up to five different launch locations per year over the next 10 years, beginning in FY 2022. The launch locations which meet screening criteria are as follows: Pacific Missile Range Facility (PMRF) at the Sandia National Laboratories/Kauai Test Facility (SNL/KTF), WFF, Vandenberg Air Force Base (VAFB), and Cape Canaveral Air Force Station (CCAFS). The Proposed Action is to perform land-based tests to prove that the Navy Conventional Prompt Strike (CPS) weapon system and the Army Long Range Hypersonic Weapon (LRHW) system meet performance requirements within the capabilities of the All Up Round (AUR) missile, which is used by both systems.

3. No direct writing or analysis by NASA WFF will be required. SSP and RCCTO will take the following actions to support interagency cooperation with NASA WFF:

a. Request your review of draft EA/OEA and related National Environmental Policy Act (NEPA) documentation such as the Finding of No Significant Impact and biological consultation documents.

b. Invite you to JFC Programmatic Land-Based environmental planning meetings and confer with your staff on regulatory agency consultations, including consultations that directly affect NASA WFF.

c. Include information within environmental documents that NASA WFF may need to meet its environmental responsibilities such as mitigation, permits and consultations for NASA WFF facilities and properties that would support the JFC Programmatic Land-Based flight tests.

4. As a Cooperating Agency, SSP and RCCTO requests NASA WFF support SSP and RCCTO in the following:

a. Provide reviews and comments throughout the EA/OEA process, to include working drafts of the EA/OEA and other ancillary documents such as biological consultation documents.

b. Participate in meetings to discuss EA/OEA related issues.

c. Respond to SSP and RCCTO requests for information.

d. Assist SSP and RCCTO in determining appropriate avoidance, minimization, and mitigation measures to incorporate into environmental documentation and permit applications.

e. Adhere to the overall schedule as set forth by SSP and RCCTO. Enclosure (1) provides the current JFC Programmatic Land-Based Project Schedule identifying project milestones.

f. Provide formal, written response to this request, agreeing to the support listed in subparagraphs 4.a through 4.f.

5. The U.S. Navy and U.S. Army views its relationship with NASA WFF as important to the successful completion of the NEPA process for the JFC Programmatic Land-Based EA/OEA. It is the Navy's and Army's goal to complete the NEPA process as expeditiously as possible, and firmly believe that establishing a formal Cooperating Agency relationship with NASA WFF will help attain this goal. Should NASA WFF elect not to participate as a Cooperating Agency, the Navy and Army welcome NASA WFF's informal participation in the environmental planning process.

6. The SSP technical Point of Contact (POC) for this action is Mr. Fred Chamberlain, (202) 433-7141, SP2016l@ssp.navy.mil. Legal POC is Mr. Jeremy Cohn, (202) 433-9773, Jeremy.Cohn@ssp.navy.mil. Environmental POC is Mr. David Fuller, U.S. Army Space & Missile Defense Command (USASMDC), (256) 425-2016, david.g.fuller6.civ@mail.mil.

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Henry W. McElreath

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Milesha Grier
Test Execution Manager and Principal Assistant PM for Test & Evaluation (Acting)
Conventional Prompt Strike Program Office

DEPARTMENT OF THE ARMY
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SAAL-RCH-T 14 August 2020

From: Army Hypersonic Project Office and U.S. Navy Conventional Prompt Strike Program Office

To: Vandenberg Air Force Base, 30th Civil Engineer Squadron/CEIEA
(Attn: Ms. Samantha Kaisersatt, Environmental Planner)
1028 Iceland Ave., Vandenberg AFB, CA 93437

Subj: COOPERATING AGENCY FOR JOINT FLIGHT CAMPAIGN PROGRAMMATIC LAND-BASED ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT

Encl: (1) JFC Programmatic Land-Based Project Schedule

1. U.S. Navy Strategic Systems Programs (SSP) and U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) are preparing a Programmatic Environmental Assessment (EA)/Overseas Environmental Assessment (OEA) to evaluate potential environmental impacts from the proposed testing of the Joint Flight Campaign (JFC). The Programmatic JFC Program is supported by the Office of the Under Secretary of Defense for Research and Engineering Department and is separated by land-based and sea-based launches. Vandenberg Air Force Base (VAFB) provides technology development support for the program and launch facilities. Per 40 CFR Part 1501 and Council on Environmental Quality Cooperating Agency guidance, SSP and RCCTO requests VAFB participate as a Cooperating Agency for the development of the JFC Programmatic Land-Based EA/OEA.

2. The Proposed Action consists of up to six flight test launches at up to five different launch locations per year over the next 10 years, beginning in FY 2022. The launch locations which meet screening criteria are as follows: Pacific Missile Range Facility (PMRF) at the Sandia National Laboratories/Kauai Test Facility (SNL/KTF), Wallops Flight Facility (WFF), Vandenberg Air Force Base (VAFB), and Cape Canaveral Air Force Station (CCAFS). The Proposed Action is to perform land-based tests to prove that the Navy Conventional Prompt Strike (CPS) weapon system and the Army Long Range Hypersonic Weapon (LRHW) system meet performance requirements within the capabilities of the All Up Round (AUR) missile, which is used by both systems.

3. No direct writing or analysis by VAFB will be required. SSP and RCCTO will take the following actions to support interagency cooperation with VAFB:

a. Request your review of draft EA/OEA and related National Environmental Policy Act (NEPA) documentation such as the Finding of No Significant Impact and biological consultation documents.

b. Invite you to JFC Programmatic Land-Based environmental planning meetings and confer with your staff on regulatory agency consultations, including consultations that directly affect VAFB.

c. Include information within environmental documents that VAFB may need to meet its environmental responsibilities such as mitigation, permits and consultations for VAFB facilities and properties that would support the JFC Programmatic Land-Based flight tests.

4. As a Cooperating Agency, SSP and RCCTO requests VAFB support SSP and RCCTO in the following:

a. Provide reviews and comments throughout the EA/OEA process, to include working drafts of the EA/OEA and other ancillary documents such as biological consultation documents.

b. Participate in meetings to discuss EA/OEA related issues.

c. Respond to SSP and RCCTO requests for information.

d. Assist SSP and RCCTO in determining appropriate avoidance, minimization, and mitigation measures to incorporate into environmental documentation and permit applications.

e. Adhere to the overall schedule as set forth by SSP and RCCTO. Enclosure (1) provides the current JFC Programmatic Land-Based Project Schedule identifying project milestones.

f. Provide formal, written response to this request, agreeing to the support listed in subparagraphs 4.a through 4.f.

5. The U.S. Navy and U.S. Army views its relationship with VAFB as important to the successful completion of the NEPA process for the JFC Programmatic Land-Based EA/OEA. It is the Navy's and Army's goal to complete the NEPA process as expeditiously as possible, and firmly believe that establishing a formal Cooperating Agency relationship with VAFB will help attain this goal. Should VAFB elect not to

participate as a Cooperating Agency, the Navy and Army welcome VAFB's informal participation in the environmental planning process.

6. The SSP Technical Point of Contact (POC) for this action is Mr. Fred Chamberlain, (202) 433-7141, SP20161 @ ssp.navy.mil. Legal POC is Mr. Jeremy Cohn, (202) 433-9773, Jeremy.Cohn@ssp.navy.mil. Environmental POC is Mr. David Fuller, U.S. Army Space & Missile Defense Command (USASMDC), (256) 425-2016, david.g.fuller6.civ@mail.mil.

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SAAL-RCH-T 14 August 2020

From: Army Hypersonic Project Office and U.S. Navy Conventional Prompt Strike Program Office

To: Cape Canaveral Air Force Station, 45th SW Environmental and Naval Ordnance Test Unit, (Attn: Eva Long, NEPA Specialist)

Subj: COOPERATING AGENCY FOR JOINT FLIGHT CAMPAIGN PROGRAMMATIC LAND-BASED ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT

Encl: (1) JFC Programmatic Land-Based Project Schedule

1. U.S. Navy Strategic Systems Programs (SSP) and U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) are preparing a Programmatic Environmental Assessment (EA)/Overseas Environmental Assessment (OEA) to evaluate potential environmental impacts from the proposed testing of the Joint Flight Campaign (JFC). The Programmatic JFC Program is supported by the Office of the Under Secretary of Defense for Research and Engineering Department and is separated by land-based and sea-based launches. Cape Canaveral Air Force Station (CCAFS) provides technology development support for the program and launch facilities. Per 40 CFR Part 1501 and Council on Environmental Quality Cooperating Agency guidance, SSP and RCCTO requests CCAFS participate as a Cooperating Agency for the development of the JFC Programmatic Land-Based EA/OEA.

2. The Proposed Action consists of up to six flight test launches at up to five different launch locations per year over the next 10 years, beginning in FY 2022. The launch locations which meet screening criteria are as follows: Pacific Missile Range Facility (PMRF) at the Sandia National Laboratories/Kauai Test Facility (SNL/KTF), Wallops Flight Facility (WFF), Vandenberg Air Force Base (VAFB), and Cape Canaveral Air Force Station (CCAFS). The Proposed Action is to perform land-based tests to prove that the Navy Conventional Prompt Strike (CPS) weapon system and the Army Long Range Hypersonic Weapon (LRHW) system meet performance requirements within the capabilities of the All Up Round (AUR) missile, which is used by both systems.

3. No direct writing or analysis by CCAFS will be required. SSP and RCCTO will take the following actions to support interagency cooperation with CCAFS:

a. Request your review of draft EA/OEA and related National Environmental Policy Act (NEPA) documentation such as the Finding of No Significant Impact and biological consultation documents.

b. Invite you to JFC Programmatic Land-Based environmental planning meetings and confer with your staff on regulatory agency consultations, including consultations that directly affect CCAFS.

c. Include information within environmental documents that CCAFS may need to meet its environmental responsibilities such as mitigation, permits and consultations for CCAFS facilities and properties that would support the JFC Programmatic Land-Based flight tests.

4. As a Cooperating Agency, SSP and RCCTO requests CCAFS support SSP and RCCTO in the following:

a. Provide reviews and comments throughout the EA/OEA process, to include working drafts of the EA/OEA and other ancillary documents such as biological consultation documents.

b. Participate in meetings to discuss EA/OEA related issues.

c. Respond to SSP and RCCTO requests for information.

d. Assist SSP and RCCTO in determining appropriate avoidance, minimization, and mitigation measures to incorporate into environmental documentation and permit applications.

e. Adhere to the overall schedule as set forth by SSP and RCCTO. Enclosure (1) provides the current JFC Programmatic Land-Based Project Schedule identifying project milestones.

f. Provide formal, written response to this request, agreeing to the support listed in subparagraphs 4.a through 4.f.

5. The U.S. Navy and U.S. Army views its relationship with CCAFS as important to the successful completion of the NEPA process for the JFC Programmatic Land-Based EA/OEA. It is the Navy's and Army's goal to complete the NEPA process as expeditiously as possible, and firmly believe that establishing a formal Cooperating Agency relationship with CCAFS will help attain this goal. Should CCAFS elect not to

participate as a Cooperating Agency, the Navy and Army welcome CCAFS's informal participation in the environmental planning process.

6. The SSP Technical Point of Contact (POC) for this action is Mr. Fred Chamberlain, (202) 433-7141, SP20161 @ ssp.navy.mil. Legal POC is Mr. Jeremy Cohn, (202) 433-9773, Jeremy.Cohn@ssp.navy.mil. Environmental POC is Mr. David Fuller, U.S. Army Space & Missile Defense Command (USASMDC), (256) 425-2016, david.g.fuller6.civ@mail.mil.

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SAAL-RCH-T 14 August 2020

From: Army Hypersonic Project Office and U.S. Navy Conventional Prompt Strike Program Office

To: Department of Energy, National Nuclear Security Administration, Sandia Field Office, (Attn: Ms. Susan Lacy, Environmental Team Lead)

Subj: COOPERATING AGENCY FOR JOINT FLIGHT CAMPAIGN PROGRAMMATIC LAND-BASED ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT

Encl: (1) JFC Programmatic Land-Based Project Schedule

1. U.S. Navy Strategic Systems Programs (SSP) and U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) are preparing a Programmatic Environmental Assessment (EA)/Overseas Environmental Assessment (OEA) to evaluate potential environmental impacts from the proposed testing of the Joint Flight Campaign (JFC). The Programmatic JFC Program is supported by the Office of the Under Secretary of Defense for Research and Engineering Department and is separated by land-based and sea-based launches. DOE NNSA SFO provides technology development support for the program and launch facilities. Per 40 CFR Part 1501 and Council on Environmental Quality Cooperating Agency guidance, SSP and RCCTO requests DOE NNSA SFO participate as a Cooperating Agency for the development of the JFC Programmatic Land-Based EA/OEA.

2. The Proposed Action consists of up to six flight test launches at up to five different launch locations per year over the next 10 years, beginning in FY 2022. The launch locations which meet screening criteria are as follows: Pacific Missile Range Facility (PMRF) at the Sandia National Laboratories/Kauai Test Facility (SNL/KTF), Wallops Flight Facility (WFF), Vandenberg Air Force Base (VAFB), and Cape Canaveral Air Force Station (CCAFS). The Proposed Action is to perform land-based tests to prove that the Navy Conventional Prompt Strike (CPS) weapon system and the Army Long Range Hypersonic Weapon (LRHW) system meet performance requirements within the capabilities of the All Up Round (AUR) missile, which is used by both systems.

3. No direct writing or analysis by DOE NNSA SFO will be required. SSP and RCCTO will take the following actions to support interagency cooperation with DOE NNSA SFO:

a. Request your review of draft EA/OEA and related National Environmental Policy Act (NEPA) documentation such as the Finding of No Significant Impact and biological consultation documents.

b. Invite you to JFC Programmatic Land-Based environmental planning meetings and confer with your staff on regulatory agency consultations, including consultations that directly affect DOE NNSA SFO.

c. Include information within environmental documents that DOE NNSA SFO may need to meet its environmental responsibilities such as mitigation, permits and consultations for DOE NNSA SFO facilities and properties that would support the JFC Programmatic Land-Based flight tests.

4. As a Cooperating Agency, SSP and RCCTO requests DOE NNSA SFO support SSP and RCCTO in the following:

a. Provide reviews and comments throughout the EA/OEA process, to include working drafts of the EA/OEA and other ancillary documents such as biological consultation documents.

b. Participate in meetings to discuss EA/OEA related issues.

c. Respond to SSP and RCCTO requests for information.

d. Assist SSP and RCCTO in determining appropriate avoidance, minimization, and mitigation measures to incorporate into environmental documentation and permit applications.

e. Adhere to the overall schedule as set forth by SSP and RCCTO. Enclosure (1) provides the current JFC Programmatic Land-Based Project Schedule identifying project milestones.

f. Provide formal, written response to this request, agreeing to the support listed in subparagraphs 4.a through 4.f.

5. The U.S. Navy and U.S. Army views its relationship with DOE NNSA SFO as important to the successful completion of the NEPA process for the JFC Programmatic Land-Based EA/OEA. It is the Navy's and Army's goal to complete the NEPA process as expeditiously as possible, and firmly believe that establishing a formal Cooperating Agency relationship with DOE NNSA SFO will help attain this goal. Should DOE NNSA

SFO elect not to participate as a Cooperating Agency, the Navy and Army welcome DOE NNSA SFO's informal participation in the environmental planning process.

6. The SSP Technical Point of Contact (POC) for this action is Mr. Fred Chamberlain, (202) 433-7141, SP20161 @ ssp.navy.mil. Legal POC is Mr. Jeremy Cohn, (202) 433-9773, Jeremy.Cohn@ssp.navy.mil. Environmental POC is Mr. David Fuller, U.S. Army Space & Missile Defense Command (USASMDC), (256) 425-2016, david.g.fuller6.civ@mail.mil.

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Henry W. McElreath

Henry W. McElreath
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Test Execution Manager and Principal
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Conventional Prompt Strike Program
Office

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND/
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF

May 24, 2021

Cathy Tortorici
Chief, ESA Interagency Cooperation Division
Office of Protected Resources
NOAA's National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910

Re: Consultation for Joint Flight Campaign activities in the Pacific and Atlantic Oceans

Dear Ms. Tortorici:

The United States Army Space and Missile Defense Command (USASMDC) is assisting the United States Department of the Navy (U.S. Navy) Strategic Systems Programs and the U.S. Army Rapid Capabilities and Critical Technologies Office, the Action Proponents, in evaluating the effects of the proposed Joint Flight Campaign (JFC) (Proposed Action). The Proposed Action involves up to six flight test launches from up to four different launch locations per year, over the next 10 years. After launch, tests would include vehicle flight over the Pacific and/or Atlantic Oceans and would involve splashdown of spent boosters and payload impact in the broad ocean area (BOA). The proposed JFC Action is evaluated in a programmatic context to provide an analysis of multiple launch locations that will be available to the U.S. Navy and U.S. Army test directorates over the next 10 years. It is anticipated that this evaluation will support foreseeable future JFC Program test decisions.

The Action Proponents have prepared a Biological Evaluation to evaluate the effects of the Proposed Action on marine species listed as endangered or threatened under the Endangered Species Act (ESA) and on designated critical habitat in the Action Area. The Action Proponents and USASMDC have prepared this evaluation in coordination with cooperating agencies at proposed launch installations including the Department of Energy, the National Aeronautics and Space Administration, the U.S. Air Force 30th Space Wing, and the U.S. Air Force 45th Space Wing.

JFC vehicle launch would occur at one of four installations: (1) Pacific Missile Range Facility, Kauai, Hawaii; (2) Vandenberg Air Force Base, California; (3) Wallops Flight Facility, Virginia; and (4) Cape Canaveral Space Force Station (CCSFS), Florida. All launches would take place at existing launch facilities at these installations. The Action Proponents have determined there would be no effect on ESA-listed marine species or designated critical habitats at or in nearshore waters at Vandenberg Air Force Base and Wallops Flight Facility due to proposed activities. The Action Proponents have also determined that the potential effects of JFC launch-related activities on ESA-listed marine species at or in nearshore waters at CCSFS are encompassed by existing programmatic Section 7 consultation coverage for pre-launch operations, launch activities, and post-test operations at CCSFS as described in the enclosed Biological Evaluation. Therefore, the enclosed Biological Evaluation evaluates the potential effects of proposed JFC activities on marine ESA-listed species only at Pacific Missile Range Facility and in the BOA portion of the Action Area in the Pacific and Atlantic Oceans.

As described in the enclosed JFC Biological Evaluation, a number of ESA-listed species under the jurisdiction of the National Marine Fisheries Service occur or have the potential to occur in the Action Area. Based on analyses of all the potential stressors resulting from the Proposed Action, the Action Proponents have determined that the Proposed Action may affect but is not likely to adversely affect the ESA-listed species considered in the Biological Evaluation. Twenty three marine species may be, but are not likely to be adversely affected by the Proposed Action : sei whales (*Balaenoptera borealis*), blue whales (*Balaenoptera musculus*), fin whales (*Balaenoptera physalus*), North Atlantic right whales (*Eubalaena glacialis*), North Pacific right whales (*Eubalaena japonica*), humpback whales (*Megaptera novaeangliae*), sperm whales (*Physeter macrocephalus*), false killer whales (*Pseudorca crassidens*), Guadalupe fur seals (*Arctocephalus townsendi*), Hawaiian monk seals (*Neomonachus schauinslandi*), loggerhead sea turtles (*Caretta caretta*), green sea turtles (*Chelonia mydas*), leatherback sea turtles (*Dermochelys coriacea*), hawksbill sea turtles (*Eretmochelys imbricata*), Kemp's ridley sea turtles (*Lepidochelys kempii*), olive ridley sea turtles (*Lepidochelys olivacea*), Atlantic sturgeon (*Acipenser oxyrinchus oxyrinxhus*), oceanic whitetip sharks (*Carcharhinus longimanus*), giant manta rays (*Manta birostris*), coho salmon (*Oncorhynchus kisutch*), steelhead (*Oncorhynchus mykiss*), chinook salmon (*Oncorhynchus tshawytscha*), and scalloped hammerhead sharks (*Sphyrna lewini*).

Several designated critical habitats for ESA-listed species also occur in or near the Action Area. The Action Proponents have concluded that the Proposed Action may affect but is not likely to adversely affect designated critical habitat for the Central America DPS of humpback whales, for the Mexico DPS of humpback whales, for leatherback sea turtles, and designated *Sargassum* critical habitat for loggerhead sea turtles.

Our supporting analysis is provided in the enclosed Biological Evaluation. We request initiation of informal consultation under Section 7 of the ESA and request your written concurrence if you agree with our determinations.

Please contact David Fuller in my office, USASMDC Environmental Division, regarding this consultation request at 256-955-5585 or david.g.fuller6.civ@mail.mil.

Sincerely,

HILL.WELDON.H.JR.1216862682 Digitally signed by HILL.WELDON.H.JR.1216862682
Date: 2021.05.24 09:48:47 -05'00'

Weldon H. Hill, Jr.
Deputy Chief of Staff for Engineering
U.S. Army Space and Missile Defense Command

Enclosure: Marine Biological Evaluation for the Joint Flight Campaign

From:	Fuller, David G CIV USARMY SMDC (USA)
To:	jason.aldridge@dos.myflorida.com
Cc:	Hasley, David C CIV USARMY SMDC (USA)
Subject:	JFC EA Letter and NOA for FL SHPO
Date:	Friday, June 11, 2021 1:44:02 PM
Attachments:	CCSFS SHPO Letter 11Jun2021a.pdf Notice of Availability - JFC Draft EAOEA_11Jun2021.pdf

Mr. Aldridge,

The attached letter requests concurrence on a “no adverse effect” determination for National Register of Historic Places (NRHP) listed and eligible sites at Cape Canaveral Space Force Station (CCSFS). Due to the large size of the file, the associated Joint Flight Campaign (JFC) Draft Environmental Assessment/Overseas Environmental Assessment is available from the JFC web site atCaution-https://jfceaoea.govsupport.us/ < Caution-https://jfceaoea.govsupport.us/ >

Thank you,
David

David Fuller
NEPA Program Manager
Environmental Division/NEPA Branch
U.S. Army Space & Missile Defense Command
Redstone Arsenal, AL
(c) 256.425.2016

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF

June 11, 2021

Florida Division of Historical Resources
And State Historic Preservation Officer
Attn: Jason Aldridge, Supervisor of
Federal and State Compliance Review
500 South Bronough Street
R.A. Gray Building, Room 305
Tallahassee, Florida 32399-0250

SUBJECT: NATIONAL HISTORIC PRESERVATION ACT SECTION 106 CONSULTATION FOR JOINT FLIGHT CAMPAIGN (JFC) FLIGHT TESTS FROM CAPE CANAVERAL SPACE FORCE STATION (CCSFS)

Dear Mr. Aldridge:

The United States Army Space and Missile Defense Command (USASMDC) is assisting the United States Department of the Navy (U.S. Navy) Strategic Systems Programs and the U.S. Army Rapid Capabilities and Critical Technologies Office, the Action Proponents, in evaluating the effects of the proposed JFC flight tests (Proposed Action). Cooperating Agencies include the Department of Energy, the National Aeronautics and Space Administration, the U.S. Air Force Space Launch Delta 30, and the U.S. Air Force Space Launch Delta 45. The Action Proponents request your concurrence on a "no adverse effect" determination for National Register of Historic Places (NRHP) listed and eligible sites at CCSFS.

The Action Proponents are preparing a Programmatic Environmental Assessment/Overseas Environmental Assessment (PEA/OEA) in accordance with the National Environmental Policy Act (NEPA) (42 United States Code 4321, as amended), the Council on Environmental Quality Regulations for Implementing the Procedural Provisions of NEPA (Title 40 Code of Federal Regulations [CFR] Parts 1500-1508, 1978, July 1, 1986), the Department of the Army Procedures for Implementing NEPA (32 CFR Part 651), the Department of the Air Force Procedures for Implementing NEPA (32 CFR Part 989), Chief of Naval Operations Instruction 5090.1E, and Executive Order 12114, Environmental Effects Abroad of Major Federal Actions.

The proposed JFC action is evaluated in a programmatic context to provide an analysis of multiple launch locations that will be available to the U.S. Navy and U.S. Army test directorates over the next 10 years. The Proposed Action involves up to six flight test launches from up to four different launch locations per year, over the next 10 years. After launch, tests would include vehicle flight over the Pacific and/or Atlantic Oceans and would involve splashdown of spent boosters and payload impact in the broad ocean area (BOA).

Through the environmental assessment process, the Action Proponents have come to the determination that the launching of up to six JFC weapon system tests annually over the next 10 years would result in negligible impacts to NRHP-listed and eligible sites at CCSFS. The Action Proponents would arrange to transport the rocket motors via truck or military aircraft to CCSFS. Once unloaded they would be placed in either the Trident Magazines or the Missile Assemble and Checkout Area (MACA) Complex. Prior to launch from Launch Complex-46 (LC-46), routine launch support activities would take place. All activities would use existing facilities and infrastructure systems. The existing Mobile Support Structure (MSS) at LC-46 may require modifications to better control the environmental conditions. Once ready for assembly, the motors, which would be pre-loaded with solid propellant, would be transferred to LC-46. At LC-46, the JFC weapon system would be erected on the launch pad in the preferred launch configuration. No fueling activities would occur at LC-46. Once the vehicles are in place on the launch pad, a series of system and operational tests would be performed to ensure launch preparedness. Upon successful completion of these tests, the vehicle would be cleared for launch. The Morrell Operations Center would be used for launch command by appropriate JFC project personnel.

Numerous NRHP-listed and eligible historic sites, as well as National Historic Landmarks, are located at CCSFS, as described in *the Integrated Cultural Resource Management Plan 2015-2019: Volume 1. Cape Canaveral Air Force Station, Patrick Air Force Base, Malabar Transmitter Annex, and Jonathan Dickinson Missile Tracking*. However, the launch support facilities to be used as part of the Proposed Action are not listed or eligible for listing on the NRHP. According to *the Federal Aviation Administration (FAA) 2008 Environmental Assessment for Space Florida Launch Site Operator License at Launch Complex-46*, and the *FAA 2010 Final Supplemental Environmental Assessment to the September 2008 Environmental Assessment for Space Florida Launch Site Operator License*, LC-46 and its launch support locations do not contain a historic or tribal site of significance.

In the extremely unlikely event that an anomalous test event happens, and historic structures were identified as part of a response activity, the Florida State Historic Preservation Office would be notified and appropriate mitigations measures would be implemented in accordance with the National Historic Preservation Act. During the potential MSS modifications at LC-46, the 45 SW Cultural Resource Manager would work with the State Historic Preservation Office should unexpected discoveries occur, and project re-commencement would only be authorized once the State Historic Preservation Office clears the site.

We appreciate your review of this Proposed Action of JFC flight test launches from CCSFS. Please contact David Fuller, USASMDC Environmental Division, regarding this consultation request at (256)-425-2016 or david.g.fuller6.civ@mail.mil.

Sincerely,

HASLEY.DAVID.C.1230984308 Digitally signed by HASLEY.DAVID.C.1230984308 Date: 2021.06.11 12:42:31 -05'00'

Weldon H. Hill, Jr.
Deputy Chief of Staff for Engineering
U.S. Army Space and Missile Defense Command

Enclosure:
Draft Joint Flight Campaign Programmatic Environmental Assessment/Overseas Environmental Assessment Notice of Availability

Notice of Availability
Joint Flight Campaign (JFC)
Draft Programmatic Environmental Assessment/Overseas Environmental Assessment (PEA/OEA)

The Proposed Action, Joint Flight Campaign (JFC), is sponsored by the Office of the Under Secretary of Defense for Research and Engineering and by the United States Department of the Army (U.S. Army). These agencies have designated the United States Department of the Navy (U.S. Navy) Strategic Systems Programs (SSP) and the U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) as the lead agencies for the Proposed Action. The U.S. Army RCCTO, the U.S. Navy SSP, and the United States Army Space and Missile Defense Command (USASMDC), as Participating Agencies, along with the Department of Energy, the National Aeronautics and Space Administration (NASA), the U.S. Air Force 30th Space Wing, and the U.S. Air Force 45th Space Wing as Cooperating Agencies, have prepared this PEA/OEA in accordance with the National Environmental Policy Act (NEPA; 42 United States Code 4321, as amended), the Council on Environmental Quality (CEQ) Regulations for Implementing the Procedural Provisions of NEPA (Title 40 Code of Federal Regulations [CFR] Parts 1500-1508, 1978, July 1, 1986), the Department of the Army Procedures for Implementing NEPA (32 CFR Part 651), the Department of the Air Force Procedures for Implementing NEPA (32 CFR Part 989), Chief of Naval Operations Instruction 5090.1E, and Executive Order 12114, Environmental Effects Abroad of Major Federal Actions.

The Proposed Action entails up to six flight test launches at up to four different launch locations per year, over the next 10 years. Test objectives are expected to dictate range selection from Atlantic and Pacific test ranges. Due consideration will be given to existing launch ranges to avoid any unnecessary changes to the environment. The launch range for each test will be determined based on the test objectives, and the availability and technical suitability of the test range. Test scenarios are planned to include broad ocean area (BOA) impacts of the spent stages and the hypersonic payload, and do not include any land-based impacts. This PEA/OEA is being prepared as a Programmatic EA to provide an analysis of multiple launch locations that will be available to the test directorates over the next 10 years. The launch selection process will utilize this PEA/OEA and will include a check of the relevancy of this document to support specific launch scenarios. It is anticipated that this PEA/OEA will support most future decisions; however, tiered NEPA documents could occur if there are significant changes to the proposed missile or facilities at a proposed launch location.

The U.S. Army RCCTO and U.S. Navy SSP determined that four launch locations meet the screening criteria/evaluation factors and the test requirements for vehicle performance and data collection. They also considered the No Action Alternative, as required by the CEQ regulations. There is one launch location on the west coast and one in Hawai`i, both with impact sites in the Pacific Ocean, and two launch locations on the east coast, with impact sites in the Atlantic Ocean. The Pacific locations analyzed are the Pacific Missile Range Facility, Barking Sands, Kauai, Hawai`i; Vandenberg Space Force Base, California; and BOA impact sites in the Pacific Ocean. The east coast locations include the NASA Wallops Flight Facility, Virginia; Cape Canaveral Space Force Station, Florida; and Atlantic BOA impact sites.

The Draft JFC PEA/OEA and Draft Finding of No Significant Impact (FONSI) are available at http://jfceaoea.govsupport.us. Public comments on the Draft JFC PEA/OEA and Draft FONSI will be accepted from **June 11, 2021 to July 10, 2021** and can be provided in either of the following ways: (1) E-mail comments by **July 10, 2021** to jfceaoea@govsupport.us; (2) Mail comments, postmarked no later than **July 10, 2021**, to: USASMDC, ATTN: SMDC-EN (D. Fuller), P.O. Box 1500, Huntsville, AL 35807.

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND/
ARMY FORCES STRATEGIC COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF

Environmental Division 13 July 2021

Florida State Clearinghouse
Florida Department of Environmental Protection
3800 Commonwealth Blvd., M.S. 47
Tallahassee, FL 32399-2400
Attn: Chris Stahl, Coordinator

SUBJECT: Draft Programmatic Environmental Assessment / Overseas Environmental Assessment for the Joint Flight Campaign and Draft Finding of No Significant Impact / Finding of No Significant Harm

Mr. Stahl,

The attached JFC Draft Programmatic EA/OEA and Draft FONSI/FONSH is provided for Florida Clearinghouse review. We provided the document to the public for review from June 11, 2021, to July 10, 2021. The document was also provided to the Florida Division of Historical Resources and State Historic Preservation Officer for review. However, we did not provide the document to your office for review.

The JFC program is launching at an existing active launch site at Cape Canaveral Space Force Station (CX46) already covered by an Environmental Assessment where the FAA was lead agency as noted in the JFC Programmatic EA/OEA. This JFC Programmatic EA/OEA is to cover an additional DoD program at the site that is going to add up to 6 launches per year over a 10-year period. Three additional launch sites, located outside of Florida, are also included in the Programmatic EA/OEA. The proposal does not nvolve new infrastructure or construction at the site. The Coastal Consistency Determination is included as Appendix C of the Programmatic EA/OEA.

We ask for an expedited review if possible.

We appreciate your review of this Proposed Action of JFC flight test launches from CCSFS. Please contact David Fuller, USASMDC Environmental Division, regarding this consultation request at (256)-425-2016 or david.g.fuller6.civ@mail.mil.

The documents are also available on the internet at http://jfceaoea.govsupport.us.

Enclosure

National Environmental Policy Act, 42 U.S.C. §§ 4321-4347, as amended.

The Florida Fish and Wildlife Conservation Commission has reviewed the proposed action and independently submitted comments for your consideration. These have been attached to this letter and are incorporated hereto.

If prehistoric or historic artifacts, such as pottery or ceramics, projectile points, dugout canoes, metal implements, historic building materials, or any other physical remains that could be associated with Native American, early European, or American settlement are encountered at any time within the project site area, the permitted project shall cease all activities involving subsurface disturbance in the vicinity of the discovery. The applicant shall contact the Florida Department of State, Division of Historical Resources, Compliance Review Section at (850)-245-6333. Project activities shall not resume without verbal and/or written authorization. In the event that unmarked human remains are encountered during permitted activities, all work shall stop immediately and the proper authorities notified in accordance with Section 872.05, Florida Statutes.

Based on the information submitted and minimal project impacts, the state has no objections to the subject project and, therefore, it is consistent with the Florida Coastal Management Program (FCMP). Thank you for the opportunity to review the proposed plan. If you have any questions or need further assistance, please don't hesitate to contact me at (850) 717-9076.

Sincerely,

Chris Stahl

Chris Stahl, Coordinator
Florida State Clearinghouse
Florida Department of Environmental Protection
3800 Commonwealth Blvd., M.S. 47
Tallahassee, FL 32399-2400
ph. (850) 717-9076
State.Clearinghouse@floridadep.gov < Caution-mailto:State.Clearinghouse@floridadep.gov >

August 9, 2020

Chris Stahl, Coordinator
Florida State Clearinghouse
Florida Department of Environmental Protection
3800 Commonwealth Blvd., M.S. 47
Tallahassee, FL 32399-2400
Chris.Stahl@dep.state.fl.us
State.Clearinghouse@dep.state.fl.us

RE: SAI # FL202107149284C, Cape Canaveral Space Force Station Joint Flight Campaign Draft EA and FONSI, Brevard County

Dear Mr. Stahl:

Florida Fish and Wildlife Conservation Commission (FWC) staff reviewed the Environmental Assessment for the Space Coast Air and Spaceport and provide the following comments and recommendations for your consideration in accordance with Chapter 379, Florida Statutes (F.S.), the Federal National Environmental Policy Act (NEPA), and the Federal Coastal Zone Management Act/Florida's Coastal Management Program.

Project Description

The U.S. Department of the Army (U.S. Army) Rapid Capabilities and Critical Technologies Office (RCCTO) and the U.S. Department of the Navy (U.S. Navy) Strategic Systems Programs (SSP) has jointly prepared a Draft Environmental Assessment (EA)/Overseas EA (OEA) to evaluate the potential environmental impacts resulting from a Joint Flight Campaign (JFC) that entails up to six flight test launches annually at up to four different launch locations over the next 10 years. The U.S. Army RCCTO and U.S. Navy SSP are considering four primary launch locations with impacts of the spent stages and the hypersonic payload in a broad ocean area (BOA). The launch location being considered in Florida is at the Cape Canaveral Space Force Station (CCSFS) in Brevard County with stage 1 booster drop zone impacts occurring in the Atlantic Ocean beyond 12 nautical miles within the U.S. Exclusive Economic Zone and the stage 2 booster/payload drop zone impacts occurring primarily in international waters. The land cover on CCSFS is dominated by scrub habitat with small patches of riverine and maritime hammock. Much of the landscape on CCSFS has been fragmented by infrastructure necessary for CCSFS operations such as roads, space launch complexes, and aircraft runways. Additionally, fire exclusion, hydrology alterations, and the introduction of invasive vegetation have further altered the vegetative communities on CCSFS.

Potentially Affected Resources

The biological resources at CCSFS were recently evaluated in the 2020 Integrated Natural Resources Management Plan (INRMP) for the 45th Space Wing Installations, as well as, in the EA's for a range of launch program activities from 2010 to 2020. The Draft EA/OEA identifies suitable habitat for listed and managed species that have the potential to occur within the areas on CCSFS that are subject to JFC pre- and post-launch operations and launch activities including:

- Green sea turtle (*Chelonia mydas*, Federally Endangered [FE]),
- Leatherback sea turtle (*Dermochelys coriacea*, FE),
- Kemp's ridley sea turtle (*Lepidochelys kempii*, FE),
- Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*, FE),
- Smalltooth sawfish (*Pristis pectinata*, FE),
- Nassau grouper (*Epinephelus striatus*, Federally Threatened [FT]),
- Giant manta ray (*Manta birostris*, FT),
- Southeastern beach mouse (*Peromyscus polionotus niveiventris*, FT),
- Florida scrub-jay (*Aphelocoma coerulescens*, FT),
- Rufa red knot (*Calidris canutus rufa*, FT),
- Piping plover (*Charadrius melodus*, FT),
- Roseate tern (*Sterna dougallii dougallii*, FT),
- Wood stork (*Mycteria americana*, FT),
- Audubon's crested caracara (*Polyborus plancus audubonii*, FT),
- Eastern indigo snake (*Drymarchon corais couperi*, FT),
- American alligator (*Alligator mississippiensis*, FT due to similarity of appearance),
- Gopher tortoise (*Gopherus polyphemus*, State Threatened [ST])
- Florida pine snake (*Pituophis melanoleucus mugitus*, ST), and
- Critical habitat for the North Atlantic right whale (*Eubalaena glacialis*, FE), loggerhead sea turtle (*Caretta caretta*, FT), and West Indian manatee (*Trichechus manatus*, FT).

The report indicates that elevated noise levels, increased human and equipment activity, and launch activities may startle or flush wildlife and may cause animals to avoid launch areas, but the disturbance would be brief and is not expected to have long-term impacts. Resident species at the CCSFS most likely to be affected include gopher tortoises, southeastern beach mice, eastern indigo snakes, Florida scrub-jays, rufa red knot, piping plover, wood stork, roseate tern, and Audubon's crested caracara.

Since 1986, the 45th Space Wing has implemented a sea turtle plan which employs preservation techniques such as exterior light management, predator control, rescue and release of hatchlings, nest relocation, daily nest surveys, salvage, and stranding activities, and taking part in the State of Florida Index Nesting Beach Survey. The report also indicates that all activities conducted under the JFC Proposed Action would be in accordance with the Florida Scrub-Jay Management Plan for CCSFS.

Comments and Recommendations

<u>Southeastern Beach Mouse</u>

In 2020 and 2021, FWC staff conducted monitoring studies on CCSFS for the southeastern beach mouse within several inactive launch pads, including SLC-16, SLC-19, and SLC-20. Additionally, the area around the skid strip was monitored by CCSFS staff. Southeastern beach mice were detected at all study sites, which is contrary to the statements made on pages 3-72 and 4-31 of the Draft EA/OEA. FWC staff is willing to monitor at and around LC-46 prior to and after launches to better understand potential effects the launches may have on the southeastern beach mouse. CCSFS staff should coordinate with FWC staff regarding future monitoring projects by contacting Terry Doonan by phone at (386) 754-1662 or by email at Terry.Doonan@MyFWC.com.

FWC staff appreciate the opportunity to provide input on this project and look forward to working with the applicant throughout the permitting process. For specific technical questions regarding the content of this letter, please contact Michelle Sempsrott at (407) 452-1995 or by email at Michelle.Sempsrott@MyFWC.com. All other inquiries may be sent to ConservationPlanningServices@MyFWC.com.

Sincerely,

Jason Hight, Acting Director
Office of Conservation Planning Services

jh/mls

Cape Canaveral Space Force Station Joint Flight Campaign Draft EA and FONSI_44959_08092021

cc: David Fuller, U.S. Army Space and Missile Defense Command, jfceaoea@govsupport.us

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
1315 East-West Highway
Silver Spring, Maryland 20910

October 14, 2021
Refer to NMFS No: OPR-2021-02470

Weldon H. Hill, Jr.
Deputy Chief of Staff for Engineering
U.S Army Space and Missile Defense Command
Department of the Army
Post Office Box 1500
Huntsville, AL 35807-3801

RE: Programmatic Concurrence Letter for the Department of Defense Joint Flight Campaign Activities in the Atlantic and Pacific Oceans

Dear Mr. Hill:

The National Oceanic and Atmospheric Administration's National Marine Fisheries Service (NMFS) Endangered Species Act (ESA) Interagency Cooperation Division received the United States (U.S.) Department of the Army's May 24, 2021 request for concurrence with your determination that the proposed flight test launches may affect, but are not likely to adversely affect any ESA-listed species or designated critical habitat. This response to your request was prepared by NMFS ESA Interagency Cooperation Division pursuant to section 7(a)(2) of the ESA, implementing regulations at 50 C.F.R. §402, and agency guidance for preparation of letters of concurrence and programmatic consultation documents.

This letter underwent pre-dissemination review using standards for utility, integrity, and objectivity in compliance with agency guidelines issued under section 515 of the Treasury General Government Appropriations Act of 2001 (Data Quality Act; 44 U.S.C. 3504(d)(1) and 3516). A complete record of this consultation is on file at NMFS Office of Protected Resources in Silver Spring, Maryland.

Consultation History

On April 6, 2021, the U.S. Army Space and Missile Defense Command sent NMFS a request for early coordination to meet and discuss the Joint Flight Campaign (JFC) activities and a potential informal consultation under section 7 of the ESA. On May 17, 2021, NMFS met with the U.S. Army Space and Missile Defense Command to discuss an overview of the JFC activities, the action area considered, species list, the agency's preliminary effects determinations, path forward, and schedule. On May 25, 2021, NMFS received a request from the Department of the Army for concurrence that the proposed JFC activities in the Atlantic and Pacific Oceans may affect, but are not likely to adversely affect any ESA-listed species and designated critical habitat in the action area of the consultation. On May 28, 2021, NMFS provided the U.S. Army Space and Missile Defense Command with comments on the species list. The U.S. Army Space and Missile Defense Command provided preliminary responses to NMFS' comments on June 4, 2021, and additional documents on June 8, 2021. The U.S. Army Space and Missile Defense Command is assisting the action proponents of the U.S. Department of the Navy Strategic Systems Programs and the U.S. Army Rapid Capabilities and Critical Technologies Office. Cooperating agencies at the proposed launch installations include the Department of Energy, National Aeronautics and Space Administration, the U.S. Air Force 30th Space Wing, and U.S. Air Force 45th Space Wing.

The Department of the Army (as well as the National Aeronautics and Space Administration, Federal Aviation Administration, or U.S. Air Force when the lead federal agency) has previously consulted with the NMFS Southeast Regional Office and NMFS West Coast Regional Office for pre-launch, launch, and post-launch activities at (on land) or in nearshore waters at Wallops Flight Facility (Virginia), Cape Canaveral Space Force Station (Florida), and Vandenberg Air Force Base (California). The JFC activities are covered under these existing consultations (e.g., SER-2016-17894, SER-2018-19649, 2019/11490:LMM, OPR-2020-00268) and will occur in compliance with the terms of existing consultations and/or standard operating procedures. Therefore, this consultation covers only JFC activities in the broad ocean areas (BOA; stage one booster drop zones and stage two booster drop zones/payload impact zones), flight corridors, and vessel transit corridors of the four installations in the Atlantic and Pacific Oceans, as well as pre-launch, launch, and post-launch activities at (on land) or in nearshore waters at Pacific Missile Range Facility (Kauai, Hawaii).

Proposed Action and Action Area

The Department of the Army proposes to conduct up to six flight test launches from up to four different launch locations per year, over the next ten years of the Atlantic and Pacific Oceans. A typical JFC test includes pre-launch ground preparations, launch and flight test, vehicle flight, payload flight, impact in the BOA, and post-launch operations. The JFC activities will occur at existing launch vehicle facilities at four installations (Figure 1), which include Wallops Flight Facility (Figure 5), Cape Canaveral Space Force Station (Figure 6), Pacific Missile Range Facility (**Error! Reference source not found.** and Figure 8), and Vandenberg Air Force Base (Figure 9). At this time, the number of flight test launches that will occur annually from each location is unknown. The initial flight test will occur in the first half of fiscal year 2022. After launch, vehicle flights will occur over the Atlantic and/or Pacific Oceans. Expended or spent booster splashdown and hypersonic payload impact will occur in the BOA in the North Atlantic and North Pacific Oceans. The vehicle flights and splashdown and payload impacts will occur in U.S. waters within the Exclusive Economic Zone and in international waters.

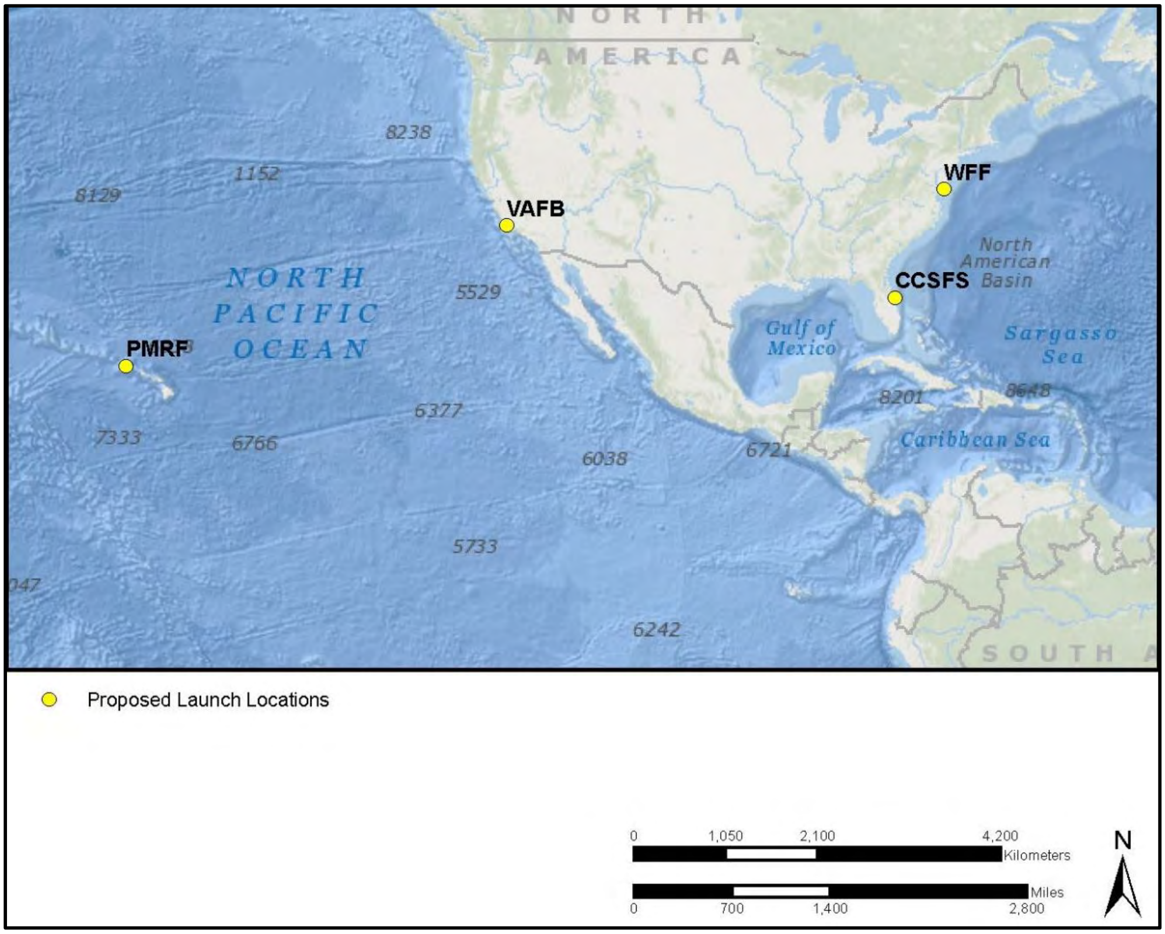

Figure 1. Proposed joint flight campaign activity locations in the Atlantic and Pacific Oceans.
WFF=Wallops Flight Facility; CCSFS=Cape Canaveral Space Force Station; PMRF=Pacific Missile Range Facility; VAFB=Vandenberg Air Force Base

Launch vehicles, also known as an up-round missile, consist of a two-stage booster system and payload (Figure 2). The launch vehicle is approximately 87.6 centimeters (34.5 inches) in diameter, is approximately 10.2 meters (33.6 feet) in length, and contains a total of 6,804 kilograms (15,000 pounds) of solid propellant in the first and second stages. The launch vehicle and payload system characteristics are described more in Table 1. Launch configurations include the use of a stool, a canister/box, or transporter erector.

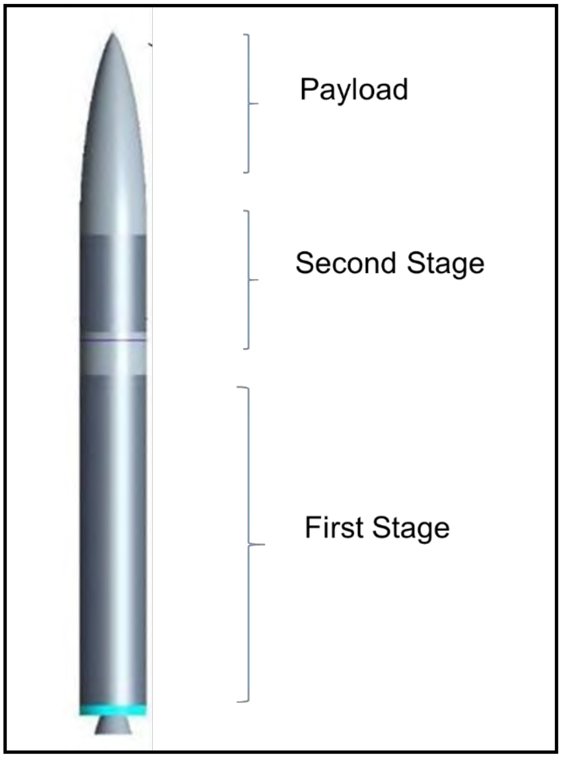

Figure 2. A joint launch campaign vehicle.

Table 1. Characteristics of the launch vehicle and payload system for joint flight campaign activities.

Launch Vehicle Characteristics	
Major Components	Rocket motors, propellant, magnesium thorium, nitrogen gas, halon, asbestos, and battery electrolytes (lithium ion, silver zinc).
Communications	Various 5 to 20 Watt radio frequency transmitters, one maximum 400-Watt radio frequency pulse.
Power	Up to nine lithium ion polymer and silver zinc batteries, each weighing between 1.3 to 18 kilograms (3 to 40 pounds).
Propulsion/Propellant	Rocket propellant and approximately 1.3 kilograms (3 pounds) of pressurized nitrogen gas.
Other	Small Class C (1.4) electro-explosive devices for flight termination.
Payload System Characteristics	
Structure	Aluminum, steel, titanium, magnesium and other alloys, copper, fiberglass, chromate coated hardware, tungsten, plastic, Teflon, quartz, and room temperature vulcanizing silicone.
Communications	Two up-to 20-Watt radio frequency transmitters.

Power	Up to three lithium ion polymer batteries, each weighing between 1 to 23 kilograms (3 to 50 pounds).
Propulsion	None
Other	Class C (1.4) electro-explosive devices for safety and payload system subsystem operations.

A short hot launch may be conducted to demonstrate a successful egress of a representative vehicle from a transporter erector launcher canister. A short hot launch will consist of a launch vehicle with a mass representative payload having a subset of electronics required to control launch activities. After egress from the canister, a pre-coordinated destruct action will occur utilizing the onboard flight termination system to allow the debris to follow a ballistic trajectory and impact within the drop zones of the JFC activities.

Prior to launch, routine activities will be conducted on the ground to prepare for flight testing. Pre-launch ground preparations will occur in compliance with standard operating procedures and best management practices implemented at existing launch vehicle facilities. Routine activities by personnel include ground equipment checkout, flight vehicle-to-booster assembly checkout, and other preparations for flight testing. Representatives will direct and coordinate JFC activities with the host existing launch vehicle facilities and range organizations.

At the Pacific Missile Range Facility, the potential launch site for the JFC activities is Pad 42 at Kauai Test Facility (see Figure 3**Error! Reference source not found.**). Launches will be delayed if a Hawaiian monk seal is observed within the explosive quantity distance arc or if Hawaiian monk seals, humpback whales, or green turtles are observed in the offshore launch safety zone. Modeling by Kahle et al. (2021) indicates that initial liftoff of the launch vehicle will result in in-air peak sound pressure levels of approximately 145 decibels (dB) referenced to 20 micropascals (re: 20 μPa) at approximately 30 meters (100 feet) from the launch pad. After launch, the vehicle will ascend quickly, and sound pressure levels are expected to remain elevated above ambient sound levels for less than 60 seconds.

Figure 3. Proposed joint flight campaign activity launch location at the Pacific Missile Range Facility.

For a nominal mission during JFC activities, it is anticipated that increased terminal location activities will be required in the BOA. These activities will include operation of a support vessel, setting up mobile terminal area scoring, deploying sea-based sensor rafts at the area of impact, and deploying telemetry assets. A different support vessel will be used for each activity with the largest likely to be an open ocean resupply vessel under 91.4 meters (300 feet) long with a 6.1 meter (20 foot) draft and a large open deck for mission equipment. This vessel will be used to gather information on the flight test during terminal flight and impact using radars and other sensors on the vessel. The support vessel is expected to remain on station for up to two weeks while waiting for the test to occur. During this time, there is no intention to anchor, and if active positioning of the support vessel is not maintained, it will return to port. The deck of the support vessel will also be used to store and deploy around nine 3-meter by 3.7-meter (10-feet by 12-feet) self-stationing sensor rafts prior to the test flight. Sensors may include radar, acoustic, and/or optical sensors. The self-stationing sensor rafts will be placed around the payload target site in the BOA to collect data on payload impact. Self-stationing sensor rafts will generally use twin battery-powered trolling motors for thrust navigation and station-keeping, and will not require an anchoring system. Self-stationing sensor rafts will be outfitted and inspected by personnel while in port prior to being deployed for a test during JFC activities. Ports used will likely be located in Honolulu, Hawaii; New Orleans, Louisiana; or Kwajalein, Republic of the Marshall Islands.

After launch, the test includes flight of the vehicle and impact of the payload in the BOA. Following first-stage motor ignition and liftoff from the launch location, the first-stage motor will burn out downrange and separate from the second-stage with inter-stage assembly also being jettisoned. The components will land (i.e., splashdown) in the stage-one booster drop zone, which is at least 22 kilometers (12 nautical miles) from the nearest land (see Figure 4, Figure 5, Figure 6, Figure 7, Figure 8, and Figure 9). Farther into flight, the second-stage will burn out and separate, with the payload adapter being jettisoned from the payload. The payload will fly toward a predesignated site in the BOA. The second-stage motor, payload adaptor, and payload will land (i.e., splashdown) at different points in the open ocean within the stage-two booster drop zones (see Figure 4, Figure 5, Figure 6, Figure 7, Figure 8, and Figure 9).

If the launch vehicle were to deviate from its course or if other problems were to occur during flight that might jeopardize public safety, the onboard flight termination system will be activated. Activating this system will initiate a predetermined safe mode for the vehicle, causing it to terminate the flight and fall towards the ocean. The flight termination system will be designed to prevent debris from falling into any area that is inhabited on land or marine protected area (e.g., designated critical habitat).

The flight path of the launch vehicle will be monitored by a series of sensors with overlapping coverage of the flight from launch until payload impact in the BOA. All sensors are part of existing programs so use of these sensors will be based on availability. The sensors include:

- Existing ground-based optics, telemetry, and radars;
- Vessel-based mobile instrumentation such as unmanned aerial vehicles and drones for telemetry, video, and surveillance; and
- Safety relay aircraft for additional range safety support “off-axis” to ensure public safety. Takeoff and landing operations will occur as part of ongoing operations of existing programs.

Additional air and water sensors on commercial or military aircraft are not planned as part of JFC activities.

The splashdown of launch vehicles will occur in drop zones of the BOA. Test components of the launch vehicles are expected to sink after impact in deep waters of the open ocean. No residual debris is expected. A recovery team will be sent to inspect the location where the payload lands in the water when the area has been cleared and deemed safe. The BOA is too deep to allow for the safe recovery of any hardware on the launch vehicles that may have survived the impact with the water and still have sufficient mass to sink to the seafloor. Any debris that is visible on the water's surface will be recovered by personnel on the vessel. The self-stationing rafts and large instrumentation raft will be recovered by the support vessel.

The following avoidance and minimization measures will be implemented as part of the JFC activities to minimize the potential effects of the proposed action on ESA-listed species and designated critical habitat:

- During travel to and from impact zones, and during raft deployment, vessel personnel will monitor for marine mammals and sea turtles to avoid potential vessel strikes. Vessel operators will adjust speed or raft deployment based on expected animal locations, densities, and/or lighting and turbidity conditions.
- Vessel operations will only occur when weather and sea conditions are acceptable for safe travel. There will be weather limitation on deck operations/activities for safety reasons based on vessel pitch/roll, wind, lightning, and other environmental factors causing conditions that would contribute to less than safe working conditions. Ultimately, the ship's Master will have final determination regarding the safe operation of the vessel based on the current activities, the current effects of wind and sea on the vessel, and the handling characteristics of the vessel. Vessel operations will not involve any intentional ocean discharges of fuel, toxic wastes, or plastics and other solid wastes that could potentially harm life in the marine environment.

The action area for the JFC activities covered under this consultation includes the BOAs in the Atlantic and Pacific Oceans, as well as the Pacific Missile Range Facility. The BOA consists mostly of the open ocean in deep water, as well as the airspace above those waters. After launch from one of the four existing launch vehicle facilities, the vehicle will fly over the ocean towards a terminal payload impact site in the BOA. The action area includes stage one and stage two booster drop zones in the BOA where components of the launch vehicles will impact (i.e., splashdown) in the open ocean. The stage one booster drop zones will all occur outside the territorial sea of U.S. waters (greater than 22 kilometers [12 nautical miles]), but mostly within the U.S. Exclusive Economic Zone (EEZ; out to 370 kilometers [200 nautical miles]). The stage two booster drop zones (which include payload impact) will occur mostly outside the U.S. EEZ, in the high seas (international waters). The flight corridor over the Atlantic and Pacific Oceans is also part of the action area. The action area includes the transit routes of the support vessel(s) from a port on the coast to and from the terminal location of pre-launch and post-launch activities.

The Pacific Missile Range Facility consists of marine and terrestrial habitats, where marine mammals (e.g., Hawaiian monk seals) may haul-out. The Pacific Missile Range Facility is located on the western shore of the island of Kauai.

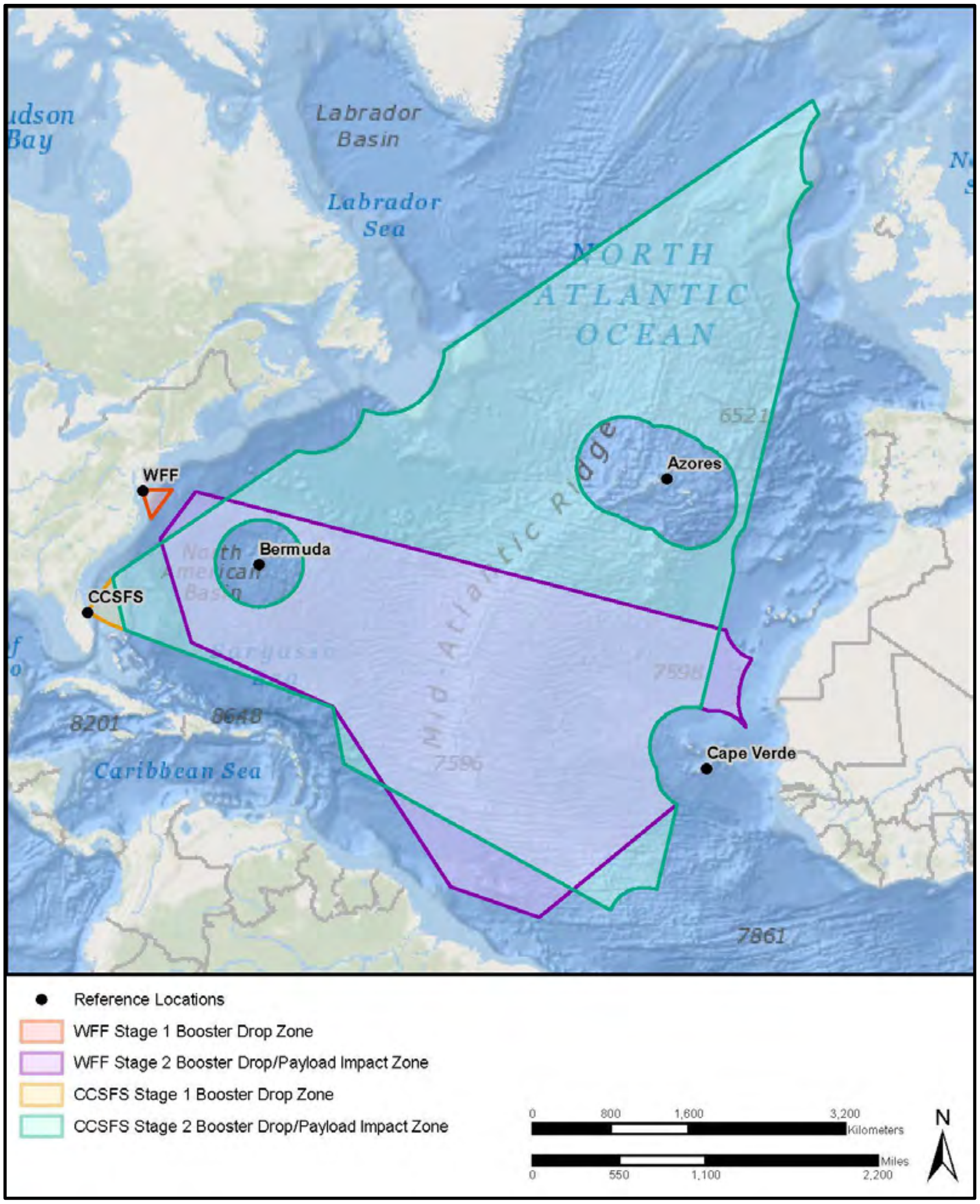

Figure 4. Proposed joint flight campaign activity locations in the Atlantic Ocean.

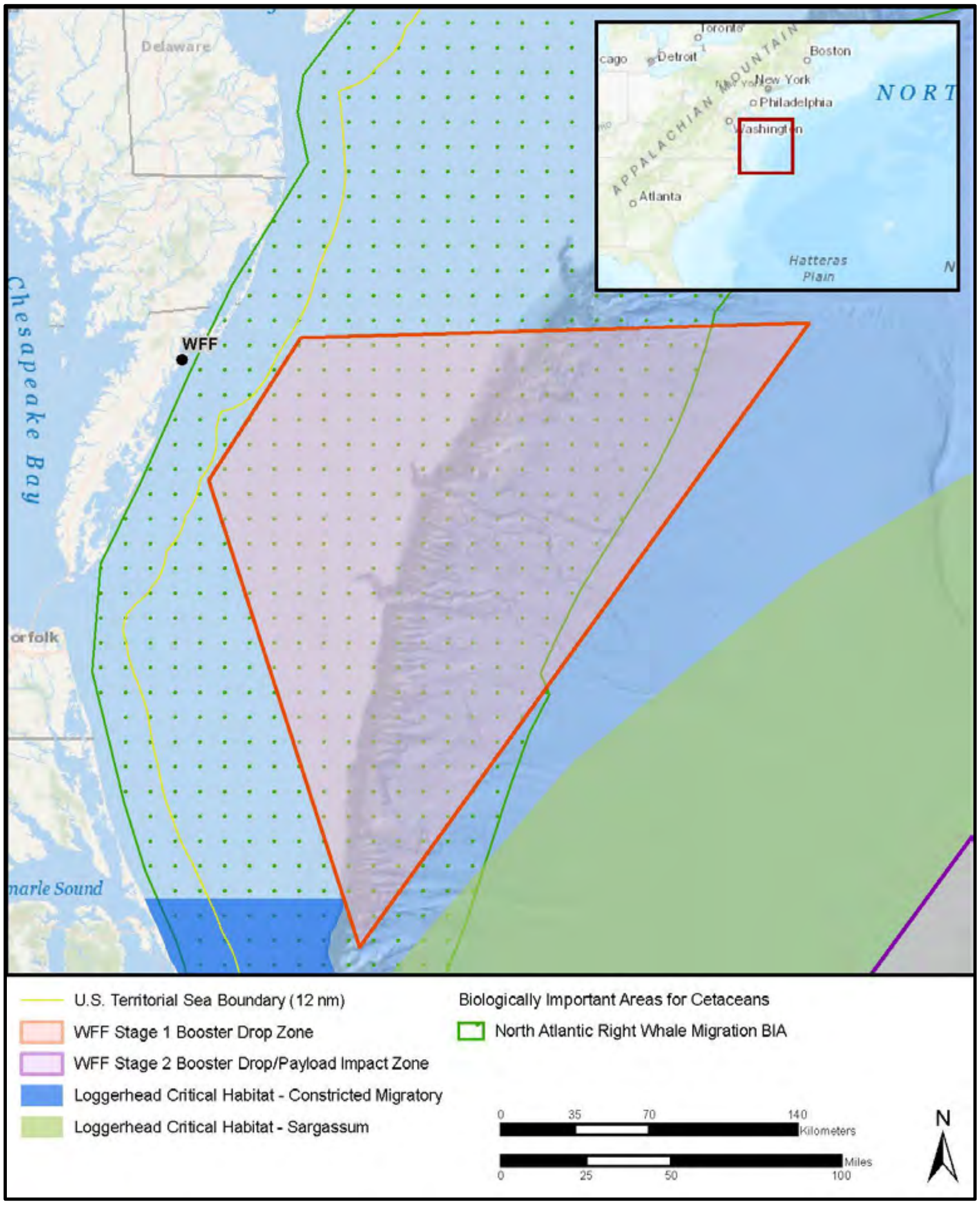

Figure 5. Proposed joint flight campaign activity stage one drop zone at the Wallops Flight Facility.

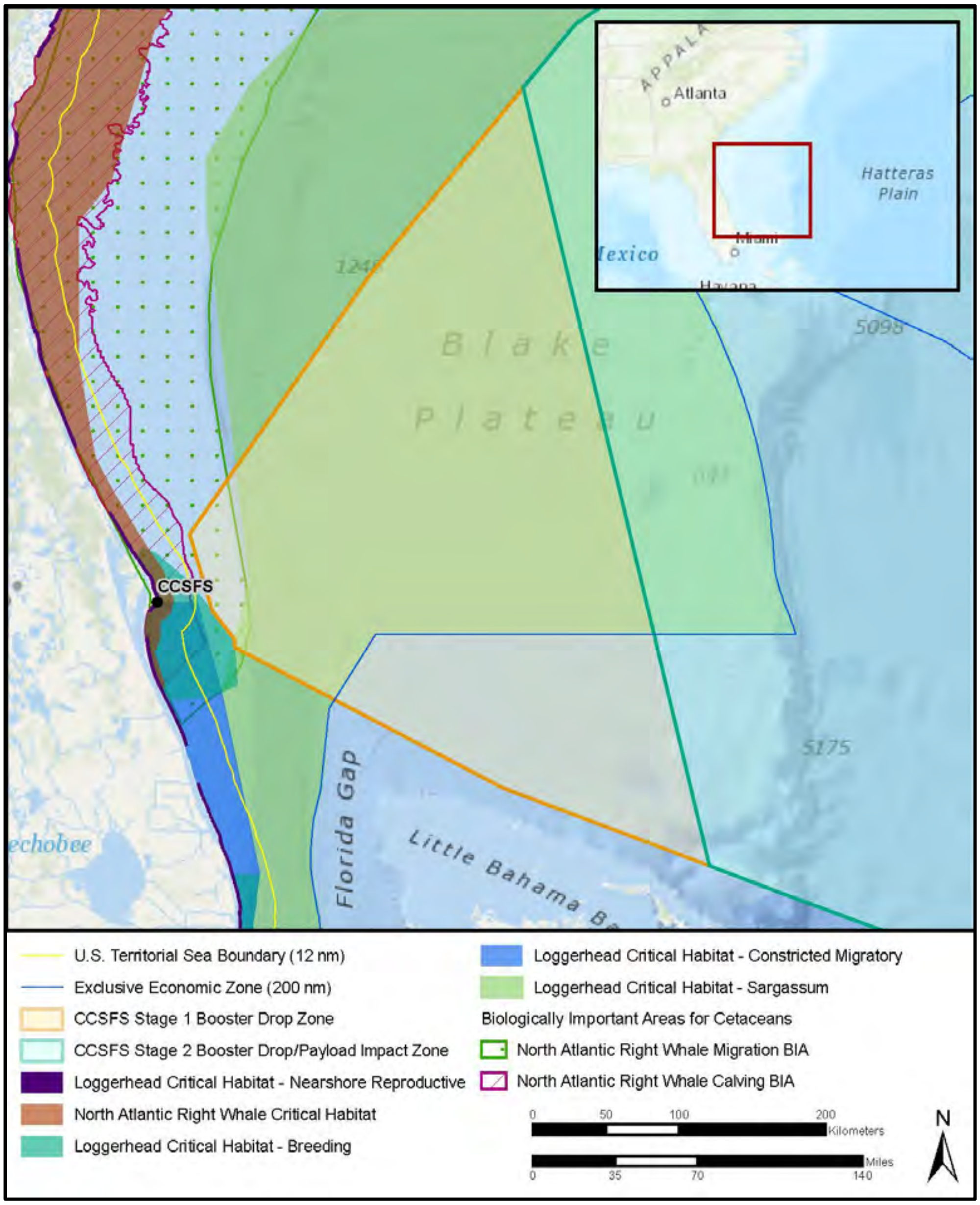

Figure 6. Proposed joint flight campaign activity stage one drop zone at the Cape Canaveral Space Force Station.

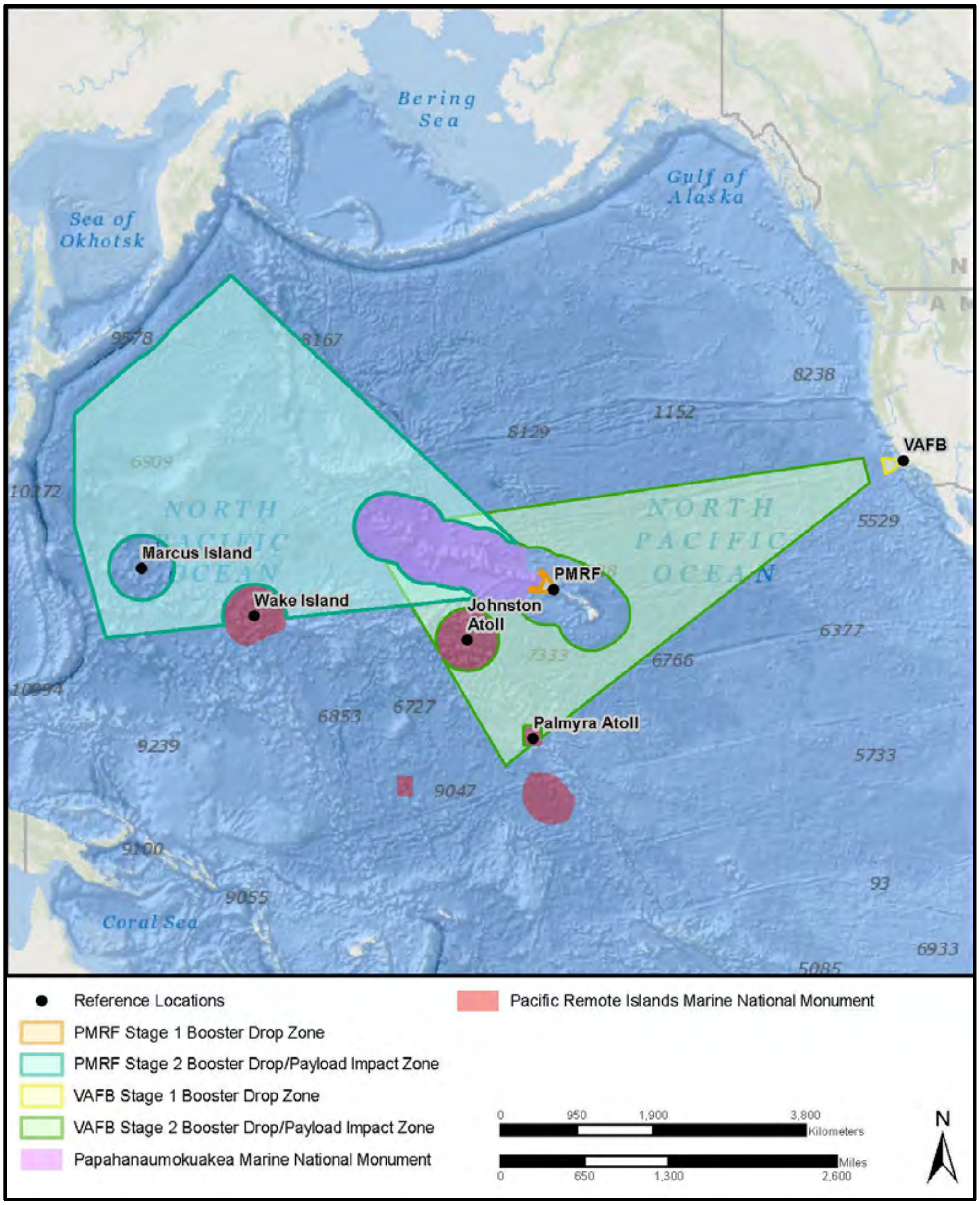

Figure 7. Proposed joint flight campaign activity locations in the Pacific Ocean.

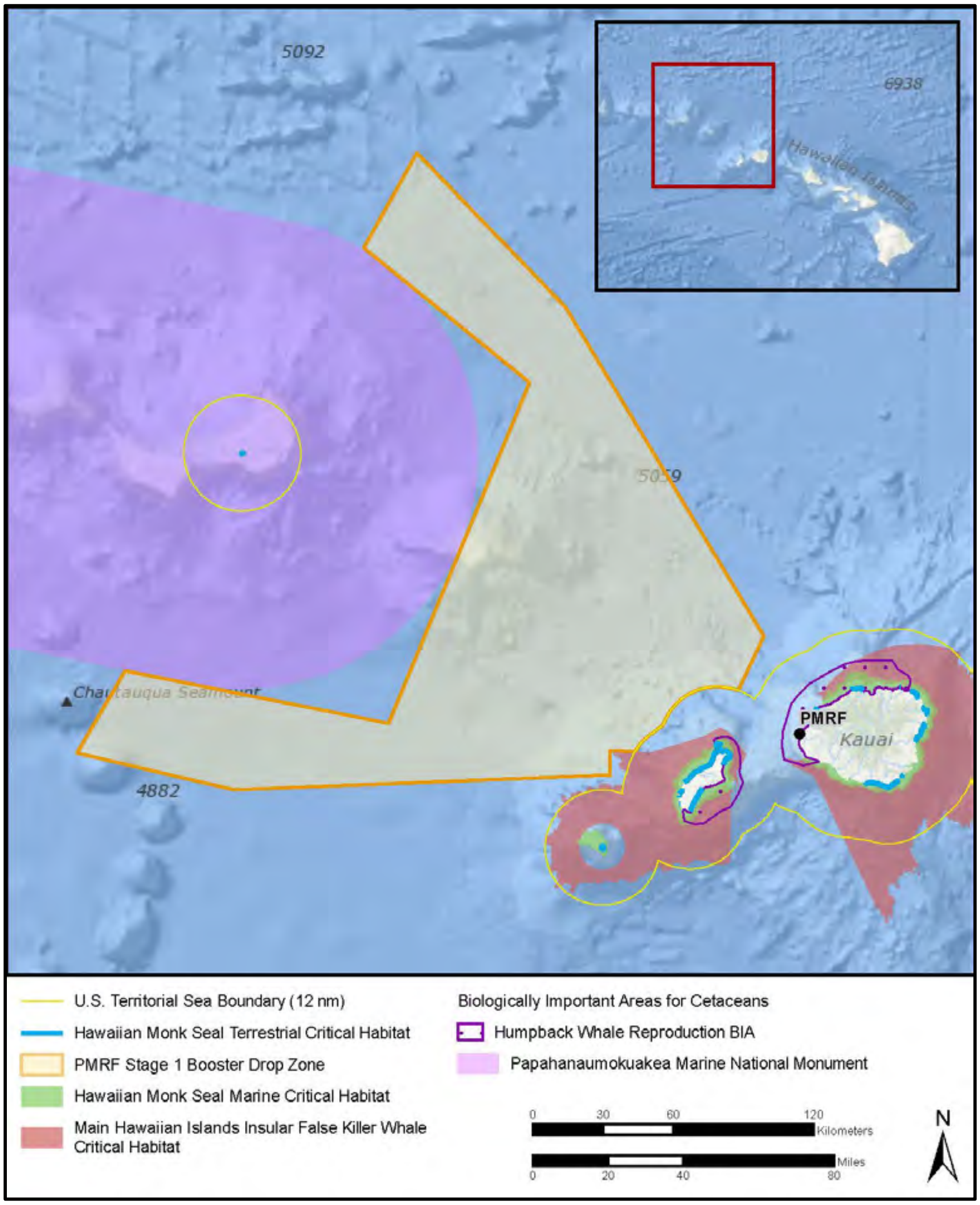

Figure 8. Proposed joint flight campaign activity stage one drop zone at the Pacific Missile Range Facility.

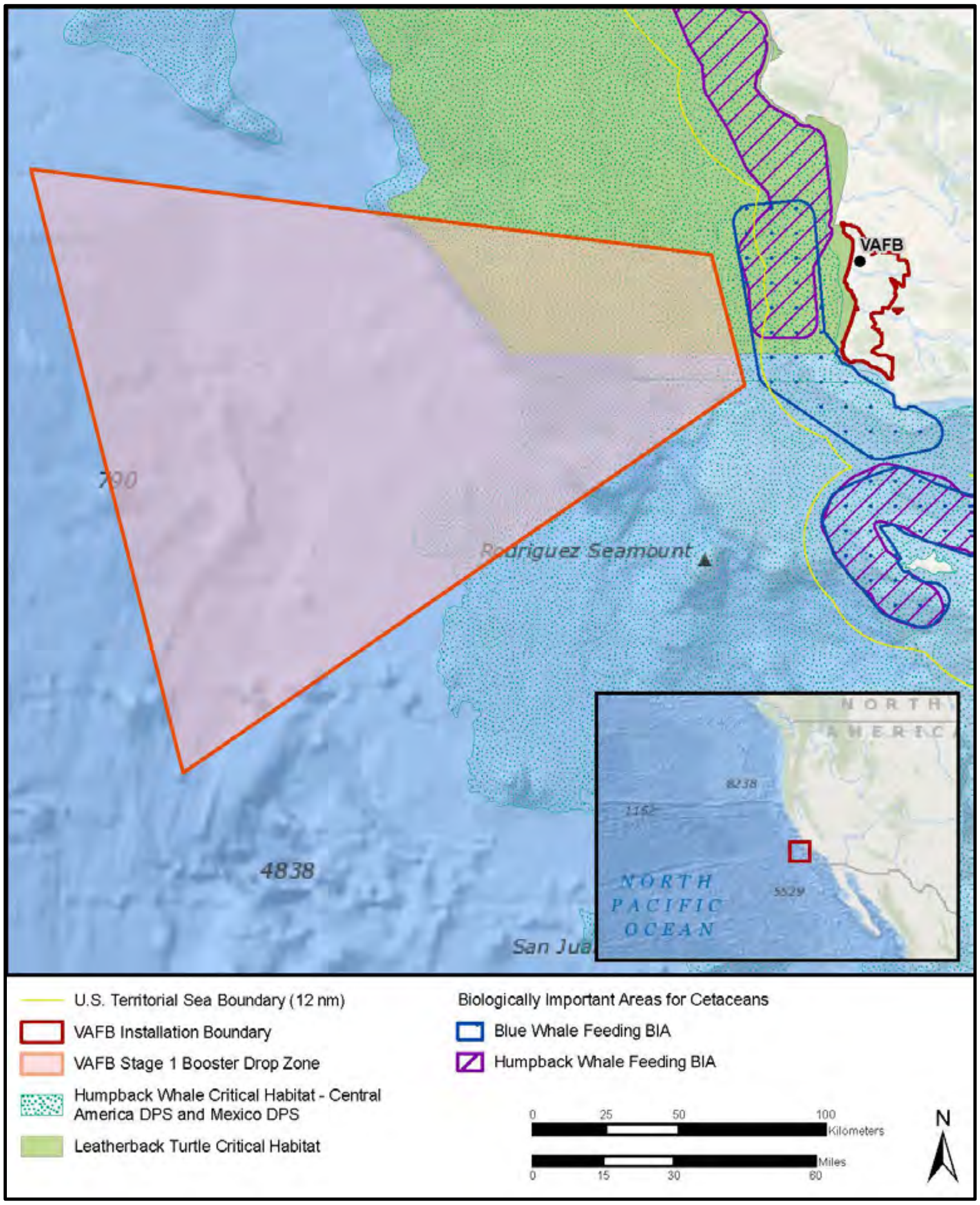

Figure 9. Proposed joint flight campaign activity stage one drop zone at the Vandenberg Air Force Base.

Affected Endangered Species Act-Listed Species and Designated Critical Habitat

ESA-listed marine mammals (cetaceans and pinnipeds), sea turtles, and fish and designated critical habitat are present in the action area and may be affected by the proposed action (Table 2).

Table 2. Endangered Species Act-listed species and designated critical habitat that may be affected by the Department of the Army's proposed action.

Species	ESA Status	Critical Habitat	Recovery Plan
Marine Mammals - Cetaceans			
Blue Whale (*Balaenoptera musculus*)	E – 35 FR 18319	-- --	07/1998 11/2020
False Killer Whale (*Pseudorca crassidens*) – Main Hawaiian Islands Insular DPS	E – 77 FR 70915	83 FR 35062	Draft – 85 FR 65791 9/2020
Fin Whale (*Balaenoptera physalus*)	E – 35 FR 18319	-- --	75 FR 47538 07/2010
Gray Whale (*Eschrichtius robustus*) – Western North Pacific Population	E – 35 FR 18319	-- --	-- --
Humpback Whale (*Megaptera novaeangliae*) – Cape Verde Islands/Northwest Africa DPS	E – 81 FR 62259	-- --	11/1991
Humpback Whale (*Megaptera novaeangliae*) – Central America DPS	E – 81 FR 62259	86 FR 21082*	11/1991
Humpback Whale (*Megaptera novaeangliae*) – Mexico DPS	T – 81 FR 62259	86 FR 21082*	11/1991
Humpback Whale (*Megaptera novaeangliae*) – Western North Pacific DPS	E – 81 FR 62259	86 FR 21082	11/1991
North Atlantic Right Whale (*Eubalaena glacialis*)	E – 73 FR 12024	81 FR 4837	70 FR 32293 08/2004
North Pacific Right Whale (*Eubalaena japonica*)	E – 73 FR 12024	73 FR 19000	78 FR 34347 06/2013
Sei Whale (*Balaenoptera borealis*)	E – 35 FR 18319	-- --	12/2011

Sperm Whale (*Physeter macrocephalus*)	E – 35 FR 18319	-- --	75 FR 81584 12/2010
Marine Mammals - Pinnipeds			
Guadalupe Fur Seal (*Arctocephalus townsendi*)	T – 50 FR 51252	-- --	-- --
Hawaiian Monk Seal (*Neomonachaus schauinslandi*)	E – 41 FR 51611	80 FR 50925	72 FR 46966 2007
Marine Reptiles			
Green Turtle (*Chelonia mydas*) – North Atlantic DPS	T – 81 FR 20057	63 FR 46693	10/1991
Green Turtle (*Chelonia mydas*) – Central North Pacific DPS	T – 81 FR 20057	-- --	63 FR 28359 01/1998
Green Turtle (*Chelonia mydas*) – Central West Pacific DPS	E – 81 FR 20057	-- --	63 FR 28359 01/1998
Green Turtle (*Chelonia mydas*) – East Pacific DPS	T – 81 FR 20057	-- --	63 FR 28359 01/1998
Hawksbill Turtle (*Eretmochelys imbricata*)	E – 35 FR 8491	63 FR 46693	57 FR 38818 08/1992 – U.S. Caribbean, Atlantic, and Gulf of Mexico 63 FR 28359 05/1998 – U.S. Pacific
Kemp's Ridley Turtle (*Lepidochelys kempii*)	E – 35 FR 18319	-- --	09/2011
Leatherback Turtle (*Dermochelys coriacea*)	E – 35 FR 8491	44 FR 17710 and 77 FR 4170*	10/1991 – U.S. Caribbean, Atlantic, and Gulf of Mexico 63 FR 28359 05/1998 – U.S. Pacific
Loggerhead Turtle (*Caretta caretta*) – Northeast Atlantic Ocean DPS	E – 76 FR 58868	-- --	-- --
Loggerhead Turtle (*Caretta caretta*) – Northwest Atlantic Ocean DPS	T – 76 FR 58868	79 FR 39855*	74 FR 2995 10/1991 – U.S. Caribbean, Atlantic, and Gulf of Mexico 05/1998 – U.S. Pacific

			01/2009 – Northwest Atlantic
Loggerhead Turtle (*Caretta caretta*) – North Pacific Ocean DPS	E – 76 FR 58868	-- --	63 FR 28359
Olive Ridley Turtle (*Lepidochelys olivacea*) – All Other Areas/Not Mexico's Pacific Coast Breeding Colonies	T – 43 FR 32800	-- --	-- --
Olive Ridley Turtle (*Lepidochelys olivacea*) – Mexico's Pacific Coast Breeding Colonies	E – 43 FR 32800	-- --	63 FR 28359
Fishes			
Atlantic Salmon (*Salmo salar*) – Gulf of Maine DPS	E – 74 FR 29344 and 65 FR 69459	74 FR 39903	70 FR 75473 and 81 FR 18639 (Draft) 11/2005 03/2016 – Draft 2/2019- Final
Atlantic Sturgeon (*Acipensar oxyrinchus oxyrinchus*) – Carolina DPS	E – 77 FR 5913	82 FR 39160	-- --
Atlantic Sturgeon (*Acipensar oxyrinchus oxyrinchus*) – Chesapeake DPS	E – 77 FR 5879	82 FR 39160	-- --
Atlantic Sturgeon (*Acipensar oxyrinchus oxyrinchus*) – Gulf of Maine DPS	T – 77 FR 5879	82 FR 39160	-- --
Atlantic Sturgeon (*Acipensar oxyrinchus oxyrinchus*) – New York Bight DPS	E – 77 FR 5879	82 FR 39160	-- --
Atlantic Sturgeon (*Acipensar oxyrinchus oxyrinchus*) – South Atlantic DPS	E – 77 FR 5913	82 FR 39160	-- --
Giant Manta Ray (*Manta birostris*)	T – 83 FR 2916	-- --	-- --
Oceanic Whitetip Shark (*Carcharhinus longimanus*)	T – 83 FR 4153	-- --	9/2018- Outline

Scalloped Hammerhead Shark (*Sphyrna lewini*) – Central and Southwest Atlantic DPS	T – 79 FR 38213	-- --	-- --
Scalloped Hammerhead Shark (*Sphyrna lewini*) – Eastern Atlantic DPS	E – 79 FR 38213	-- --	-- --
Scalloped Hammerhead Shark (*Sphyrna lewini*) – Eastern Pacific DPS	E – 79 FR 38213	-- --	-- --
Scalloped Hammerhead Shark (*Sphyrna lewini*) – Indo-West Pacific DPS	T – 79 FR 38213	-- --	-- --
Steelhead Trout (*Oncorhynchus mykiss*) – California Central Valley DPS	T – 71 FR 834	70 FR 52487	79 FR 42504
Steelhead Trout (*Oncorhynchus mykiss*) – Central California Coast DPS	T – 71 FR 834	70 FR 52487	81 FR 70666
Steelhead Trout (*Oncorhynchus mykiss*) – Lower Columbia River DPS	T – 71 FR 834	70 FR 52629	78 FR 41911
Steelhead Trout (*Oncorhynchus mykiss*) – Middle Columbia River DPS	T – 71 FR 834	70 FR 52629	74 FR 50165
Steelhead Trout (*Oncorhynchus mykiss*) – Northern California DPS	T – 71 FR 834	70 FR 52487	81 FR 70666
Steelhead Trout (*Oncorhynchus mykiss*) – Puget Sound DPS	T – 72 FR 26722	81 FR 9251	84 FR 71379
Steelhead Trout (*Oncorhynchus mykiss*) – Snake River Basin DPS	T – 71 FR 834	70 FR 52629	81 FR 74770 (Draft) 11-2017-Final
Steelhead Trout (*Oncorhynchus mykiss*) – South-Central California Coast DPS	T – 71 FR 834	70 FR 52487	78 FR 77430

Steelhead Trout (*Oncorhynchus mykiss*) – Southern California Coast DPS	E – 71 FR 834	70 FR 52487	77 FR 1669
Steelhead Trout (*Oncorhynchus mykiss*) – Upper Columbia River DPS	T – 71 FR 834	70 FR 52629	72 FR 57303
Steelhead Trout (*Oncorhynchus mykiss*) – Upper Willamette River DPS	T – 71 FR 834	70 FR 52629	76 FR 52317

DPS=distinct population segment; ESU=evolutionarily significant unit; E=endangered; T=threatened; FR=*Federal Register*; *=designated critical habitat in the action area

The Department of the Army determined that the JFC activities may affect, but are not likely to adversely affect most of the ESA-listed species and designated critical habitat in Table 2. The Department of the Army did not make an effects determination for Western North Pacific population of gray whales, specific DPSs of Atlantic sturgeon, Gulf of Maine DPS of Atlantic salmon, as well as specific DPSs of salmonids in the Pacific Ocean. This consultation considers the effects of the proposed action on these species because we determined these animals are in the action area and may be affected by the proposed action.

Endangered Species Act-Listed Marine Mammals in the Action Area

Blue whales, fin whales, and sei whales are widely distributed across the globe in all major oceans. All of these species typically winter at low latitudes, where they mate, calve and nurse, and summer at high latitudes, where they feed. They are most common in offshore continental shelf and slope waters that support productive zooplankton blooms.

Humpback whales are also widely distributed and winter at low latitudes, where they calve and nurse, and summer at high latitudes, where they feed. The Western North Pacific DPS of humpback whales are known to breed/winter in the area of Okinawa and the Philippines and migrate to feeding grounds in the northern Pacific Ocean, primarily off the Russian coast (81 FR 62259). The Cape Verde Islands/Northwest Africa DPS of humpback whales are known to breed near the Cape Verde Islands in the Atlantic Ocean, and feed primarily near Iceland and Norway (81 FR 62259). The Mexico DPS of humpback whales breed along the Pacific coast of mainland Mexico and the Revillagigedos Islands, and feed across a broad geographic range from California to the Aleutian Islands (81 FR 62259). The Central America DPS of humpback whales breed along the Pacific coast of Central America and feeds almost exclusively offshore of California and Oregon (81 FR 62259).

The Western North Pacific population of gray whales tend to feed near the bottom in productive waters closer to shore. Some Western North Pacific populations of gray whales winter on the west coast of North America, while most others migrate south to winter in waters off Japan and

China and summer in the Okhotsk Sea off northeast Sakhalin Island, Russia, and off southeastern Kamchatka in the Bering Sea (Burdin et al. 2013).

The North Atlantic right whale is primarily found in the western North Atlantic Ocean, from shallow, coastal water breeding grounds in temperate latitudes off the coast of the southeastern U.S. during the winter and in summer, and feed on large concentrations of zooplankton in the sub-polar latitudes (Colligan et al. 2012) off the coast of Nova Scotia (Waring et al. 2016).

North Pacific right whales mostly inhabit coastal and continental shelf waters in the North Pacific Ocean. They have been observed in temperate latitudes during winter (Japan, California, and Mexico) where they likely calve and nurse. In the summer, they feed on large concentrations of zooplankton in sub-polar waters around Alaska.

The sperm whale is widely distributed globally, found in all major oceans. Sperm whales mostly inhabit areas with a water depth of 600 meters (1,968 feet) or more, and are uncommon in waters less than 300 meters (984 feet) deep. They winter at low latitudes, where they calve and nurse, and summer at high latitudes, where they feed primarily on squid and demersal fish.

False killer whales prefer waters more than 1,000 meters (3,280.8 feet) deep, feeding on fishes and cephalopods. The Main Hawaiian Islands Insular DPS of false killer whale is considered resident within 40 kilometers (21.6 nautical miles) of the Main Hawaiian Islands.

Guadalupe fur seals breed mainly on Guadalupe Island with another smaller breeding colony in the San Benito Archipelago, Baja California, Mexico (Belcher and T.E. Lee 2002). Guadalupe fur seals feed mainly on squid species (Esperon-Rodriguez and Gallo-Reynoso 2013) with foraging trips that can last between four to 24 days (average of 14 days) and cover great distances, with sightings occurring thousands of kilometers away from the main breeding colonies (Aurioles-Gamboa et al. 1999). Guadalupe fur seals are infrequently observed in U.S. waters but they can be found on California's Channel Islands.

The entire range of the Hawaiian monk seal is located within U.S. waters. The main breeding subpopulations are in the Northwestern Hawaiian Islands, but there is also a small growing population found on the Main Hawaiian Islands. Hawaiian monk seals are considered foraging generalist that feed primarily on benthic and demersal prey such as fish, cephalopods, and crustaceans in subphotic zones (Parrish et al. 2000).

Endangered Species Act-Listed Sea Turtles in the Action Area

The green turtle has a circumglobal distribution, occurring throughout nearshore tropical, subtropical and, to a lesser extent, temperate waters. After emerging from the nest, hatchlings swim to offshore areas and go through a post-hatchling pelagic stage believed to last several years. Adult green turtles exhibit site fidelity and migrate hundreds to thousands of kilometers from nesting beaches to foraging areas. Green turtles spend the majority of their lives in coastal foraging grounds, which include open coastlines and protected bays and lagoons.

Green turtles from the North Atlantic DPS range from the boundary of South and Central America in the south, throughout the Caribbean Sea, Gulf of Mexico, and the U.S. Atlantic coast to New Brunswick, Canada in the north. The range of the North Atlantic DPS of green turtle extends east to the western coasts of Europe and Africa. The North Atlantic DPS of green turtle nesting occurs primarily in Costa Rica, Mexico, Florida, and Cuba. The Central North Pacific DPS of green turtle is found in the Pacific Ocean near the Hawaiian Archipelago and Johnston Atoll. The major nesting site for the Central North Pacific DPS of green turtle is at East Island, French Frigate Shoals, in the Northwestern Hawaiian Islands; lesser nesting sites are found throughout the Northwestern Hawaiian Islands and the Main Hawaiian Islands. Green turtles in the Central West Pacific DPS are found throughout the western Pacific Ocean, in Indonesia, the Philippines, the Marshall Islands, and Papua New Guinea. The Central West Pacific DPS is composed of green turtle nesting assemblages in the Federated States of Micronesia, the Japanese islands of Chichijima and Hahajima, the Marshall Islands, and Palau. Green turtles in the East Pacific DPS are found from the California/Oregon border south to central Chile. Major nesting sites occur at Michoacán, Mexico, and the Galapagos Islands, Ecuador. Smaller nesting sites are found in the Revillagigedos Archipelago, Mexico, and along the Pacific Coast of Costa Rica, Columbia, Ecuador, Guatemala and Peru (Seminoff et al. 2015).

The hawksbill turtle has a circumglobal distribution throughout tropical and, to a lesser extent, subtropical waters of the Atlantic, Indian, and Pacific Oceans. In their oceanic phase, juvenile hawksbill turtles can be found in *Sargassum* mats; post-oceanic hawksbills may occupy a range of habitats that include coral reefs or other hard-bottom habitats, seagrass, algal beds, mangrove bays and creeks (Bjorndal and Bolten 2010; Musick and Limpus 1997).

The Kemp's ridley turtle occurs from the Gulf of Mexico and up along the Atlantic coast of the U.S. (TEWG 2000). The majority of Kemp's ridley turtles nest at coastal Mexican beaches in the Gulf of Mexico. During spring and summer, juvenile Kemp’s ridleys occur in the shallow coastal waters of the northern Gulf of Mexico from south Texas to north Florida. In the fall, most Kemp’s ridleys migrate to deeper or more southern, warmer waters and remain there through the winter (Schmid 1998). As adults, many Kemp’s ridley turtles remain in the Gulf of Mexico, with only occasional occurrence in the Atlantic Ocean (NMFS et al. 2010).

Globally, olive ridley sea turtles can be found in tropical and subtropical waters in the Atlantic, Indian, and Pacific Oceans. Major nesting beaches are found in Nicaragua, Costa Rica, Panama, India and Suriname. Olive ridleys may forage across ocean basins, primarily in pelagic habitats, on crustaceans, fish, mollusks, and tunicates. The range of the endangered Pacific coast breeding population extends as far south as Peru and up to California. Olive ridley turtles of the Pacific coast breeding colonies nest on arribada beaches at Mismaloya, Ixtapilla and La Escobilla, Mexico. Solitary nesting takes place all along the Pacific coast of Mexico.

Loggerhead turtles are circumglobal, and are found in the temperate and tropical regions of the Atlantic, Indian, and Pacific Oceans. The post-hatchling stage is in pelagic waters and juveniles are first in the oceanic zone and later in the neritic zone (i.e., coastal waters). While in their oceanic phase, loggerhead turtles undertake long migrations using ocean currents. Adults and sub-adults occupy nearshore habitat important for foraging and inter-nesting migration. The Northeast Atlantic Ocean DPS of loggerhead turtles are found in the northeastern Atlantic Ocean, from western Europe to western Africa, but they can also migrate west to feeding grounds. The Cape Verde Archipelago hosts the highest concentration of Northeast Atlantic Ocean DPS of loggerhead turtle nesting. The Northwest Atlantic Ocean DPS of loggerhead turtle hatchlings disperse widely, most likely using the Gulf Stream to drift throughout the Atlantic Ocean. Genetic evidence demonstrates that juvenile loggerheads from southern Florida nesting beaches comprise the vast majority (71 to 88 percent) of individuals found in foraging grounds throughout the western and eastern Atlantic (Masuda 2010). North Pacific Ocean DPS of loggerhead turtles are found throughout the Pacific Ocean, north of the equator. Their range extends from the West Coast of North America to eastern Asia. Two major juvenile foraging areas have been identified in the North Pacific Basin: Central North Pacific and off of Mexico's Baja California Peninsula. Hatchlings from Japanese nesting beaches use the North Pacific Subtropical Gyre and the Kurishio Extension to migrate to those foraging grounds (Abecassis et al. 2013; Seminoff et al. 2014).

Endangered Species Act-Listed Fishes in the Action Area

Gulf of Maine DPS of Atlantic salmon juveniles spend about two years feeding in freshwater until they migrate more than 4,000 kilometers (2,159.8 nautical miles) in the open ocean to reach feeding areas in the Davis Strait between Labrador and Greenland. The majority of Gulf of Maine DPS of Atlantic salmon spend two winters at sea before reaching maturity and returning to their natal rivers.

Atlantic sturgeon spawn in freshwater, but spend most of their adult life in the marine environment. Atlantic sturgeon occupy ocean waters and associated bays, estuaries, and coastal river systems from Hamilton Inlet, Labrador, Canada, to Cape Canaveral, Florida (ASMFC 2006; Stein et al. 2004). Atlantic sturgeon are listed as five DPS's under the ESA: Gulf of Maine, New York Bight, Chesapeake Bay, Carolina, and South Atlantic. Juveniles typically spend two to five years in freshwater before eventually becoming coastal residents as sub-adults (Boreman 1997; Schueller and Peterson 2010; Smith 1985). Atlantic sturgeon exhibit high fidelity to their natal rivers but can undergo extensive mixing in coastal waters (Grunwald et al. 2008; King et al. 2001; Waldman et al. 2002).

The giant manta ray occupies tropical, subtropical, and temperate oceanic waters and productive coastlines where they feed on zooplankton. Giant manta rays are commonly found offshore in oceanic waters, but are sometimes found feeding in shallow waters (less than 10 meters [32.8

feet]) during the day. Giant manta rays can dive to depths of over 1,000 meters (3,280.8 feet), and also conduct night descents to between 200 and 450 meters (656.2 to 1,476.4 feet) deep.

The oceanic whitetip shark is a large pelagic shark distributed globally throughout open ocean waters, outer continental shelves, and around oceanic islands, primarily from 10 degrees North to 10 degrees South, but up to 30 degrees North and 35 degrees South (Young 2016). They occur from the surface to at least 152 meters (498.7 feet) deep, and display a preference for water temperatures above 20 degrees Celsius.

The scalloped hammerhead shark is found throughout the world and the Central and Southwest Atlantic DPS, Eastern Atlantic DPS, Eastern Pacific DPS, and Indo-West Pacific DPSs live in coastal warm temperate and tropical seas. It occurs over continental shelves and the shelves surrounding islands, as well as adjacent deep waters, but is seldom found in waters cooler than 22 degrees Celsius (Compagno 1984; Schulze-Haugen and Kohler 2003). It ranges from the intertidal and surface to depths of up to 450 to 512 meters (1,476.4 to 1,679.8 feet), with occasional dives to even deeper waters. It has also been documented entering enclosed bays and estuaries. The Central and Southwest Atlantic DPS of scalloped hammerhead shark range extends from the southeast coast of Florida to Brazil, including the Caribbean Sea, but not the Gulf of Mexico. The Eastern Atlantic DPS of scalloped hammerhead shark range is from the Mediterranean Sea to Namibia. The Eastern Pacific DPS of scalloped hammerhead shark, range extends from the coast of southern California, including the Gulf of California, down to Ecuador and possibly Peru, and waters off of Tahiti. The Indo-West Pacific DPS of scalloped hammerhead shark ranges from Japan down to Australia. The central Pacific Ocean waters near Hawaii are not included with the listed DPSs.

Steelhead trout typically migrate to open marine waters of the North Pacific Ocean after spending two years in fresh water. They reside in marine waters for typically two or three years prior to returning to their natal stream as four- or five-year olds to spawn shortly after river entry. Steelhead trout adults typically spawn from December through April, with peaks from January through March in small streams and tributaries where cool, well oxygenated water is available year-round (Hallock *et al.* 1961; McEwan 2001).

Programmatic Consultation

A programmatic consultation addresses multiple actions by an agency on a program, region, or other basis usually over an extended period of time. Programmatic consultations allow the Services to consult on the effects of programmatic actions such as: (1) multiple similar, frequently occurring or routine actions expected to be implemented in particular geographic areas; and (2) a proposed program, plan, policy, or regulation providing a framework for future actions (50 C.F.R. §402.02). This approach facilitates working with the federal action agency to avoid and minimize impacts to ESA-listed resources in a manner that supports recovery.

Project specific reviews for this programmatic consultation for JFC activities are not required as long as the activities are in compliance with the elements of the *Proposed Action and Action Area*, including:

- Use of a launch vehicle with characteristics as described in Table 1;
- Use of existing launch vehicle facilities at one or more of the following installations: Wallops Flight Facility, Cape Canaveral Space Force Station, Pacific Missile Range Facility, and Vandenberg Air Force Base. Launch preparations will occur in compliance with standard operating procedures and best management practices currently implemented at these existing launch vehicle facilities;
- Expended or spent booster splashdown and hypersonic payload impact will occur in the defined BOA in the North Atlantic and North Pacific Oceans;
- The flight path of the launch vehicle will be monitored and, if the launch vehicle were to deviate from its course or if other problems were to occur during flight, the onboard flight termination system will be activated to prevent debris from falling into any marine protected area;
- Launches from the Pacific Missile Range Facility, specifically the Kaui Test Facility, will be delayed if a Hawaiian monk seal is observed within the explosive quantity distance arc or if Hawaiian monk seals, humpback whales, or green turtles are observed in the offshore launch safety zone; and
- Recovery team vessel personnel sent to payload impact locations will monitor for ESA-listed species to avoid potential vessel strikes.

Annual Review

The Department of the Army and NMFS will conduct an annual review of the JFC activities. This review will evaluate, among other things, whether the scope of the activities are consistent with the description of the proposed action and action area, and whether the nature and scale of the effects predicted (see below) continue to be valid. To assist in this annual review, the Department of the Army will submit an annual report within 30 days of the end of the first year after conclusion of this consultation and within 30 days of the end of each subsequent year in which the JFC activities continue. The annual report will include the following information:

- The annual number of launches, and any launch failures, associated with the JFC activities from each launch facility, along with any associated recovery operations; and
- Information regarding observations of ESA-listed species under NMFS jurisdiction during JFC activities, including the time of year to infer seasonal occurrence of species.

Information for the annual report should be submitted electronically to cathy.tortorici@noaa.gov with the subject line "Annual Review, OPR-2021-02470, Programmatic Concurrence for the Department of Defense Joint Flight Campaign Activities in the Atlantic and Pacific Oceans." We may share the annual reports with the appropriate NMFS regional offices for review and comment dependent on where JFC activities occur in a given year.

Reporting Stranded, Injured, or Dead Animals

Any personnel during JFC activities will immediately report any stranded, injured, or dead ESA-listed species to NMFS: https://www.fisheries.noaa.gov/report.

Effects of the Action

"Effects of the action" means all consequences to ESA-listed species or designated critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 C.F.R. §402.2).

The applicable standard to find that a proposed action is not likely to adversely affect ESA-listed species or designated critical habitat is that all of the effects of the action are expected to be discountable, insignificant, or wholly beneficial. Beneficial effects have an immediate positive effect without any adverse effects to the species or habitat. Insignificant effects relate to the size or severity of the impact and include those effects that are undetectable, not measurable, or so minor that they cannot be meaningfully evaluated. Insignificant is the appropriate effect conclusion when plausible effects are going to happen, but will not rise to the level of constituting an adverse effect. For an effect to be discountable, there must be a plausible adverse effect (i.e., a credible effect that could result from the action that would be an adverse effect if it did affect an ESA-listed species), but it is very unlikely to occur.

Overall, the stressors associated with the proposed action have the potential to affect ESA-listed species and designated critical habitat for ESA-listed species in the action area, depending on where JFC activities occur each year. Stressors are any physical, chemical, or biological agent, environmental condition, external stimulus, or event that may induce an adverse response in either an ESA-listed species or its designated critical habitat. The stressors associated with the proposed action include elevated sound pressure levels from the vehicle launch, sonic booms, and component splashdown, dispersion of vehicle components that may result in direct contact, ingestion, hazardous materials, and vessel transit and strikes.

Elevated Sound Pressure Levels from Vehicle Launch, Sonic Booms, and Component Splashdown

ESA-listed marine mammals, sea turtles, and fish (Table 2) may be affected by elevated sound pressure levels from vehicle launch, sonic booms, and component splashdown. Empirical data on sound pressure levels from the JFC activities have not been collected. Modeling by Kahle et al.

(2021) indicates that initial liftoff of the launch vehicle will result in in-air peak sound pressure levels of approximately 145 dB re: 20 µPa at approximately 30 meters (100 feet) from the launch pad (

Figure **10** and Figure 11). After launch, the vehicle will ascend quickly, and sound pressure levels are expected to remain elevated above ambient sound levels for less than 60 seconds. No model estimates are available for sonic boom footprints from JFC activities, but maximum sound pressure levels are expected to average 130 dB re: 1 µPa (maximum of 135 dB re: 1 µPa) at the water's surface for most of the vehicle flights and last no more than 270 milliseconds. Sonic booms generated by the payload near component splashdown may by up to 175 dB re: 1 µPa near the impact point (in the water) and last approximately 75 milliseconds. No model estimates are available for splashdown of components from JFC activities, but peak noise levels have been estimated based on the size characteristics of the vehicle components compared to the component sizes for other test vehicles for which splashdown noise level estimates are available. Using peak sound pressure estimates for the largest U.S. Navy Flight Experiment-2 stage (which is approximately 1.4 times larger than stage one of JFC activities) for the stage one booster and the smallest U.S. Navy Flight Experiment-2 stage (which is approximately the same size as stage two of JFC activities) for the stage two booster, the peak sound pressure levels are expected to be less than 218 dB re: 1 µPa at one meter (3.3 feet) for splashdown of the stage one booster and 201 dB re: 1 µPa for splashdown of the stage two booster (U.S. Navy 2019). Also, using the U.S. Navy Flight Experiment-2 payload for the payload of JFC activities estimate, the sound pressure levels are expected to be less than 191 dB re: 1 µPa at the water's surface near the sound source for splashdown and last no more than a few seconds (U.S. Navy 2019).

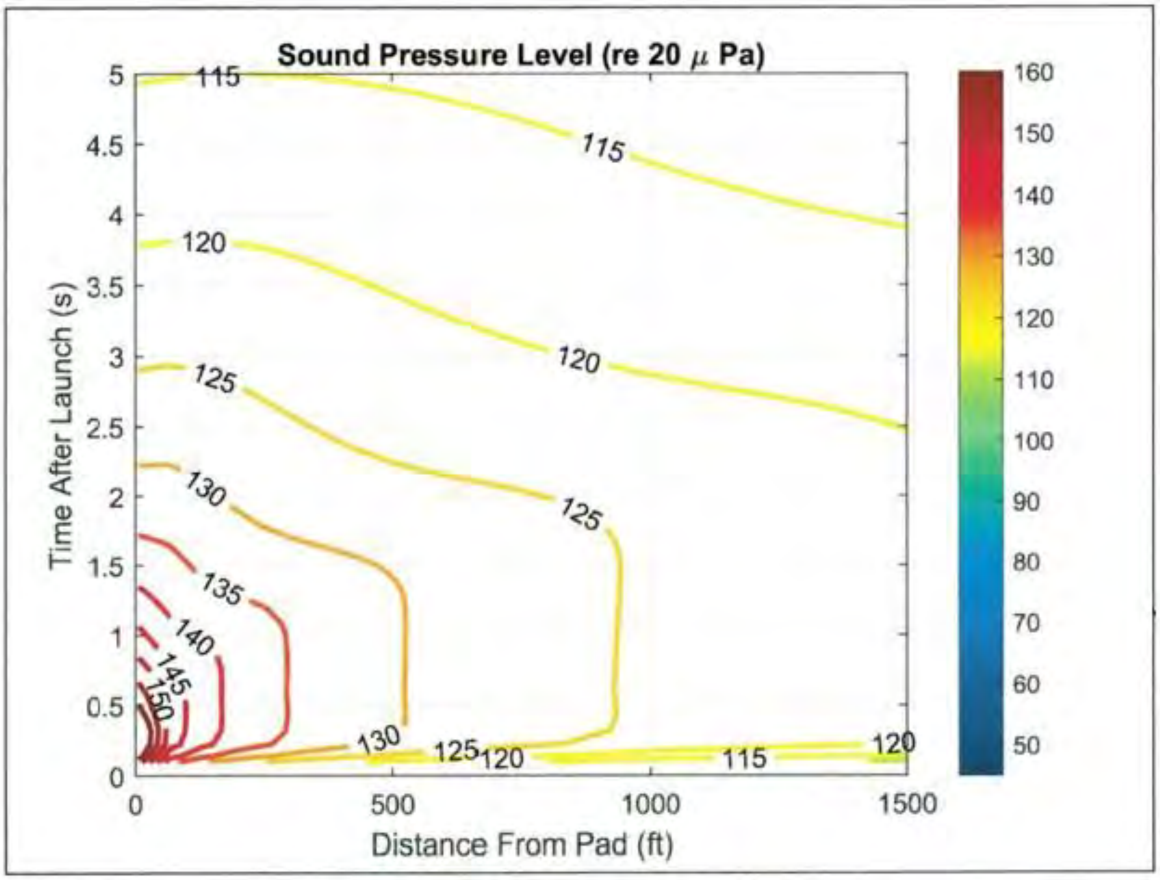

Figure 10. Modeled maximum sound pressure levels at various distances (feet) from the launch pad and duration for launches during Joint Flight Campaign activities.

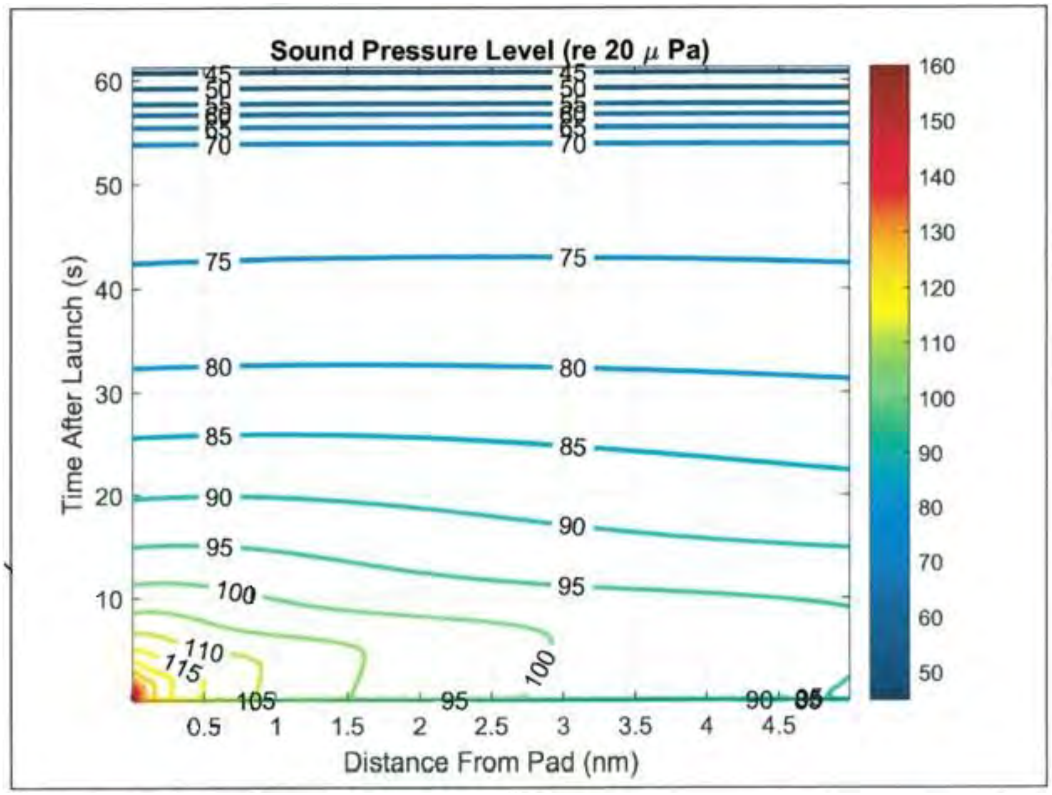

Figure 11. Modeled maximum sound pressure levels at various distances (nautical miles) from the launch pad and duration for launches during Joint Flight Campaign activities.

Impulse noise may result from a sonic boom, explosion, or splashdown. Exposure to loud sounds may result in temporary or permanent loss of hearing (i.e., temporary threshold shift [TTS] or permanent threshold shift [PTS]) depending on the location of the animal in relation to the source of the sound. Some marine animal behavioral responses vary by individual, species, and circumstances. Some sounds may not cause any response, while others may result in minor to significant changes in a variety of behaviors, such as diving, surfacing, vocalizing, feeding, and/or mating, and flushing into the water from land. However, not all changes in behavior result in adverse effects to marine animals. Some marine animal responses are momentary inconsequential reactions, such as the turn of a head, while other responses are within natural variation such as change in dive time.

On June 21, 2018, the *NOAA Technical Memorandum, NMFS-OPR-59 Revisions to: Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing – Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts*, was published. The revised criterion for in-water PTS (injury) ranges from a 24-hour cumulative exposure level of 183 dB re: 1 µPa for low-frequency cetaceans (e.g., baleen whales) to a peak impulsive sound level of 230 dB re: 1 µPa for mid-frequency cetaceans (e.g., toothed whales). For otariid pinnipeds (like Guadalupe fur seals), the revised criteria range from a 24-hour cumulative exposure level of 203 dB re: 1 µPa to a peak impulsive sound level of 232 dB re: 1

μPa. For phocid pinnipeds (like Hawaiian monk seals), the revised criteria range from a 24-hour cumulative exposure level of 185 dB re: 1 μPa to a peak impulsive sound level of 218 dB re: 1 μPa. There is no criterion established for in-air PTS. For all marine mammals, the criterion for behavioral disruption for in-water exposure to impulsive noise is 160 dB re: 1 μPa. The criterion for behavioral disruption for in-air exposure noise is 100 dB re: 1 μPa all pinnipeds (except harbor seals [*Phoca vitulina*]). We evaluated the potential effects of the JFC activities on ESA-listed marine mammals in the action area using the acoustic thresholds in Table 3, which also contains the thresholds for sea turtles and fish used to assess the effects of the action.

As indicated in Table 3, the TTS threshold used for in-water sound pressure levels from component splashdown is 213 dB peak sound pressure level (SPL peak) and PTS threshold used is 219 dB SPL peak for low frequency cetaceans. The TTS threshold used is 224 dB SPL peak and PTS threshold used is 230 dB peak for mid-frequency cetaceans. The TTS threshold used is 226 dB SPL peak and PTS threshold used is 232 dB SPL peak for otariid pinnipeds. The TTS threshold used is 212 dB SPL peak and PTS threshold used is 218 dB SPL peak for phocid pinnipeds. The TTS threshold used is 224 dB SPL peak and PTS threshold used is 230 dB SPL peak for sea turtles. In addition, the TTS threshold used is 186 dB SPL peak and PTS threshold used is 229 dB SPL peak for fish. These thresholds were taken from Popper et al. (2014), which divides fish according to presence/absence of a swim bladder and if the swim bladder is involved in hearing. Fishes without a swim bladder, but with hearing limited to particle motion detection at frequencies well below 1 kiloHertz include giant manta ray, oceanic whitetip shark, and scalloped hammerhead shark. Fishes with a swim bladder that is not involved in hearing, lack hearing specializations, and primarily detect particle motion at frequencies below 1 kiloHertz include Atlantic salmon, Atlantic sturgeon, and steelhead trout. We evaluated the JFC activities using the thresholds in Table 3.

Table 3. Distance to permanent threshold shift and temporary threshold shift for marine mammals, sea turtles, and fish for elevated in-water sound pressure levels resulting from component splashdown or impact during Joint Flight Campaign activities.

Functional Hearing Group	Permanent Threshold Shift		Temporary Threshold Shift			
	Threshold (dB SPL_{peak})	Radial Distance to Threshold from Stage One Splashdown (m)	Threshold (dB SPL_{peak})	Radial Distance to Threshold from Splashdown (m)		
				Stage One	Stage Two	Payload
Low-Frequency Cetaceans	219	-- --	213	2	-- --	-- --

Mid-Frequency Cetaceans	230	-- --	224	-- --	-- --	-- --
Phocid Pinnipeds	218	-- --	212	2	-- --	-- --
Otariid Pinnipeds	232	-- --	226	-- --	-- --	-- --
Sea Turtles	230	-- --	224	-- --	-- --	-- --
Fish	229	-- --	186	40	6	2

dB = decibels, m = meters, SEL = Sound Exposure Level, SPL = Sound Pressure Level
Sources: U.S. Navy (2019); NMFS (2019); NOAA (2018); Finneran and Jenkins (2012), and Popper et al. (2014).
Notes: All sound pressures in this table are in dB SPLpeak re 1 µPa unless indicated.
(1) The PTS threshold listed for sea turtles is based on the non-lethal injury threshold in Finneran and Jenkins (2012).
(2) The PTS threshold for fish with swim bladders is based on the mortality/mortal injury threshold in NMFS (2015) and Popper et al. (2014). Thresholds in fish are not specific to auditory injury.

The elevated sound pressure levels from vehicle launch, sonic booms, and component splashdown have the potential to disturb marine mammals by eliciting an alert, avoidance, or other behavioral reactions such as diving and moving away from the sound source at haul-outs. Pinnipeds are expected to haul-out of the ocean onto rocks and beaches within the Pacific Ocean portion of the proposed action area. Haul-outs in rocky habitat provide them with protection and create an environment that will deflect any potential loud noise stimuli (e.g., the wave action will dampen noise and the rocks will deflect any sound waves away from the animals and back towards the sound source). Sound pressures might be high enough to cause behavioral disturbance in hauled-out pinnipeds. Pinniped reactions to rocket launches and overflight at San Nicolas Island were studied from August 2001 through October 2008 (Holst et al. 2011). California sea lions startled and increased vigilance for up to two minutes after a rocket overflight, with some individuals moving down the beach or returning to the water. Northern elephant seals showed little reaction to any overflight. Harbor seals had the most pronounced reactions of the three species observed with most animals within approximately 4 kilometers (2.5 miles) of the rocket trajectory leaving their haulout sites for the water and not returning for several hours. The authors concluded that the effects of the rocket launches were minor with no effects on local populations evidenced by the growing populations of pinnipeds on San Nicolas Island (Holst et al. 2011). Thus, for the proposed action, we believe any behavioral disturbance to sound would be limited to temporary startle reactions or an animal temporarily leaving the beach or haulout and entering the ocean. All life stages of ESA-listed pinnipeds could be present at haulouts and beaches in the Pacific Ocean portion of the action area. We do not anticipate trampling of any age class, including pups, which are more vulnerable to trampling due to their small size. The JFC activities could occur at any time of the year such as when pups are present in areas of haulouts. Any temporary startle or movement to or into the water would occur without resulting in any mass movement leading to trampling in part because the ESA-listed pinnipeds in the Pacific Ocean portion of the action area are relatively solitary animals and do not congregate in large numbers.

While sonic booms, with a maximum sound level of 175 dB re: 1 μPa in the action area may potentially result in a short-duration startle response, we do not expect they will exceed the TTS and PTS thresholds for ESA-listed cetaceans, pinnipeds, sea turtles, and fish. The amount of sound pressure that could damage hearing will likely decay to non-harmful sound pressure levels before reaching the aforementioned species, including hauled-out pinnipeds.

Based on modeling, the expected sound pressure levels at launch will not exceed 130 dB re: 1 μPa at any beach habitat, but may be above 100 dB as far as 5.4 kilometers (2.9 nautical miles) from the launch site. Sound pressure levels above 130 dB re: 1 μPa will last no longer than three seconds and sound pressure levels above 100 dB re: 1 μPa will last no longer than 15 seconds. Maximum sound pressure levels at the Pacific Missile Range Facility will not exceed the TTS or PTS for phocid pinnipeds (i.e., Hawaiian monk seals, the only ESA-listed species under NMFS' jurisdiction that occurs in terrestrial habitats at the Pacific Missile Range Facility). The maximum sound pressure level expected at the closest known haul-out location, which is 1 kilometer [0.6 miles] from the launch site, will be no higher than 115 dB re: 20 μPa.

Splashdown of boosters and payload are not expected to exceed the PTS threshold for any ESA-listed marine mammals, sea turtles, or fish, but may exceed the TTS threshold for low-frequency cetaceans, phocid pinnipeds, and fishes in small areas (two to 40 meters [6.6 to 131.2 feet) (see Table 3).

Results of monitoring during launches and sonic booms at Vandenberg Air Force Base have shown little to no behavioral responses in pinnipeds. Any observed behavioral responses has included a raise of the head or brief alert, but animals returned to normal behavior shortly after the stimulus. Sound pressure levels from launches may cause a behavioral disturbance to hauled-out pinnipeds (i.e., Hawaiian monk seals), but this single short-duration sound will be limited to temporary startle reactions or animals temporarily leaving the haul-out and entering the water.

As outlined in the Biological Evaluation for the JFC activities, estimated species' densities (animals per square kilometer) were calculated for ESA-listed marine mammals and sea turtles in the drop zones in the BOAs in the Atlantic and Pacific Oceans to calculate estimated numbers of potential direct contact exposures per animal. The highest species of densities in the BOAs in the Atlantic Ocean by species group were estimated to be 0.0129 for sperm whales and 0.343 for all DPSs of loggerhead turtles. The highest species densities in the BOAs in the Pacific Ocean by species group were estimated to be 0.0235 for fin whales, 0.0278 for Guadalupe fur seals, and 0.0043 for the sea turtle guild (primarily composed of green and hawksbill turtles, but also encompassing leatherback, loggerhead and olive ridley turtles from all DPSs). Therefore, ESA-listed marine mammals and sea turtles are likely to have very low densities, patchy distributions, and in many cases seasonal occurrence in the action area. According to the Biological

Evaluation, the highest number of direct contact exposures per animal over the course of six tests was estimated to be 3.18×10^{-4} for all DPSs of loggerhead turtles in the BOAs in the Atlantic Ocean and 1.05×10^{-4} for fin whales in the BOAs in the Pacific Ocean. In-air and in-water impacts from elevated sound pressure levels from vehicle launch, sonic booms, and component splashdown are extremely unlikely to occur due to the aforementioned low densities of ESA-listed marine mammals and sea turtles in the action area.

It is likely that any noise associated with the sonic boom will transmit from the air to water and propagate some distance (up to 40 meters [131.2 feet]) in the water column, but the sound pressure levels are expected to be below current thresholds for potential PTS (injury), TTS, or behavioral disturbance to ESA-listed marine mammals, sea turtles, and fish from impulsive noise. These sound sources are temporary, dispersed throughout the year, and will last a maximum of a few seconds. Thus, we find that the effects of elevated sound pressure levels from vehicle launch and sonic booms on ESA-listed species (Table 2) within the action area are insignificant. As stated previously, component splashdown may exceed TTS threshold sound pressure levels for low-frequency cetaceans, phocid pinnipeds, and fish. However, given that these raised sound pressure levels would likely occur infrequently over small areas and that ESA-listed species are unlikely to co-occur in these small areas, we find that effects of elevated sound pressure levels from component splashdown are discountable.

Dispersion of Vehicle Components that may result in Direct Contact

The ESA-listed marine mammals, sea turtles, and fish (Table 2) in the action area may be affected by component impact (i.e., splashdown) in the open ocean if they came into direct contact with the component when it hit the water or was sinking through the water column. Spent stage one and stage two boosters, as well as the payload, will fall in the drop zones in the marine environment. After the impacts of the payload, visible debris still on the water's surface will be recovered and removed by a recovery team. This will minimize the potential for interactions between these components and ESA-listed marine mammals, sea turtles, and fish.

The approximate dimensions of the stage one booster are 5.3 meters (17.4 feet) in length by 0.86 meters (2.8 feet) in diameter, stage two booster are 2.0 meters (6.6 feet) in length by 0.86 meters (2.8 feet) in diameter, and payload are 2.9 meters (9.5 feet) in length by 0.86 meters (2.8 feet) in diameter. Due to the relatively small size of the objects and the low density of ESA-listed marine mammals and sea turtles in the booster drop zones (highest estimated density of ESA-listed marine mammals and sea turtles in the action area was that of all DPSs of loggerhead sea turtles in the Atlantic Ocean BOAs: 0.343 animals per square kilometer), NMFS believes that it is highly unlikely that ESA-listed marine mammals and sea turtles will be struck.

While density data are not available for fish (i.e., giant manta rays, oceanic whitetip sharks, scalloped hammerhead sharks, salmonids, and sturgeon) in the action area, these species are likely to have very low densities in the large action area. It is difficult to accurately estimate the number of individuals that could be exposed to potential stressors at a specified location and time in the offshore environment because fish distribution is influenced by a number of environmental factors and vertical distribution. Given the small direct contact area, and the low densities and patchy distribution of fish in the large action area, it is extremely unlikely that these fish would be subject to direct contact from vehicle components during JFC activities.

Marine mammals and sea turtles spend time at the water's surface to breathe (although, when not transiting, the majority of their time is spent below the water's surface) and are at a risk of interacting with impacts of components from JFC activities. Most fish species (e.g., giant manta ray, oceanic whitetip sharks, and salmonids) can but generally do not occur at the water's surface and are unlikely to interact with these components when they hit the water. Launch tests will occur intermittently (six tests per year over ten years), although it is unknown how many will occur at each launch installation and where splashdowns will occur. Given the large geographic area involved and the relatively low densities of ESA-listed marine mammals, sea turtles, and fish in the action area, we do not believe interactions between vehicle components and these species are likely to occur anywhere in the water column. Additionally, while disturbance or direct contact from any expended materials as they fall through the water column is possible, it is extremely unlikely because objects will slow as they sink to the bottom and can be avoided by highly mobile marine mammals, sea turtles and fish. While no residual debris is expected, a recovery team would inspect the payload impact site after the test flight to recover and remove any visible debris on the ocean surface.

We find the probability of adverse impacts to ESA-listed marine mammals, sea turtles, and fish (Table 2) from this potential stressor to be extremely unlikely to occur. Thus, we find that the effects of direct contact from splashdown and sinking of vehicle components on ESA-listed species within the action area are discountable.

Ingestion

Test components have the potential to pose an ingestion risk to marine wildlife. However, all debris is expected to sink to the ocean bottom where depths reach thousands of feet and where most ESA-listed species do not occur. Given the limited time most items will spend in the water column, it is not likely that these items would be accidentally ingested by ESA-listed marine mammals, sea turtles, and fish that do not typically forage on the sea floor. Of the marine mammals in the action area, the only species potentially exposed to expended munitions and shrapnel fragments while foraging on the sea floor in deep water is sperm whales. However, the relatively low density of both sperm whales and test components along the vast sea floor suggests ingestion would be rare. Humpback whales also feed at the seafloor but do so in relatively shallow water and soft sediment areas where ingestion stressors are less likely to be present (fewer activities take place in shallow water and test components are more likely to bury in soft sediment and be less accessible). If a large whale were to accidentally ingest expended materials small enough to be eaten, it is likely the item will pass through the digestive tract and neither result in an injury (e.g., Wells et al. 2008) nor an increased likelihood of injury from significant disruption of normal behavioral patterns such as breeding, feeding, or sheltering.

In the unlikely event an ESA-listed sea turtle or fish may attempt to ingest a test component fragment, it is likely that the animal would reject it, after realizing it is not a food item. If material is ingested, most ingestible-sized items would likely be spit out or passed through the digestive tract without significantly impacting the individual.

Benthic associated species such as sturgeon could feed on test components that have settled on the seafloor. However, this is unlikely to occur considering the depths at which most components would be found and the relatively low density of ESA-listed sturgeon in areas where ingestible items would be expended. Shiny fragments of sinking munitions in the water column could attract and be ingested by fast, mobile predators that chase moving prey. However, this is an unlikely scenario considering: (1) the small amount of time such objects would be in the water column and, (2) that highly mobile predators would be expected to evacuate an area where a splashdown has just occurred.

In conclusion, because we expect smaller test components would likely pass through ESA-listed marine mammals, sea turtles, and fish (see Table 2) with no adverse effects, the effects of this stressor (i.e., ingestion of small test components) are insignificant. Because ingestion of test components of sufficient size to result in adverse effects on ESA-listed marine mammals, sea turtles, and fish (see Table 2) is extremely unlikely, the effects of this stressor (i.e., ingestion of large expended materials) are discountable.

Hazardous Materials

The ESA-listed marine mammals, sea turtles, and fish (Table 2) may be affected by exposure to hazardous materials in the Atlantic and Pacific Oceans during the proposed action. Various substances (e.g., rocket motor, unused propellant, battery electrolytes, residual explosives, and heavy metals) may be introduced into the marine environment from boosters or payload that are not consumed during flight or jettison. Substances may fall into the ocean during flight or be introduced during splashdown. Any marine debris from the components at the water's surface or in the water column are expected to sink to the seafloor. The stage one booster drop zones are located at least 22 kilometers (12 nautical miles) from any land and in deep water depths. As previously mentioned, recovery team will inspect the impact site after the test flight to recover and remove any visible debris present on the water's surface.

As previously mentioned, the ESA-listed marine mammals, sea turtles, and fish (Table 2) that may be affected by the proposed action are likely to have very low densities, patchy distributions, and in many cases seasonal occurrence in the action area. Thus, because of their life histories and because any chemical introduced into the water column will be quickly diluted and dispersed by wave action, ocean currents, and the large volume of water in the Atlantic and

Pacific Oceans, we anticipate exposure to hazardous materials from test flights will be extremely unlikely.

Chemicals released from propellants may include perchlorate, which is highly soluble in water, persistent, and impacts metabolic processes in many plants and animals if in sufficient concentration. However, such concentrations would be localized and are not likely to persist in the ocean. Research has demonstrated that perchlorate does not bioconcentrate or bioaccumulate, which was consistent with the expectations for a water-soluble compound (Furin et al. 2013). Given the dynamic nature of the environment (currents, tides, etc.), long-term impacts from perchlorate in the environment are not expected. It is extremely unlikely that perchlorate released into the marine environment would compromise water quality to the point that it would result in adverse effects on ESA-listed marine mammals, sea turtles, and fish.

Explosive byproducts may also be released into the marine environment. Lotufo et al. (2010) studied the potential toxicity of Royal Demolition Explosive byproducts to marine organisms. The authors concluded that degradation products of these explosives are not toxic at realistic exposure levels. Furthermore, while explosives and their degradation products were detectable in marine sediment approximately 15.2 to 30.5 centimeters (6 to 12 inches) away from degrading munitions, the concentrations of these compounds were not statistically distinguishable from baseline levels beyond 0.9 to 1.8 meters (3 to 6 feet) from the degrading munitions. Based on these results, while it is possible that ESA-listed marine mammals, sea turtles, and fish could be exposed to degrading explosives, such exposure would likely only occur within a very small radius of the unspent explosive.

Any metals deposited on the seafloor would be buried in sediment and slowly degrade over time. Some metals bioaccumulate and physiological impacts begin to occur only after several trophic transfers concentrate the toxic metals. In studies involving munitions from Naval exercises (Briggs et al. 2016; Edwards et al. 2016; Kelley et al. 2016; Koide et al. 2016; Navy 2013), metal contamination is highly localized and bioaccumulation resulting from munitions could not be demonstrated. Specifically, in sampled marine life living on or around munitions on the seafloor, metal concentrations could not be definitively linked to the munitions because comparison of metal concentrations in sediment next to munitions show relatively little difference in comparison to other baseline marine sediments used as a control (Koide et al. 2016).

Given the vast area over which these chemicals and metal debris may be released, it is extremely unlikely that the ESA-listed species (Table 2) in the action area would be impacted by them. ESA-listed species are not expected to be exposed to hazardous chemicals in concentrations high enough to have any significant effects on the animals. Thus, we find that the effects to the ESA-listed species (Table 2) within the action area of exposure to hazardous materials from boosters or payload that are not consumed or jettisoned and reach the water are insignificant.

Vessel Transit and Strikes

The ESA-listed marine mammals, sea turtles, and fish (Table 2) may be affected by vessel transit and strikes in the Atlantic and Pacific Oceans during the proposed action. The JFC activities will consist of relatively little vessel traffic by support vessels and rafts because the flight test launches are infrequent. The Department of the Army proposes to conduct up to six flight test launches from up to four different launch locations per year over the next ten years. In addition, the use of support vessels and rafts will not meaningfully increase the total vessel traffic in the Atlantic and Pacific Oceans.

The support vessel and raft will be traveling at generally slow speeds ranging from eight to 12 knots, reducing the probability of a vessel strike, as vessel operators may have more time to observe and avoid striking an ESA-listed marine mammal, sea turtle, or fish. In addition, most of the action area occurs offshore, away from nearshore waters where interactions with certain ESA-listed fish that transit near the surface of the water (e.g., Atlantic salmon, giant manta rays, oceanic whitetip sharks, scalloped hammerhead sharks, and steelhead trout) may be more likely. Our expectation of vessel strike for an ESA-listed marine mammal, sea turtle, and fish is small due to the small battery-powered trolling motors used by rafts, mostly stationary or very slow movement of support vessels and rafts, the general expected movement of ESA-listed species away or parallel to the vessel, and slow speeds and movement of the support vessel and rafts during most transit. In addition, adherence to observation and avoidance procedures will help minimize the potential for vessel strikes to ESA-listed marine mammals and sea turtles as they come to the surface to breathe. Vessel operators would adjust vessel speed or raft deployment based on expected animal locations, densities, and/or lighting and turbidity conditions. Given the anticipated low density of ESA-listed marine mammals, sea turtles, and fish in the action area, the ability of these ESA-listed species to maneuver to avoid any oncoming vessels, and the low number of vessels associated with JFC activities, it is extremely unlikely that a vessel associated with JFC activities will strike these aforementioned ESA-listed species. We have concluded the potential for vessel strike from the support vessel and rafts is extremely unlikely to occur. Thus, we find that the effects of vessel strikes from transit of the support vessel and rafts on ESA-listed species (Table 2) within the action area are discountable.

Effects to Designated Critical Habitat

Critical habitat for the Central America DPS and Mexico DPS of humpback whales is present within the Vandenberg Air Force Base stage one booster drop zone. The physical and biological features (PBFs) essential to the conservation of Central America DPS of humpback whales include prey species, primarily euphausiids (*Thysanoessa*, *Euphausia*, *Nyctiphanes*, and *Nematoscelis*) and small pelagic fishes, such as Pacific sardine (*Sardinops sagax*), northern anchovy (*Engraulis mordax*), and Pacific herring (*Clupea pallasii*), of sufficient quality, abundance and accessibility within humpback whale feeding areas to support feeding and population growth. For the Mexico DPS of humpback whales, the PBFs also include small pelagic schooling fishes, such as capelin (*Mallotus villosus*), juvenile walleye pollock (*Gadus chalcogrammus*), and Pacific sand lance (*Ammondytes personatus* (86 FR 21082).

Critical habitat for leatherback turtles occurs within the Vandenberg Air Force Base stage one booster drop zone. The PBF for this critical habitat is the occurrence of prey species, primarily scyphomedusae of the order Semaeostomeae (e.g., Chyrsaora, Auerelia, Phacellophora, and Cyanea), of sufficient condition, distribution, diversity, abundance and density necessary to support individual as well as population growth, reproduction, and development of leatherback turtles.

Sargassum critical habitat for the Northwest Atlantic Ocean DPS of loggerhead turtles occurs within the Cape Canaveral Space Force Station stage one booster drop zone and the Wallops Flight Facility and Cape Canaveral Space Force Station stage two booster drop zones. The PBFs for this critical habitat include:

- Convergence zones, surface-water downwelling areas, the margins of major boundary currents (Gulf Stream), and other locations where there are concentrated components of the *Sargassum* community in water temperatures suitable for the optimal growth of *Sargassum* and inhabitance of loggerhead turtles;
- *Sargassum* in concentration that supports adequate prey abundance and cover;
- Available prey and other material associated with *Sargassum* habitat including, but not limited to, plants and cyanobacteria and animals native to the *Sargassum* community such as hydroids and copepods; and
- Sufficient water depth and proximity to available currents to ensure offshore transport (out of the surf zone), and foraging and cover requirements by *Sargassum* for post-hatchling loggerhead turtles (i.e., greater than 10 meters [32.8 feet]) depth).

The elevated sound pressure levels from vehicle launch, sonic booms, and component splashdown are temporary, short duration sounds and are not expected to significantly impair the use or occupancy of critical habitat by the PBF of prey of the Central America DPS and Mexico DPS of humpback whales, leatherback turtles, and Northwest Atlantic Ocean DPS of loggerhead turtles. The elevated sound pressure levels will not significantly alter the primary prey resources available for the aforementioned species, given the relatively short duration of the JFC activities within the designated critical habitats. If pelagic and schooling fishes preyed upon by the Central America DPS and Mexico DPS of humpback whales (i.e., pelagic and schooling fishes) avoid the area of the elevated sound pressure levels due to aversions from the sound source, avoidance is expected to be temporary with no long-term, significant effects. Regarding adverse effects of low frequency sounds to euphausiids preyed upon by the Central America DPS and Mexico DPS of humpback whales, evidence is currently lacking. The invertebrate prey species of leatherback turtles and the Northwest Atlantic Ocean DPS of loggerhead turtles are the same density as seawater and they lack air cavities that would function like the fish swim bladder in responding to pressure (Budelmann 2010). Therefore, acoustic impacts, if any, to leatherback and loggerhead prey species would not be expected to occur on a scale necessary to affect the overall prey availability for leatherback and loggerhead turtles. Thus, we find that the effects of elevated sound pressure levels from vehicle launch, sonic booms, and component splashdown on designated critical habitat for the Central America DPS and Mexico DPS of humpback whales, leatherback turtles, and Northwest Atlantic Ocean DPS of loggerhead turtles are insignificant.

Direct contact from vehicle components during JFC activities will not significantly change the PBFs of prey distribution or densities or *Sargassum* in designated critical habitat because of the small area that may be impacted relative to the size of the designated critical habitats for the Central America DPS and Mexico DPS of humpback whales, leatherback turtles, and Northwest Atlantic Ocean DPS of loggerhead turtles. If prey items are killed within any of the aforementioned critical habitats, it is likely that only a low number of individuals representing a small portion of prey species' populations will be killed. Although some prey items could be killed, other prey items would likely be available to ESA-listed humpback whales, leatherback turtles, and loggerhead turtles in the immediate area surrounding the impact, and any prey that left the area due to the disturbance are expected to return to the area after the impact.

The majority of prey available to loggerhead sea turtles in designated *Sargassum* critical habitat are expected to be near the surface (Witherington et al. 2012). As such, direct contact from vehicle components in designated *Sargassum* critical habitat is expected to affect the PBFs of *Sargassum* habitat due to the potential physical destruction of *Sargassum* and prey in the footprint of the fragments. However, such impacts are expected to be relatively minor and temporary given the high turnover rate of zooplankton and the currents in the North Atlantic gyre and the Gulf Stream, which would circulate *Sargassum* into designated loggerhead critical habitat within the action area (see Richardson et al. 2017 for simulations based on the results of McCauley et al. 2017 that suggest ocean circulation greatly reduced the impact of seismic surveys on zooplankton at the population level).

While direct contact from vehicle components may temporarily alter prey abundance for the Central America DPS and Mexico DPS of humpback whales, leatherback turtles, and Northwest Atlantic Ocean DPS of loggerhead turtles, and *Sargassum* concentrations for the Northwest Atlantic Ocean DPS of loggerhead turtles, direct contact is not expected to have meaningful effects on the conservation value of any of these designated critical habitats. Thus, we find the effects of direct contact from vehicle components on designated critical habitat for the Central America DPS and Mexico DPS of humpback whales, leatherback turtles, and Northwest Atlantic Ocean DPS of loggerhead turtles are insignificant.

Exposure to hazardous materials during JFC activities will not significantly affect prey distribution or densities or *Sargassum* in designated critical habitats for the Central America DPS and Mexico DPS of humpback whales, leatherback turtles, and Northwest Atlantic Ocean DPS of loggerhead turtles. Any chemical introduced into the water column will be quickly diluted and dispersed to concentrations that will not alter the aforementioned critical habitats. As discussed in the *Hazardous Materials* subsection above, studies have shown that chemical and metal contamination from U.S. Naval exercises are extremely localized in the marine environment. Therefore, toxic concentrations of these hazardous substances would not be expected to be encountered by prey species of the Central America DPS of humpback whale, Mexico DPS of humpback whale, leatherback turtle, or Northwest Atlantic Ocean DPS of loggerhead turtle. Thus, we find the effects of exposure to hazardous material on designated critical habitat for the Central America DPS of humpback whale, Mexico DPS of humpback whale, leatherback turtle, and Northwest Atlantic Ocean DPS of loggerhead turtle are insignificant.

While vessel operations can result in minor changes in water flow, turbidity, and movement, these will be extremely localized and temporary and thus not meaningful on a scale that will be expected to adversely affect critical habitat. While the action area is large, vessel activities would only occur over a small portion of the action area to deploy sensor rafts and collect flight data. Support vessels may remain on site for up to two weeks, but they will be largely stationary during this time, which would minimize changes to water flow, turbidity, and movement. As previously mentioned, the rafts use small motors, which would also minimize changes to the aforementioned water dynamics. Support vessels and rafts can come into close proximity with, or even in contact with, prey of ESA-listed species (i.e., Central America DPS of humpback whale, Mexico DPS of humpback whale, leatherback turtle, and Northwest Atlantic Ocean DPS of loggerhead turtle) or *Sargassum* (i.e., Northwest Atlantic Ocean DPS of loggerhead turtle) found within these designated critical habitats. Given the limited amount of vessel activity associated with the JFC activities, we expect that any such interactions will only result in a temporary, slight displacement of prey or *Sargassum*. If larger prey were to be drawn into or struck by the vessel's propellers, it is possible that individual prey can be killed. However, even if this occurred, the removal of individual prey would have a limited impact on the overall abundance of prey resources in the designated critical habitats in the action area. Given the short-term nature of vessel activities, they will not restrict inter-area passage or significantly alter ambient noise levels. Any effects from the proposed action will be short-term and minimal, and will not have any measurable impacts on the aforementioned PBFs comprising the critical habitats of Central America DPS and Mexico DPS of humpback whales, leatherback turtles, and Northwest Atlantic Ocean DPS of loggerhead turtles. Because the operations of the support vessels and rafts are temporary (i.e., not a permanent structure), the JFC activities will not prevent animals from accessing critical habitat. Even though these vessels may remain on site for up to two weeks, animals would still be able to access critical habitat because of the low number of vessels and relatively small area over which they would operate in the action area. Thus, we find that the effects of vessel strikes on designated critical habitat for the Central America DPS and Mexico DPS of humpback whales, leatherback turtles, and Northwest Atlantic Ocean DPS of loggerhead turtles are insignificant.

Given the nature of the proposed action, none of the PBFs essential to the conservation of the ESA-listed species (i.e., Central America DPS of humpback whale, Mexico DPS of humpback whale, leatherback turtle, and Northwest Atlantic Ocean DPS of loggerhead turtle) will be significantly altered. The proposed action will not significantly alter the aforementioned PBFs or their conservation value for all critical habitats overlapping the action area, including large-scale physical or oceanographic conditions or processes, nutrients, bathymetry, photoperiod, or prey resources and availability.

In conclusion, we find that the effects of the proposed JFC activities on the ESA-listed species and designated critical habitat in Table 2 are either insignificant or discountable. Therefore, these JFC activities may affect, but are not likely adversely affect any ESA-listed species or designated critical habitat in the action area.

Additive Effects

We have concluded the JFC activities are not likely to adversely affect ESA-listed marine mammals, sea turtles, and fish (Table 2) or designated critical habitat for Central America DPS and Mexico DPS of humpback whales, leatherback turtles, and Northwest Atlantic Ocean DPS of loggerhead turtles. Programmatic consultations often involve actions that are expected to occur with some frequency over many years and possibly continue for an indefinite time span. As a result, we evaluate the potential for the effects of the stressors to ESA-listed species and designated critical habitat over the lifetime of the proposed action to result in additive effects due to chronic stress or cumulative effects. Therefore, we determine if when considered additively, the JFC activities are likely to adversely affect the aforementioned ESA-listed species and designated critical habitat.

The Department of the Army proposes to conduct up to six flight test launches from up to four different launch locations per year, over the next ten years. This is a relatively small amount of annual activities, spread out over large expanses of open water in the Atlantic and Pacific Oceans, for a finite number of years. Each of the stressor categories (see Effects of the Action) were determined to be extremely unlikely to have adverse effects and therefore discountable, or to result in effects that are so small as to be insignificant. The possibility of extremely unlikely effects overlapping in time and space and having a cumulative effect does not seem plausible. Chronic stress from relatively infrequent activities occurring across vast areas also does not seem plausible. Therefore, additive effects occurring over the ten years of JFC activities considered in this consultation are extremely unlikely and thus discountable.

Conclusion

Based on this analysis, NMFS ESA Interagency Cooperation Division concurs with the Department of the Army that the proposed action may affect, but is not likely to adversely affect the subject ESA-listed species and designated critical habitats.

Reinitiation of Consultation

Reinitiation of consultation is required and shall be requested by the federal agency, where discretionary federal involvement or control over the action has been retained or is authorized by law and:

1. New information reveals effects of the action that may affect an ESA-listed species or designated critical habitat in a manner or to an extent not previously considered;
2. The identified action is subsequently modified in a manner that causes an effect to the ESA-listed species or designated critical habitat that was not considered in this concurrence letter;
3. Take of an ESA-listed species occurs; or
4. A new species is listed or critical habitat designated that may be affected by the identified action (50 C.F.R. §402.16).

Critical habitat has been proposed for *Acropora globiceps*, *Acropora jacquelineae*, *Acropora retusa*, *Acropora speciose*, boulder star coral (*Orbicella franski*), *Euphyllia paradivisa*, *Isopora crateriformis*, lobed star coral (*Orbicella annularis*), mountainous star coral (*Orbicella faveolata*), rough cactus coral (*Mycetophyllia ferox*), pillar coral (*Dendrogyra cylindrus*), and *Seriatopora aculeata*. Upon issuance of the final rules designating critical habitat for these species, the Department of the Army will need to reinitiate consultation if effects to these habitats because of the JFC activities are anticipated.

Please direction questions regarding this letter to Howard Goldstein, Consulting Biologist, at (301) 427-8417, or by email at howard.goldstein@noaa.gov, or me at (301) 427-8495, or by email at cathy.tortorici@noaa.gov.

Sincerely,

Cathryn E. Tortorici
Chief, ESA Interagency Cooperation Division
Office of Protected Resources

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Comments and Responses on the Draft EA/OEA

U.S. Army Space and Missile Defense Command
Attention: SMDC-ENE (David Fuller)
Post Office Box 1500
Huntsville, AL 35807-3801
(jfceaoea@govsupport.us)

Re: EPA Comments on the Programmatic Environmental Assessment for the Testing of Hypersonic Weapon Systems, Joint Flight Campaign

The United States Environmental Protection Agency (EPA) has reviewed the referenced document in accordance with Section 309 of the Clean Air Act and Section 102(2)(C) of the National Environmental Policy Act (NEPA). The purpose of this draft Programmatic Environmental Assessment (PEA) is for the Departments of the Army and Navy (Proponent) to evaluate the impacts of testing developmental hypersonic weapons, an action known as the Joint Flight Campaign (JFC). Testing will involve missile transport, preparation and launches from a mixture of four government installations in the continental United States and Hawaii, over the Atlantic and Pacific Oceans with air and sea-based flight monitoring. Up to six launches will be conducted annually for ten years. Common elements of all Preferred Alternative installation locations, as well as elements unique to specific locations, are addressed in this comment letter.

The proposed project involves the Proposed Action Alternative and the No Action Alternative. Under the No Action Alternative, the Proponent would not pursue the JFC program. Under the Proposed Action Alternative, the Proponent proposes to test missiles at four installations and two Broad Ocean Areas (BOA) including: Pacific Missile Range Facility (PMRF), Barking Sands, Kauai, Hawaii; Vandenberg Space Force Base (VSFB), California; NASA Wallops Flight Facility (WFF), Virginia; Cape Canaveral Space Force Station (CCSFS), Florida. The proposed locations were selected from nine candidate sites based on established infrastructure, support, and procedures for missile launches.

Limited modification to structures will be required to accommodate the two-stage booster rocket and payload of the JFC. All locations will potentially conduct subject missile launches from stools and PMRF has the additional potential to launch from canisters similar to existing THAAD missile launches at PMRF. Proposed flight monitoring would be conducted by a marine vessel with onboard telemetry equipment, with the support of deployable rafts and unmanned aerial systems. The vessel would deploy for up to a month in support of each launch. Manufacture of missile components is proposed at existing facilities and is not analyzed by the PEA.

The EPA understands that the Proponent's preferred alternative is the Proposed Action Alternative. The EPA has not identified any significant environmental impacts from the proposed action that would require substantive changes to the draft PEA or require the Proponent's consideration of other alternatives for the location of the proposed testing sites. The EPA has enclosed detailed technical comments for your consideration (See enclosure).

The EPA appreciates the opportunity to review the draft PEA for the Joint Flight Campaign. If you have questions regarding our comments, please contact Douglas White, Project Manager in the NEPA Section at white.douglas@epa.gov or at 404-562-8586.

Enclosure

EPA Comments on the Programmatic Environmental Assessment for the Testing of Hypersonic Weapon Systems, Joint Flight Campaign

Biological Resources: Section 1.6 of the draft PEA indicates that the Proponent will continue coordinating with the National Marine Fisheries Service (NMFS). The EPA understands that proposed activity host installations have consulted the United States Fish and Wildlife Service (FWS) regarding existing activities including missile launches. Mitigation measures are present at installations where they have been determined to be effective, such as those identified in the 2019 Wallops Flight Facility Site-wide Programmatic Environmental Impact Statement referenced by Section 1.4.1 of the draft PEA. The draft PEA identifies the following protected species with the potential to exist near the proposed activity – PMRF: one bat species, three marine mammal species, ten bird species, and five sea turtle species; VSFB: one marine mammal species, four bird species, one invertebrate species, and one amphibian species; WFF: one bat species, three marine mammal species, ten bird species, four sea turtle species, and three fish species; and CCFSF: one terrestrial mammal species, two marine mammal species, six bird species, five sea turtle species, one tortoise species, two reptile species, and five fish species.

Recommendation: The EPA recommends consulting NMFS prior to scheduling individual launch events for determination of possible marine mammal presence and calving activity that may be impacted by monitoring and support vessel activity. Where impacts to marine mammals cannot be mitigated, alternate missile flight paths should be used. The EPA recommends adding the 2021 JFC Marine Biological Evaluation to the draft PEA as an appendix since this document is referenced multiple times by the analysis of the draft PEA. The EPA principally defers to FWS regarding compliance with the Endangered Species Act. Additional conservation measures identified by the FWS during consultation should be included in the Final EA and/or Finding of No Significant Impact.

Land Use and Environmental Justice: The proposed action is consistent with existing land use at respective locations. Section 1.4.1 of the draft PEA identifies completed NEPA analysis of ongoing operations including missile launches and activities that will support the proposed action. The NEPA documents identified in Section 1.4.1 include analysis of installation specific Environmental Justice (EJ) conditions that are cited by respective sections of the draft PEA. The EPA understands that the proposed action will not generate noise contours greater than those calculated by previous NEPA analysis, nor create adverse impacts to off-installation populations. Missile and payload flight paths will be limited to non-populated areas and the draft PEA includes specific measures to ensure marine vessels are not endangered by the proposed activity.

Recommendation: Please consider using the NEPAssist (https://www.epa.gov/nepa/nepassist) and EJSCREEN tools (https://www.epa.gov/ejscreen) as part of the NEPA analysis process.

NEPAssist and EJSCREEN combine multiple databases to help screen for environmental and social impacts.

Air Quality: The proposed activity is located in Kauai county, Hawaii; Santa Barbara county, California; Accomack county, Virginia; and Brevard county, Florida. In accordance with National Ambient Air Quality Standards (NAAQS), Santa Barbara county is designated as in maintenance status for 1-hour ozone. Kauai, Accomack, and Brevard counties are in attainment with NAAQS. The EPA understands that PEA air quality calculations using Minuteman III solid-fuel missile emission profiles indicate that emissions from the proposed activity are below the significance threshold.

COMMENT INCORPORATOR KFS-LLC	DATE 12 July 2021
COMMENTOR Douglas White Ntale Kajumba Larry Gissentanna	ORGANIZATION OF COMMENTOR **US EPA Region 4**
TITLE OF DOCUMENT Contract W9113M-17-D-0009, TO W9113M18FD010 Draft Joint Flight Campaign Programmatic Environmental Assessment / Overseas Environmental Assessment	DATE OF DOCUMENT 11 June 2021

CONTRACTOR RESPONSE COLUMNS

ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO.	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES *(Exact wording of suggested change)*	INCORP.? *(Yes/No)*	HOW COMMENT WAS INCORPORATED *(If not incorporated, why?)*
1.						**Biological Resources**: Section 1.6 of the draft PEA indicates that the Proponent will continue coordinating with the National Marine Fisheries Service (NMFS). The EPA understands that proposed activity host installations have consulted the United States Fish and Wildlife Service (FWS) regarding existing activities including missile launches. Mitigation measures are present at installations where they have been determined to be effective, such as those identified in the 2019 Wallops Flight Facility Site-wide Programmatic Environmental Impact Statement referenced by Section 1.4.1 of the draft PEA. The draft PEA identifies the following protected species with the potential to exist near the proposed activity – PMRF: one bat species, three marine mammal species, ten bird species, and five sea turtle species; VSFB: one marine mammal species, four bird species, one invertebrate species, and one amphibian species; WFF: one bat species, three marine mammal species, ten bird species, four sea turtle species, and three fish species; and CCFSF: one terrestrial mammal species, two marine mammal species, six bird species, five sea turtle species, one tortoise species, two reptile species, and five fish species. <u>Recommendation</u>: The EPA recommends consulting NMFS prior to scheduling individual launch events	Yes	As noted in the EA, the program will meet the requirements specified in the NMFS consultation for the JFC program. In addition, the JFC Program will follow the NMFS agreements that are in place at each installation. The 2021 JFC Marine Biological Evaluation will be added to the Final EA/OEA as an appendix.

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						for determination of possible marine mammal presence and calving activity that may be impacted by monitoring and support vessel activity. Where impacts to marine mammals cannot be mitigated, alternate missile flight paths should be used. The EPA recommends adding the 2021 JFC Marine Biological Evaluation to the draft PEA as an appendix since this document is referenced multiple times by the analysis of the draft PEA. The EPA principally defers to FWS regarding compliance with the Endangered Species Act. Additional conservation measures identified by the FWS during consultation should be included in the Final EA and/or Finding of No Significant Impact.		
2.						**Land Use and Environmental Justice:** The proposed action is consistent with existing land use at respective locations. Section 1.4.1 of the draft PEA identifies completed NEPA analysis of ongoing operations including missile launches and activities that will support the proposed action. The NEPA documents identified in Section 1.4.1 include analysis of installation specific Environmental Justice (EJ) conditions that are cited by respective sections of the draft PEA. The EPA understands that the proposed action will not generate noise contours greater than those calculated by previous NEPA analysis, nor create adverse impacts to off-installation populations. Missile and payload flight paths will be limited to non-populated areas and the draft PEA includes specific measures to ensure marine vessels are not endangered by the proposed activity. Recommendation: Please consider using the NEPAssist (https://www.epa.gov/nepa/nepassist) and EJSCREEN tools (https://www.epa.gov/ejscreen) as part of the NEPA analysis process. NEPAssist and EJSCREEN combine multiple databases to help screen for environmental and social impacts.	Yes	We will use NEPAssist and EJSCREEN to support the analysis in the EA/OEA

COMMENT INCORPORATOR KFS-LLC	DATE 12 July 2021
COMMENTOR General Public	ORGANIZATION OF COMMENTOR N/A
TITLE OF DOCUMENT Contract W9113M-17-D-0009, TO W9113M18FD010 Draft Joint Flight Campaign Programmatic Environmental Assessment / Overseas Environmental Assessment	DATE OF DOCUMENT 11 June 2021

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1.						Regarding: Joint Flight Campaign PEA Our organization opposes the proposed action which entails up to six Hypersonic flight test launches at up to four different launch locations per year, over the next 10 years. Test objectives are expected to dictate range selection from Atlantic and Pacific test ranges. We believe the following: • Testing of Hypersonics will dramatically escalate the nuclear arms race/new Cold War • Our nation can't afford another arms race – especially one in space • We need to be spending our national treasury on dealing with our real enemy – climate crisis and growing economic inequality • Toxic rocket fuel exacerbates an already grave climate crisis • It's time the warmongers listened to the taxpayers We support the No Action alternative. In peace, Bruce K. Gagnon Coordinator Global Network Against Weapons & Nuclear Power in Space	No	Acknowledged, thank you. As presented in the EA/OEA, there will be no significant impact to any of the resource areas analyzed.

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						PO Box 652 Brunswick, ME 04011 (207) 389-4606 http://www.space4peace.org http://space4peace.blogspot.com (blog) 'Thank God men cannot fly, and lay waste the sky as well as the earth.' ~ Henry David Thoreau		
2.						Sirs: The proposed NEPA missile launchings over the next ten years will escalate global cold war dangers and will increase the greatest threats we face at this time, which are climate polution and atmospheric destruction making the planet unliveable. The waste of national treasure on the military ignores the internal threat to our democracy posed at this time by income inequality, and unmet human needs, so great at this time. We must listen to the peoples voice for change. We have amassed an nuclear arsenal six time greater than the next seven developed nations without security from the real threats. Please say no to these tests. Richard B. Lethem 88 year old U.S. Army Veteran Claremont,CA.	No	Acknowledged, thank you.
3.						To Whom It May Concern: The proposed NEPA missile launchings over the next ten years will escalate global cold war dangers and intensify the greatest threats now facing humanity, which are climate pollution and atmospheric destruction making the planet unliveable. The waste of national treasure on the military ignores the internal threat to our Republic posed at this time by income inequality, and unmet human needs, so severe at this time. Feeding the beast of the weapons makers and saber rattling is the wrong path to take to achieve peace with others on this earth and above it in space. War is not the answer. Heed the warnings of our 34th President given to us in his farewell address to the nation. Say no to these tests.	No	Acknowledged, thank you.

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						Respectfully yours, Roy Pingel 7019 Loubet St. Forest Hills, NY 11375		
4.						I strongly oppose any pacific hypersonic testing. It's a waste of funds and the toxic rocket fuel exacerbates and already grave climate crisis situation. Patricia Blair, Kailua, Hi. 8088886393 Sent from my iPad	No	Acknowledged, thank you. As presented in the EA/OEA, there will be no significant impact to any of the resource areas analyzed.
5.						Dear Mr. Fuller, I served 29 years in the U.S. Army/Army Reserves and retired as a Colonel. I was also a U.S. diplomat for 16 years and served in U.S. Embassies in Nicaragua, Grenada, Somalia, Uzbekistan, Kyrgyzstan, Sierra Leone, Micronesia, Afghanistan and Mongolia. I have lived in Honolulu, Hawai'i for 21 years. I am very concerned about the testing of hypersonic missiles and other missiles at the Kauai Barking Sands Missile Test Site. As I understand, the U.S. military is asking that Barking Sands will be used six times a year for ten years to test the hypersonic missiles. I strongly believe the U.S. government's testing of hypersonic missiles will greatly increase the nuclear arms race and create a new Cold War. I also believe testing at Barking Sands Kauai will make the small Hawaiian Islands a major target for retaliation if the U.S. fires hypersonic missiles at China, Russia or any other country. We in the U.S. can't afford another arms race, particularly a weapons race in space. We need our taxes to deal with the climate crisis and the economic inequality we find in our own country. And the toxic rocket fuel increases the challenging climate crisis we face. The hypersonic rockets are not needed for our national security. Diplomacy, not hypersonic rockets and war, are what will ensure our national security. Ann Wright	No	Acknowledged, thank you.

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						2333 Kapiolani Blvd #3217 Honolulu, HI 96826 Annw1946@gmail.com -- Ann Wright Dissent: Voices of Conscience www.voicesofconscience.com		
6.						To: the JFCEAOEA From: Mele Stokesberry, P. O. Box 880231, Pukalani, HI 96788 I am writing to strongly opposed the basing and launching of the Hypersonic missile anywhere, but especially in the ecologically fragile Hawaiian islands. My reasons are: 1. This massively would escalate the nuclear arms race and make every nuclear nation know we would be preparing to launch a first strike, an unthinkably immoral event that would lead to planetary devastation. 2. The basing of this in Hawaii would make our state, our people, our history and culture much more of a target for competing nuclear states, as well as for any potential terrorists, domestic or foreign. 3. We cannot afford another arms race, especially one in space. We are in a time of potentially renewing America's commitment to her people. This is insane. 4. Rocket fuel and building the base, and all the launches, constitute a major threat to Hawaii's environment. Mele Stokesberry	No	Acknowledged, thank you. As presented in the EA/OEA, there will be no significant impact to any of the resource areas analyzed.
7.						Dear Mr. Fuller,I've been in education work and have lived in Hawaii for more than 50 years. I am the co-author of a book "The Dark Side of Paradise" about the military presence in Hawaii. I'm very concerned about every escalation of militarism in	No	Acknowledged, thank you.

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						our world and I believe Hypersonic missile testing poses an existential threat to all life on the planet. The military is planning on using Barking Sands on Kauai for testing hypersonic missiles six times a year for 10 years. I'm opposed to this testing. I believe it is a major step toward a new global arms race and nuclear war, not a step toward peace. It is clear the US is escalating tensions with Russia and China to fuel this arms race. It is time to deescalate tensions and use diplomacy, not more missiles as a path to peace. Hawaii is a land of aloha. Hawaii is already one of the most militarized places on the planet. It is a further insult to use Barking Sands or any other place in Hawaii for Hypersonic Missile testing. I want to see Hawaii de-militarized and cleaned up from the enormous mess the military has created in Hawaii. We don't need any more military toxins contained in missile rockets contaminating our air, land, and water. The money spent on hypersonic missiles could be better used for environmental clean up, health care, and education. Please put this hypersonic missile testing plan in the recycle bin. Thank you. Jim Albertini President, Malu Aina PO Box 489 Kurtistown, Hawaii 96760 ja@malu-aina.org -- Jim Albertini Malu 'Aina Center For Non-violent Education & Action P.O. Box 489 Ola'a (Kurtistown) Hawai'i 96760 Phone 808-966-7622 Email ja@malu-aina.org Visit us on the web at www.maluaina.org		

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8.						Dear Mr. Fuller, My name is D. Kehaulani Godines. I am of Kanaka Maoli descent and am domiciled within my Island Home. On behalf of my family and community, I emphatically concur 100% with Jim Albertini – DeEscalate and DeMilitarize. Strive for peaceful alliances and treaties of trade and friendly relations...and Hold to Them. Clean up and make global reparations. Use diplomacy, rather than weaponry. Military's role in society is one of defense, not of provocation and world domination. Operate within your parameters. Jim Albertini's testimony is as follows: I've been in education work and have lived in Hawaii for more than 50 years. I am the co-author of a book "The Dark Side of Paradise" about the military presence in Hawaii. I'm very concerned about every escalation of militarism in our world and I believe Hypersonic missile testing poses an existential threat to all life on the planet. The military is planning on using Barking Sands on Kauai for testing hypersonic missiles six times a year for 10 years. I'm opposed to this testing. I believe it is a major step toward a new global arms race and nuclear war, not a step toward peace. It is clear the US is escalating tensions with Russia and China to fuel this arms race. It is time to deescalate tensions and use diplomacy, not more missiles as a path to peace. Hawaii is a land of aloha. Hawaii is already one of the most militarized places on the planet. It is a further insult to use Barking Sands or any other place in Hawaii for Hypersonic Missile testing. I want to see Hawaii de-militarized and cleaned up from the enormous mess the military has created in Hawaii. We don't need any more military toxins contained in missile rockets contaminating our air, land, and water. The money spent on hypersonic missiles could be better used for environmental clean up, health care, and education. Please put this hypersonic missile testing plan in the recycle bin. Thank you. Jim Albertini	No	Acknowledged, thank you.

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						President, Malu Aina ja@malu-aina.org Again, I join Jim Albertini and other concerned community members in saying NO to Hypersonic Missiles Testing on Barking Sands, Kauai. Indignant, D. Kehaulani Godines		
9.						I'm writing to encourage stopping the testing of hypersonic missiles . The serious threat to human survival on this planet cannot be solved by faster missiles, more bases, lasers in space or upgraded atomic weapons. The continued expansion of militarism is the threat itself while it distracts money & energy from solving the climate crisis. Anything that doesn't deal with that reality is by definition insane. The development of hypersonic missiles doesn't make me feel more secure. On the contrary, it makes me feel our government is run by mad men. Sincerely, Robert Shetterly Brooksville, Maine	No	Acknowledged, thank you.
10.						Dear Mr. Fuller, Having lived in Japan for over 40 years and having visited Hiroshima and Nagasaki, the sites of American nuclear bombings numerous times, it sickens me that the American military still thinks that the only way America can be strong is to flex its military muscle. It is way past time for the American military to be downgraded to a defensive force, not an offensive force. Respectfully, Tom Wright	No	Acknowledged, thank you.
11.						To whom it may concern: It concerns me, and all Americans, that we care more (by spending from our Treasury for missiles) than for creating a safe	No	Acknowledged, thank you.

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						environment for all people, including all Americans, with better healthcare for all, a clean environment, and opportunities for education and jobs. Thank you for stopping missile production now! Aloha, Charlotte Flavin, Hawaii		
12.						I live on Kaua`i island and I am opposed to this costly and dangerous venture. The Department of Defense warns of the emerging threats posed by Russia and China's research and development into hypersonic vehicles, at the same time lauding itself for its own long history of development. This cycle of weapons industry enrichment and influence, disguised as "missile defense", while blaming other countries for a self inflicted nuclear arms race, needs to come to an end. Bidwn's $715B Pentagon budget means to transform war making: the Joint All-Domain Command and Control that, even if it doesn't cause intentional or accidental nuclear conflict, will cause ecological and climate devastation. We don't need to up the stakes in the nuclear arms race, because there can be no winners. We urge you to reject this dangerous proposal to launch six rockets every year for ten years. The only sure way to to avoid our home and loved ones being attacked by a nuclear weapon is to negotiate verifiable treaties to first limit numbers of warheads and missile capabilities, then abolish nuclear weapons. Until our politicians grow the political courage to favor diplomacy over war baiting, our recourse is to resist these war preparations. Choose the No Action Alternative. Regards, Michael Goodwin Kapaa, Kaua`i, Hawaii	No	Acknowledged, thank you.
13.						At a time when this nation and global community are facing serious drought, fires, ever more severe storms and hurricanes, and sea level rise, I am just sick that our Department of Defense continues to	No	Acknowledged, thank you.

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						sponge both the economic and environmental resources of this planet for any kind of weapons testing. For those decision makers who fail to see the reality of our current situation, I pray you will be spared enduring the eventual outcomes that you are burdening your children and grandchildren with. Sincerely, Cindy Piester 177 Jordan Ave. Ventura, CA 93001		
14.						Aloha Mr. Fuller, As I understand, the U.S. military is asking that Kauai Barking Sands Missile Test Site will be used six times a year for ten years to test the hypersonic missiles. I strongly believe the U.S. government's testing of hypersonic missiles will greatly increase the nuclear arms race and create a new Cold War. I also believe testing at Barking Sands Kauai will make the small Hawaiian Islands a major target for retaliation if the U.S. fires hypersonic missiles at China, Russia or any other country. We in the U.S. can't afford another arms race, particularly a weapons race in space. We need our taxes to deal with the climate crisis and the economic inequality we find in our own country. And the toxic rocket fuel increases the challenging climate crisis we face. The hypersonic rockets are not needed for our national security. Diplomacy, not hypersonic rockets and war, are what will ensure our national security. Sylvia Dolena Hawaii Resident Pele Lani Farm LLC Aloha Animal Adovcates	No	Acknowledged, thank you. As presented in the EA/OEA, there will be no significant impact to any of the resource areas analyzed.
15.						Regarding: Joint Flight Campaign PEA Our organization, PeaceWorks of Brunswick, Maine opposes the proposed action of up to six Hypersonic flight test launches at up to four different launch	No	Acknowledged, thank you. As presented in the EA/OEA, there will be no significant impact to any of the resource areas analyzed.

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						locations per year, over the next 10 years. Test objectives are expected to dictate range selection from Atlantic and Pacific test ranges. Instead we support the "No Action" alternative. We believe that: • Testing of Hypersonics will dramatically escalate the nuclear arms race/new Cold War • Our nation can't afford another arms race – especially one in space • Toxic rocket fuel exacerbates an already grave climate crisis • We need to be spending our national treasury on dealing with our real enemies – climate crisis and growing economic inequality • It's time for listening to the taxpayers sincerely and for an end to war, Rosalie Paul for PeaceWorks 30 Page Street Brunswick, ME 04011 (207) 725-7686 http://www.peaceworksbrunswickme.org "Now let us see what love can do" - William Penn - 18th century		
16.						Dear Mr. Fuller, Between 1993 and 2012 I lived on Kauai and since 2012, I live on Hawaii island. I am very concerned about the testing of hypersonic missiles and other missiles at the Kauai Barking Sands Missile Test Site. I strongly believe the U.S. government's testing of hypersonic missiles will greatly increase the nuclear arms race and create a new Cold War. This was why the INF Treaty was signed between Reagan and Gorbachev -- to put a cap on the maximum distance a missile can travel. Reagan and Gorbachev understood that the development of such weapons, predicated on the greed of companies such as Lockheed Martin and Raytheon, was not worth risking the future of	No	Acknowledged, thank you.

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						humanity. These missile tests will also make the small Hawaiian Islands a major target for retaliation if the U.S. fires hypersonic missiles at China, Russia or any other country. We in the U.S. can't afford another arms race, particularly a weapons race in space. We need our taxes to deal with the climate crisis, current and future pandemics, and the economic inequality we find in our own country. And the toxic rocket fuel increases the challenging climate crisis we face. The hypersonic rockets are not needed for our national security. Diplomacy, not hypersonic rockets and war, are what will ensure our national security. Koohan Paik-Mander P.O. Box 5133 Honokaa, HI. 96727		
17.						Dear Mr. Fuller, We are going the wrong way. Down this road awaits only death. This new weapons race is pure insanity. It doesn't matter if we beat China and Russia, because they will eventually catch up. You've seen that. Then what? Then we'll have weapons that can't be stopped and increase the chance of accidental apocalypse by a shocking degree. I remember one story about Norway launching a weather satellite and forgetting to tell Moscow. The Generals were freaking out and called Gorbacheve for permission to strike back. Gorbacheve was asleep at the time, but he calmly told the Generals that they probably just forgot to notify them. That's how close to catastrophe we came. If those generals had launched, with only minutes to make a decision, nuclear missiles would have devastated NATO bases and then of course, we'd have to strike back and it's over. Hypersonic weapons are guaranteed suicide. Don't we have enough to worry about with the climate emergency, plastics choking and poisoning the planet, 2/3 of all animals wiped out since 1970 with 200 more species going extinct everyday? If there really is such a thing as free will, which I'm beginning to doubt, then now would be the time to use it. Stop	No	Acknowledged, thank you.

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						this madness now. Only diplomacy will make us safe, not more weapons. -- Fight with aloha, <<<THIS! Topher		
18.						Dear Mr. Fuller, I served 29 years in the U.S. Army/Army Reserves and retired as a Colonel. I was also a U.S. diplomat for 16 years and served in U.S. Embassies in Nicaragua, Grenada, Somalia, Uzbekistan, Kyrgyzstan, Sierra Leone, Micronesia, Afghanistan and Mongolia. I have lived on the Big Island of Hawai'i for 22 years. I am very concerned about the testing of hypersonic missiles and other missiles at the Kauai Barking Sands Missile Test Site. As I understand, the U.S. military is asking that Barking Sands will be used six times a year for ten years to test the hypersonic missiles. I strongly believe the U.S. government's testing of hypersonic missiles will greatly increase the nuclear arms race and create a new Cold War. I also believe testing at Barking Sands Kauai will make the small Hawaiian Islands a major target for retaliation if the U.S. fires hypersonic missiles at China, Russia or any other country. We in the U.S. can't afford another arms race, particularly a weapons race in space. We need our taxes to deal with the climate crisis and the economic inequality we find in our own country. And the toxic rocket fuel increases the challenging climate crisis we face. The hypersonic rockets are not needed for our national security. Diplomacy, not hypersonic rockets and war, are what will ensure our national security. Thank you, Michál Carrillo Sent from Yahoo Mail for iPhone	No	Acknowledged, thank you.
19.						Aloha Kākou, I strongly oppose the testing of hypersonic missiles in Hawai'i, due to adverse effects on marine life, ocean health, cultural practices, and peace. It is also important to remember that such testing would be a direct violation of the neutrality of Hawai'i, which is	No	Acknowledged, thank you. As presented in the EA/OEA, there will be no significant impact to any of the resource areas analyzed.

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						illegally occupied by the United States in the first place. As an alternative to further militarization, I request that the United States withdraw its hostile occupation of our country, and clean up its mess. This would ensure world peace far better than any missile program. Mahalo, Laulani Teale, MPH Coordinator, Ho'opae Pono Peace Project		
20.						Please do not consider the island of Kaua'I for hypersonic missile testing. Regina Gregory	No	Acknowledged, thank you.
21.						I am strongly against the building, testing and implementation of hypersonic missiles in the proposed Pacific test ranges and specifically those proposed for Hawaii. Do not make Hawaii a target for a hypersonic missile war. Our country has many priorities. Growing the military industrial complex is not one of them. Respectfully, Judith E. Lyon 162124 Pearl Dr. Pahoa, HI. 96778	No	Acknowledged, thank you.
22.						Please do not build a new nuclear launch base on Kauai. It won't protect Kauai from nuclear attacks. At age 9 , I was living on Oahu and I remember December 7, 1941. Having a US Navy base in Pearl Harbor was the reason why Japan bombed it. Having the base did not protect Pearl Harbor from attack. Instead it caused a disaster for Hawaii. Building a new nuclear base for space weapons will make the new base a focus to attack, and begin a new nuclear arms race. A nuclear arms race cannot be won. Doing this will be very expensive, and it won't protect us from harm. Please stop developing	No	Acknowledged, thank you.

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						new nuclear weapons. These weapons cannot make us safe. Respectfully, Ms. Martha E. Martin 40 Kunihi Lane #226 Kahului, HI 96732		
23.						RE # 0001329762-01 Joint Flight Campaign (JFC) Draft Programmatic Environmental Assessment (PEA/OEA) To Whom it May Concern: ALOHA ! ! ! We appreciate that ALL agencies sponsored by the Office of the Under Secretary of Defense for Research and Engineering & U.S. Dept of Army & U.S. Navy - their SSP (Strategic Systems Program) ALL participating Agencies, as well as Dept of Energy, the National Aeronautics and Space Administration (NASA), the U.S. Airforce 30th Wing and U.S. Air Force 45th Space Wing - who prepared this draft PEA/OEA. Infinite are the environmental effects ! ! ! ! ! Immediately Cease and Desist ANY & ALL of the proposed action in the proposed JFC draft PEA/OEA. This proposed draft Programmatic EA is toxic in myriad, countless ways. Including, but not limited to escalated nuclear arms race...International Outrage Toxicity of declining water sources in parched continental U.S. from rocket fuel exhaust. ■ Defies U.S. Clean Water Act. Exacerbates Climate Change...Isn't the triple digits temperatures in the Pacific Northwest and 2020 forest fires from San Diego to Seattle an inkling of the crisis situation ? What are Y'all ? ! Clearly not taxpayers ! ! ! ! ! We demand NO ACTION ALTERNATIVE	No	Acknowledged, thank you. As presented in the EA/OEA, there will be no significant impact to any of the resource areas analyzed.

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						Please keep us updated on any/all updates via U.S. Postal System (USPS). Kaua'i DEFINITELY doesn't need to be more of a target : PMRF MAHALO (THANKS) for keeping us on the mailing list for the draft JFC PEA/OEA. We stand in SOLIDARITY with our Children Grandchildren and future generations "NO" further action NO ACTION ALTERNATIVE accepted by NEPA; 42 United States Code 4321 and the Council on Environmental Quality (CEQ) Regulations for implementing the Procedural Provisions of NEPA (Title 40 Code of Federal Regulations [CRF] Parts 1500- 1508, 1978, July 1, 1986, the Dept of Army Procedures for implementing NEPA (32 CRF Part 651), the Dept of Airforce Procedures for implementing NEPA (32 CRF Part 989), Chief of Naval Operations Instructions 5090.1E, and Executive Order 12114, Environmental Effects Abroad of Major Federal Action. NO Proposed Action PLEASE Cease and Desist MAHALO (THANKS) for keeping us updated via USPS mail. Malama Pono ! ! ! ! ! ALOHA 'Aina Sincerely With ALOHA, Bonnie P. Bator and 'Ohana (Keana'aina, Kai'aokamalie, Keli'ikoa and Kai) 8 July 2021 PO Box 30848 Anahola, Kaua'i Hawai'i		
24.						To whom it may concern:	No	Acknowledged, thank you.

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						I am opposed to hypersonic missiles on Kaua'i. As we realized after the 2018 false missile alert, the more weapons we have in Hawai'i, the more Hawai'i becomes a target. Negotiation and diplomacy will do more to prevent war than always upping the ante in arms races. The energy required to build, transport, and fire hypersonic missiles pollutes the environment, as do the missiles themselves when they fall into the sea. Our money is much better spent on meeting the climate crisis and strengthening our social safety net. Sincerely, Cory Harden, Hilo		
25.						To whom it may concern, I am from a military family and am 64 years old. My grandfather served in Spanish American, WWI and WWII. My uncle Lt. Colonel A.J. Deforge piloted 50 P38 missions and served his country until retirement. My uncle G.L Deforge, KIA Pusan at age 25. My mother's cousin John Ramsey worked in Los Alamos on The Manhattan Project. https://badgerchemistnews.chem.wisc.edu/staff/ramsay-john-b/ His mother H.G. Ramsay held an advanced degree from Columbia and served as an officer in the WAC WW II. I acknowledge that world peace is not likely to happen in my lifetime and I respect the necessity of military defense, but the fact that Doomesday Weapons are still not banned globally, including earth to space and space to earth and orbital weapons, is something I feel pretty powerless to do	No	Acknowledged, thank you.

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						anything about at my age... except send this email. Please... no hypersonic missile testing at Barking Sands, or anywhere for that matter. https://www.businessinsider.com/us-navy-shelves-development-ofelectromagnetic-railgun-for-hypersonic-missiles-2021-7?op=1 Rosemarie Jauch 4460 Ikena Place #56 Kalaheo, HI 96741 602-663-7876		
26.						RE # 0001329762-01 Joint Flight Campaign (JFC) Draft Programmatic Environmental Assessment (PEA/OEA) To Whom it May Concern: ALOHA ! ! ! We appreciate that ALL agencies sponsored by the Office of the Under Secretary of Defense for Research and Engineering & U.S. Dept of Army & U.S. Navy - their SSP (Strategic Systems Program) ALL participating Agencies, as well as Dept of Energy, the National Aeronautics and Space Administration (NASA), the U.S. Airforce 30th Wing and U.S. Air Force 45th Space Wing – who prepared this draft PEA/OEA. Infinite are the environmental effects ! ! ! ! ! Immediately Cease and Desist ANY & ALL of the proposed action in the proposed JFC draft PEA/OEA. This proposed draft Programmatic EA is toxic in myriad, countless ways. Including, but not limited to escalated nuclear arms race...International Outrage Toxicity of declining water sources in parched continental U.S. from rocket fuel exhaust. ■ Defies U.S. Clean Water Act.	No	Acknowledged, thank you. As presented in the EA/OEA, there will be no significant impact to any of the resource areas analyzed.

ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO.	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES *(Exact wording of suggested change)*	INCORP.? *(Yes/No)*	HOW COMMENT WAS INCORPORATED *(If not incorporated, why?)*
						Exacerbates Climate Change...Isn't the triple digits temperatures in the Pacific Northwest and 2020 forest fires from San Diego to Seattle an inkling of the crisis situation ? What are Y'all ? ! Clearly not taxpayers ! ! ! ! ! We demand NO ACTION ALTERNATIVE Please keep us updated on any/all updates via U.S. Postal System (USPS). Kaua'i DEFINITELY doesn't need to be more of a target : PMRF MAHALO (THANKS) for keeping us on the mailing list for the draft JFC PEA/OEA. We stand in SOLIDARITY with our Children Grandchildren and future generations "NO" further action NO ACTION ALTERNATIVE accepted by NEPA; 42 United States Code 4321 and the Council on Environmental Quality (CEQ) Regulations for implementing the Procedural Provisions of NEPA (Title 40 Code of Federal Regulations [CRF] Parts 1500-1508, 1978, July 1, 1986, the Dept of Army Procedures for implementing NEPA (32 CRF Part 651), the Dept of Airforce Procedures for implementing NEPA (32 CRF Part 989), Chief of Naval Operations Instructions 5090.1E, and Executive Order 12114, Environmental Effects Abroad of Major Federal Action. NO Proposed Action PLEASE Cease and Desist MAHALO (THANKS) for keeping us updated via USPS mail. Malama Pono ! ! ! ! ! ALOHA 'Aina Sincerely With ALOHA, Bonnie P. Bator and 'Ohana (Keana'aina, Kai'aokamalie, Keli'ikoa and Kai) PO Box 30848 Anahola, Kaua'i Hawai`i 96703-0848		

ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO.	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES *(Exact wording of suggested change)*	INCORP.? *(Yes/No)*	HOW COMMENT WAS INCORPORATED *(If not incorporated, why?)*
27.						The Pentagon's Proposed Action entails up to six flight test launches at up to four different launch locations per year, over the next 10 years. Test objectives are expected to dictate range selection from Atlantic and Pacific test ranges. IMPACTS TO MARINE LIFE FROM SPENT STAGES AND HYPERSONIC PAYLOAD HITTING OCEAN WILL BE SEVERE. This PEA/OEA is being prepared as a Programmatic EA to provide an analysis of multiple launch locations that will be available to the test directorates over the next 10 years. The U.S. Army RCCTO and U.S. Navy SSP are considering four launch locations: one on the west coast and one in Hawai`i, both with impact sites in the Pacific Ocean, and two launch locations on the east coast, with impact sites in the Atlantic Ocean. The Pacific locations analyzed are the Pacific Missile Range Facility, Barking Sands, Kauai, Hawai`i; Vandenberg Space Force Base, California; and BOA impact sites in the Pacific Ocean. The east coast locations include the NASA Wallops Flight Facility, Virginia; Cape Canaveral Space Force Station, Florida; and Atlantic BOA impact sites. Respectfully, Victoria McFadyen	No	Acknowledged, thank you. As presented in the EA/OEA, there will be no significant impact to any of the resource areas analyzed.
28.						Good morning Mr. Fuller, Thank you for this opportunity to share my thoughts with you about the testing of hypersonic missiles and other missiles at the Kaua'i Barking Sands Missile Test Site. My name is Kim Compoc and am a professor of U.S. history at University of Hawai'i - West O'ahu. My mother is from Huntsville, and I went to Grissom High School. My father is from Hawai'i, where I have lived for 20 years. My parents met in the Marshall Islands, site of the U.S. nuclear testing program. Because I come from a military family, I was raised to think about "security" from the point of view of U.S. national interests. It was not until I was an adult and educated myself on the impacts of militarization and nuclear testing in the Pacific that I understood the grotesque human rights violations my tax dollars are paying for.	No	Acknowledged, thank you.

ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO.	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES *(Exact wording of suggested change)*	INCORP.? *(Yes/No)*	HOW COMMENT WAS INCORPORATED *(If not incorporated, why?)*
						I urge you to please listen to reason and do all you can to stop this testing program. Hypersonic missiles will only put the U.S. - and Kaua'i in particular - at risk for retaliation. Further, this program will increase the risk of war at a time when we should be focusing on combating the multiple crises that face us: the Covid19 pandemic, climate catastrophe, and the crisis of poverty in the United States. The U.S. cannot afford to keep overfunding the military, deluding itself that these programs do anything but make us more insecure. We must learn the lessons of history. The "Wars on Terror" have been a terrible mistake that have only exacerbated terrorism. There is no bombing our way out of the catastrophes that face us. Expensive programs like this one only serve the war profiteers, not ordinary people trying to survive. Living in Hawai'i, we will be put at risk for retaliation by this program, not the people in Huntsville, or the people in Washington D.C. The people who make the decisions do not bear the risk of the catastrophe that may befall us. I urge you to do all you can to reverse this decision. How can we continue to pretend that war is working to create security when our nurses are walking around in garbage bags, and we have over 600,000 people dead from Covid in the U.S. alone? The Secretary General of the United Nations called for a global ceasefire to deal with this crisis, but the U.S. military budget has not budged. Small countries like Korea, Taiwan, and New Zealand dealt with the crisis properly and have been able to save lives and slow the spread of the epidemic. The U.S. might be inclined to think space militarization programs like this make America a great and powerful nation, but it just makes us a laughingstock. To quote Ret. Col. Ann Wright, a fellow Honolulu resident and peace activist, "The hypersonic rockets are not needed for our national security. Diplomacy, not hypersonic rockets and war, are what will ensure our national		

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						security." Again, thank you for your time. I would appreciate a letter in return. Sincerely, Dr. Kim Compoc Assistant Professor of History University of Hawai'i - West O'ahu		
29.						I am writing as an American Citizen who advocates for peace and social justice. Specifically, I am writing to voice my objection to the proposed action entailing up to six (hyper-sonic) flight test launches at up to four different launch locations per year, over the next 10 years. Stated test objectives are expected to dictate range selection from Atlantic and Pacific test ranges. It is my belief that such hyper-sonic test flights will dramatically escalate the nuclear arms race/new Cold War, something our nation can't afford – especially one in space. The ongoing "drum beat" for war against China and/or Russia is without rational basis serving only the interests of the corporate/military complex. America needs to be spending our national treasury on dealing with our real enemy – an existential climate crisis that demands international cooperation, not competition. Rather than creating enemies, we need to be nurturing friendships with our global neighbors. This is not only possible, it is critically necessary. U.S. military colonization of our planet must end. It does not serve to preserve peace, it promotes conflict…a lesson we should have long ago learned. For these reasons, and more, I urge the immediate abandonment of these proposed (hypersonic) flight test launches. Peace,	No	Acknowledged, thank you.

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						James M. Wallrabenstein -- James M. Wallrabenstein 12007 E Coyote Rock Drive Apt G201 Spokane Valley, WA 99206-6280 Res. 509-924-4406 “The greatest danger we face today is not coming from China. It is our drift toward protofascism. We must be careful not to demonize China so much that we encourage a new paranoia that further distorts our priorities, encourages nativism and xenophobia, and leads to larger military outlays rather than public investments in education, infrastructure, and basic research on which America’s future prosperity and security critically depend. The central question for America – an ever more diverse America, whose economy and culture are rapidly fusing with the economies and cultures of the rest of the globe – is whether it is possible to rediscover our identity and our mutual responsibility without creating another enemy.” --Robert Reich		
30.						Dear Mr. Fuller, I am extremely concerned about the testing of “hypersonic missiles”. I am definitely concerned this just adds fuel to the nuclear arms race. Just because we CAN do something doesn’t mean we SHOULD do it! Right now, we need our taxes to deal with the climate crises, which threatens the next generation in frightening ways. We also, of course need our taxes to deal with economic inequality, health care for all, affordable housing, and issues of biodiversity. Not to mention how these kinds of tests always harm the people and environment they purport to protect. Diplomacy, not hypersonic rockets for the next war, are what will ensure our national security! Please stop this madness! Sincerely, Laura Liben	No	Acknowledged, thank you.

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						lauli324@aol.com Sent from my iPhone		
31.						Comments on Draft JFC PEA/OEA and Draft FONSI Hypersonic Missile Testing I oppose any and all research, development, and deployment of hypersonic missile systems. I support the No Action alternative. Not proceeding with this project is the only sensible and viable route. The finding of No Significant Impact is factually incorrect and is a lack of reasoned decision-making. This project would have devastating environmental consequences to the air, ocean, and soil. The Pacific and Atlantic Ocean is already damaged by other past and present military and human activities, which this will increase. The project would have very toxic effects on humans, animals, insects, birds, whales, dolphins, fish species, other wildlife, plants, and trees, and on our collective environment. These significant impacts would occur in the vicinity of research, construction, and launch facilities and all along the flight path for many miles in all directions, including: -- Noise and sound hypersonic impacts harmful to biological life; -- Chemical and toxics pollution including from exhaust; -- Missile components and debris with hazardous substances, including rocket fuel, dumped on land and in the ocean; -- Tests of fuel, components, and engines resulting in noise and toxins pollution at testing grounds and labs, such as from the Santa Susana Field Laboratory, Simi Valley: -- Radio communications system radiation, including radar, causing widespread biological and thermal harm to biological beings including humans, which the military has extensively researched. Additional significant impacts include	No	Acknowledged, thank you. As presented in the EA/OEA, there will be no significant impact to any of the resource areas analyzed.

ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO.	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES *(Exact wording of suggested change)*	INCORP.? *(Yes/No)*	HOW COMMENT WAS INCORPORATED *(If not incorporated, why?)*
						-- Development pressures created by these facilities and buildings which themselves would create toxic pollution and run-off into watersheds and soils; -- Economic and human talent diversion into this unsustainable industry; -- Tourism impacts due to noise and other pollution; -- Fishing industry impacts; – Local economic and housing pressures; -- Land diverted and controlled by unsustainable and damaging war production and war purposes, instead of for peaceful, healthful, and beneficial uses to benefit all. This project would merely be the beginning. If approved, it would escalate in size and intensity with time, taking more land and building more missiles. If the U.S. develops weapons, it uses them, and it sells them to others. This would create a huge security problem. The Rand Corporation warns of the deadly potential of hypersonic weapons. This increases an unwise, wrong-headed U.S. commitment to aggressive war that has maimed and killed so many, in violation of the Kellogg-Briand Act and its spirit. Furthermore, this project is a massive waste of American tax dollars. Those dollars are urgently needed for domestic programs and peaceful uses. For the sake of the Earth, all life, health, and the future, do not proceed with this project. It would have significant impacts on the environment for everyone. Sincerely, Nina Beety 277 Mar Vista Dr. Monterey, California 93940 CC: Congressman Jimmy Panetta Senator Alex Padilla Senator Dianne Feinstein		

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						Governor Gavin Newsom Senator John Laird Assemblyman Mark Stone		
32.						This is my comment in response to the dangerous and costly USA Hypersonic plan of missile testing from Kauai. US military spending continues to be the single largest portion of the Federal Funds budget. The United States maintains almost 800 military bases in over 70 countries, which far exceeds our modern day security requirements. Research shows the US military is one of the largest climate polluters in history, consuming more liquid fuels and emitting more CO2e (carbon-dioxide equivalent) than most countries. We should take measures towards nuclear disarmament, not escalation . Spending should address flaws in our healthtcare, education, social services, and environmental preservation. I live in Hawaii and this new development for a hypersonic plan makes my home an even bigger target. We do not need another cold war! Thank you, Ann Pitcaithley, Wailuku, HI	No	Acknowledged, thank you.
33.						No to your Abuses of our Oceans, Lands and Sanity to the People of Hawaii. I strongly believe the U.S. government's testing of hypersonic missiles will greatly increase the nuclear arms race and create a new Cold War. I also believe testing at Barking Sands Kauai will make the small Hawaiian Islands a major target for retaliation if the U.S. fires hypersonic missiles. And the toxic rocket fuel increases the challenging climate crisis we face. The hypersonic rockets are not needed for our national security. Stop Militarization of Hawaii Islands. Dea Rackley Moku Keawe Big Island. Sent from my iPhone	No	Acknowledged, thank you.
34.						Email: scherrelle@hotmail.com	No	Acknowledged, thank you.

ITEM NO.	PAGE NO.	PARA-GRAPH	LINE NO.	FIGURE NO.	TABLE NO.	RECOMMENDED CHANGES (Exact wording of suggested change)	INCORP.? (Yes/No)	HOW COMMENT WAS INCORPORATED (If not incorporated, why?)
						Message: Please be aware that this puts HI in a bad position militarily and environmentally. Our ocean and its creatures are already up against enough. No missiles especially supersonic ones!		
35.						Dear Mr. Fuller, I am a army veteran who agrees with the below comments of Ann Wright: I served 29 years in the U.S. Army/Army Reserves and retired as a Colonel. I was also a U.S. diplomat for 16 years and served in U.S. Embassies in Nicaragua, Grenada, Somalia, Uzbekistan, Kyrgyzstan, Sierra Leone, Micronesia, Afghanistan and Mongolia. I have lived in Honolulu, Hawai'i for 21 years. I am very concerned about the testing of hypersonic missiles and other missiles at the Kauai Barking Sands Missile Test Site. As I understand, the U.S. military is asking that Barking Sands will be used six times a year for ten years to test the hypersonic missiles. I strongly believe the U.S. government's testing of hypersonic missiles will greatly increase the nuclear arms race and create a new Cold War. I also believe testing at Barking Sands Kauai will make the small Hawaiian Islands a major target for retaliation if the U.S. fires hypersonic missiles at China, Russia or any other country. We in the U.S. can't afford another arms race, particularly a weapons race in space. We need our taxes to deal with the climate crisis and the economic inequality we find in our own country. And the toxic rocket fuel increases the challenging climate crisis we face. The hypersonic rockets are not needed for our national security. Diplomacy, not hypersonic rockets and war, are what will ensure our national security. --Ann Wright Sincerely, J. Girardin	No	Acknowledged, thank you. As presented in the EA/OEA, there will be no significant impact to any of the resource areas analyzed.
36.						Powers That Be: I am outraged and dismayed at the threat of testing of hypersonic missiles and other missiles at the Kauai Barking Sands Missile Test Site. As I understand, the U.S. military is asking that Barking Sands be used six times a year for ten	No	Acknowledged, thank you. As presented in the EA/OEA, there will be no significant impact to any of the resource areas analyzed.

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						years to test the hypersonic missiles. Haven't we already done enough damage to sacred sites in Hawaii? Do we need to do more? I strongly believe the U.S. government's testing of hypersonic missiles will greatly increase the nuclear arms race and create a new Cold War. I also believe testing at Barking Sands Kauai will make the small Hawaiian Islands a major target for retaliation if the U.S. fires hypersonic missiles at China, Russia or any other country. We in the U.S. still seem to be pursuing war ways, but we can't afford another arms race, particularly the weapons race to control space in which we are now so invested. We need our taxes to deal with the climate crisis and the economic inequality we find in our own country. Toxic rocket fuel increases the challenging climate crisis we face and hypersonic rockets are unessential for our national security. Diplomacy, not hypersonic rockets, endless war and endless preparations for it are what will ensure our national security. Let's make energetic progress in the good, not the continuing of obsolete paradigms that work for no one but the arms makers and the war profiteers. Please. Sincerely, Holly G. Graham Olympia WA USA		

C

CCSFS Consistency Determination

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From: "Stahl, Chris" <Chris.Stahl@FloridaDEP.gov>
Date: Tuesday, August 10, 2021 at 2:40:18 PM
To: "Fuller, David G CIV USARMY SMDC (USA)" <david.g.fuller6.civ@mail.mil>
Cc: "State_Clearinghouse" <State.Clearinghouse@dep.state.fl.us>
Subject: [Non-DoD Source] State Clearance Letter for FL202107149284C -Draft Programmatic Environmental Assessment for the Joint Flight Campaign and Draft Finding of No Significant Impact at Cape Canaveral Space Force Station, Brevard County, Florida

All active links contained in this email were disabled. Please verify the identity of the sender, and confirm the authenticity of all links contained within the message prior to copying and pasting the address to a Web browser.

August 10, 2021

David Fuller
U.S. Army Space & Missile Defense Command
Army Forces Strategic Command
Post Office Box 1500
Huntsville, Alabama 35807

RE: Department of the Army, U.S. Army Space and Missile Defense Command, Army Forces Strategic Command, Draft Programmatic Environmental Assessment for the Joint Flight Campaign and Draft Finding of No Significant Impact at Cape Canaveral Space Force Station, Brevard County, Florida
SAI # FL202107149284C

Dear David:

Florida State Clearinghouse staff has reviewed the original proposal as well as the additional riprap placement site under the following authorities: Presidential Executive Order 12372; § 403.061(42), Florida Statutes; the Coastal Zone Management Act, 16 U.S.C. §§ 1451-1464, as amended; and the

National Environmental Policy Act, 42 U.S.C. §§ 4321-4347, as amended.

The Florida Fish and Wildlife Conservation Commission has reviewed the proposed action and independently submitted comments for your consideration. These have been attached to this letter and are incorporated hereto.

If prehistoric or historic artifacts, such as pottery or ceramics, projectile points, dugout canoes, metal implements, historic building materials, or any other physical remains that could be associated with Native American, early European, or American settlement are encountered at any time within the project site area, the permitted project shall cease all activities involving subsurface disturbance in the vicinity of the discovery. The applicant shall contact the Florida Department of State, Division of Historical Resources, Compliance Review Section at (850)-245-6333. Project activities shall not resume without verbal and/or written authorization. In the event that unmarked human remains are encountered during permitted activities, all work shall stop immediately and the proper authorities notified in accordance with Section 872.05, Florida Statutes.

Based on the information submitted and minimal project impacts, the state has no objections to the subject project and, therefore, it is consistent with the Florida Coastal Management Program (FCMP). Thank you for the opportunity to review the proposed plan. If you have any questions or need further assistance, please don't hesitate to contact me at (850) 717-9076.

Sincerely,

Chris Stahl

Chris Stahl, Coordinator
Florida State Clearinghouse
Florida Department of Environmental Protection
3800 Commonwealth Blvd., M.S. 47
Tallahassee, FL 32399-2400
ph. (850) 717-9076
State.Clearinghouse@floridadep.gov < Caution-mailto:State.Clearinghouse@floridadep.gov >

< Caution-http://survey.dep.state.fl.us/?refemail=Chris.Stahl@FloridaDEP.gov >

Coastal Zone Management Act Consistency Determination

Alternative 4 – Cape Canaveral Space Force Station

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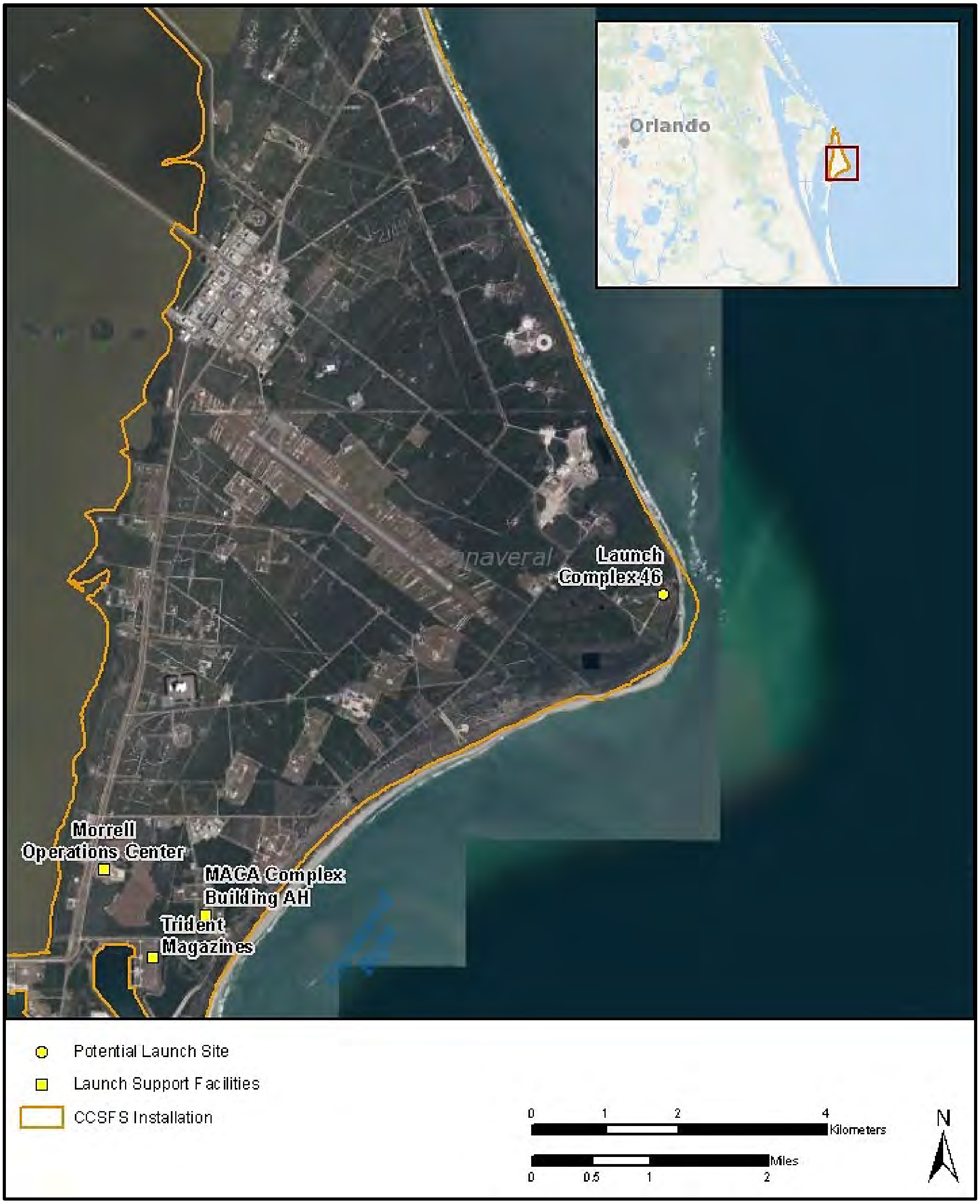
CONSISTENCY DETERMINATION FOR CAPE CANAVERAL SPACE FORCE STATION

PROPOSED ACTION

The Proposed Action entails up to six flight test launches at up to four different launch locations per year, over the next 10 years. Test scenarios are planned to include broad ocean area (BOA) impacts of the spent stages and the hypersonic payload, and do not include any land-based expended component impacts. The Proposed Action initial flight test would take place within the first half of fiscal year (FY) 2022 after the Finding of No Significant Impact / Finding of No Significant Harm (FONSI/FONSH) is signed, if approved. Although the Programmatic Environmental Assessment / Overseas Environmental Assessment (PEA/OEA) was prepared Programmatically to provide an analysis of multiple launch locations that will be available to the test directorates over the next 10 years, this Consistency Determination is being prepared to meet requirements set forth by the Florida Coastal Management Program (FCMP) and will focus solely on the Proposed Action's Alternative 4, Cape Canaveral Space Force Station (CCSFS).

The JFC launch vehicle, known as an all-up-round (AUR) missile, consists of a two-stage booster system and payload. The AUR could be launched from a launch stool, a cannister/box launcher, or a transporter erector launcher at Launch Complex-46 (LC-46). The AUR is approximately 87.6 centimeters (34.5 inches) in diameter and 10.2 meters (33.6 feet) in length. The first and second stage include a total of approximately 6,804 kilograms (15,000 pounds) of solid propellant. The Proposed Action entails ground preparations for the test, launch and flight test, impact of the payload, and post launch operations. The existing Mobile Service Structure (MSS) at LC-46 may need to be modified to provide better control of the environmental conditions. While unlikely, there could be a need for trenching to install additional power and communication lines. Grounding rods to arrest lightning and static electricity may be required. Any ground-disturbing activities are not expected to remove vegetation or earth as the MSS modifications would take place within existing man-made structures or paved LC areas. The typical JFC launch would include the launch; first-stage burn, separation, and descent into the pre-determined first-stage booster drop zone in the BOA; second stage burn, separation, and descent into the pre-determined second-stage booster/payload impact zone in the BOA; and payload flight and impact into the pre-determined second stage/payload impact zone in the BOA. See **Figure 1**, **Figure 2**, and **Figure 3**.

As part of the Proposed Action a Short Hot Launch (SHOTL) could be conducted. The SHOTL test launch is designed to demonstrate a successful egress of a representative AUR from a transporter erector launcher canister. The SHOTL launch consists of the AUR with a mass representative payload having a subset of electronics required to control the launch operations. After egress from the canister, a pre-coordinated destruct action utilizing the onboard Flight Termination System (FTS) is planned to allow the debris to follow a ballistic trajectory and impact within the pre-determined JFC booster drop zones.


Orlando
Launch Complex 46
Morrell Operations Center
MACA Complex Building AH
Trident Magazines
Potential Launch Site
Launch Support Facilities
CCSFS Installation
0 1 2 4 Kilometers
0 0.5 1 2 Miles
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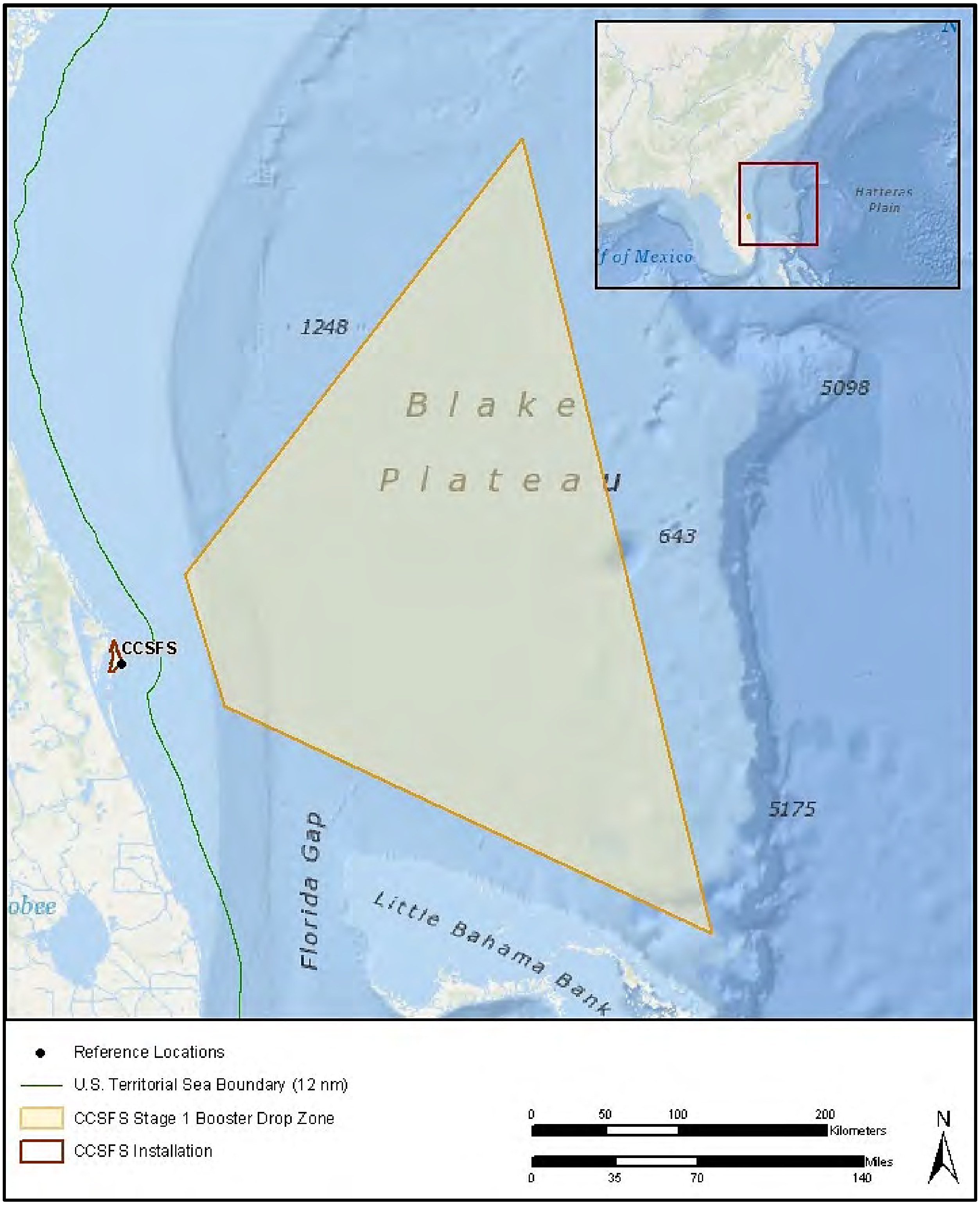

Hatteras Plain
f of Mexico
1248
Blake Plateau
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643
CCSFS
5175
Florida Gap
Little Bahama Bank
obee
Reference Locations
U.S. Territorial Sea Boundary (12 nm)
CCSFS Stage 1 Booster Drop Zone
CCSFS Installation
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0 35 70 140 Miles
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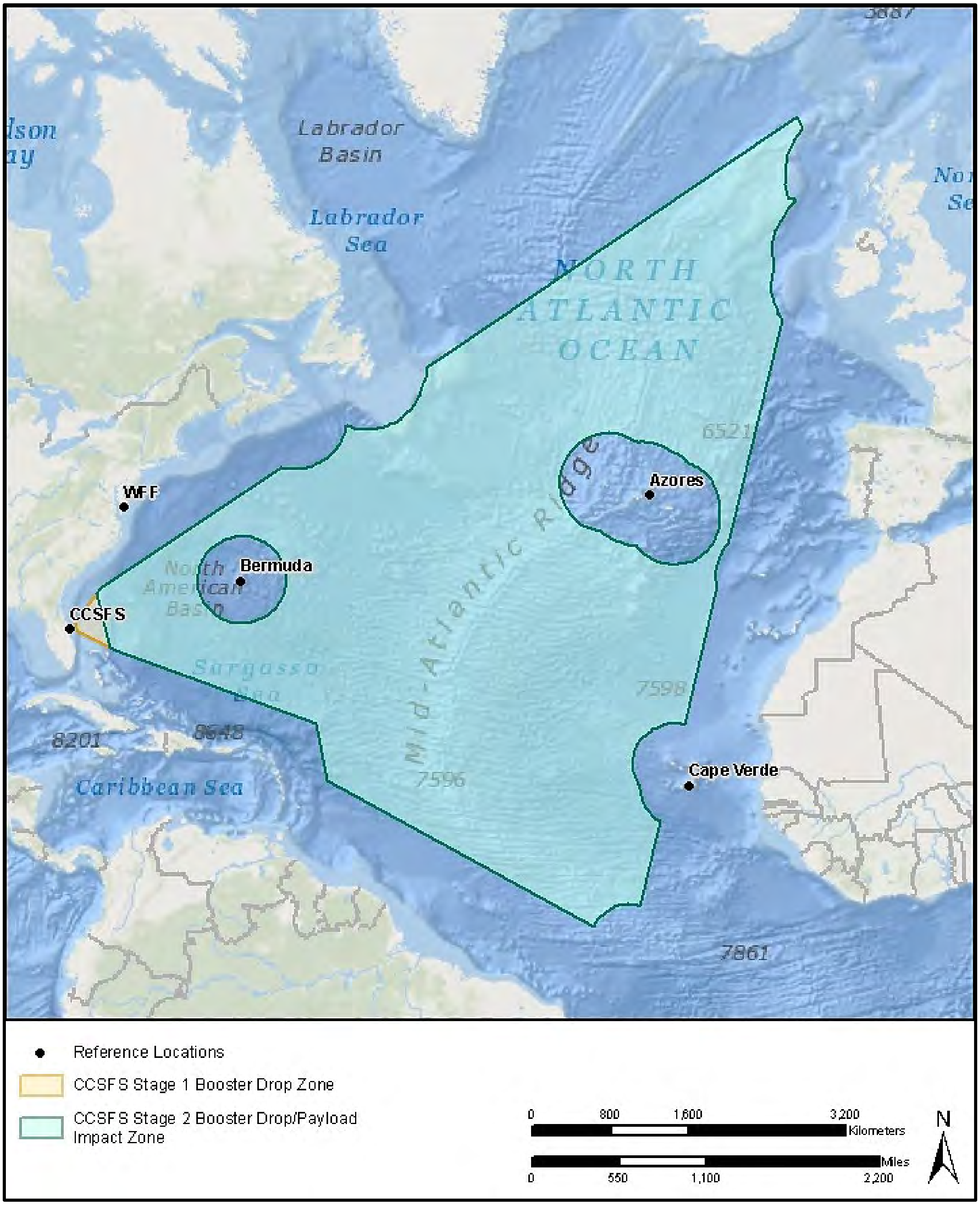

Labrador Basin
Labrador Sea
NORTH ATLANTIC OCEAN
6521
Azores
Mid-Atlantic Ridge
WFF
Bermuda
North American Basin
CCSFS
Sargasso Sea
7598
8201
8648
Caribbean Sea
Cape Verde
7596
7861
Reference Locations
CCSFS Stage 1 Booster Drop Zone
CCSFS Stage 2 Booster Drop/Payload Impact Zone
0
800
1,600
3,200
Kilometers
Miles
0
550
1,100
2,200
N

CONSISTENCY DETERMINATION

This consistency statement will examine the potential environmental consequences of the Proposed Action and ascertain the extent to which the consequences of the Proposed Action are consistent with the objectives of the Florida Coastal Management Program (FCMP).

The authority and enforceability of the FCMP is derived from 24 Florida Statutes. This consistency statement details how the Proposed Action is consistent with these 24 Florida Statutes and FCMP objectives. Consistency is based on effects rather than geographic boundaries; consequently, there are no categorical exclusions from the consistency requirement. Any federal activity or federally funded activity that would have an effect on a state's coastal zone is subject to a consistency review, unless specifically exempted by federal law. Effects are determined by assessing reasonably foreseeable direct and indirect effects on any coastal use or resource.

Chapter 161: Beach and Shore Preservation

All activities would use existing facilities and infrastructure systems, such as the Morrell Operations Center, the Magazine Assembly and Checkout Area (MACA) Complex Building AH, the Trident Magazines, and other routine support facilities (See **Figure 1**). The existing MSS at LC-46 may need to be modified to provide better control of the environmental conditions; however, the modification would occur on DOD property, away from beach and shoreline property. All federal, state, local, and CCSFS-specific Standard Operating Procedures (SOPs) would be followed during MSS modification to ensure worker safety and environmental protection. No new beach or shore preservation activities would be required as a result of this Proposed Action.

Chapter 163, Part II: Growth Policy, County and Municipal Planning; Land DevelopmentRegulation

Support personnel would number fewer than 100 per test. Only existing facilities and infrastructure would be used at CCSFS. Modifications to the MSS at LC-46 would occur on DOD property, within the existing LC. The Proposed Action would be consistent with local, regional, and state comprehensive plans and would not result in in land use conflicts.

Chapter 186: State and Regional Planning

Prior to finalizing a launch date, proposed launch activities must be scheduled through the 45^{th} Space Wing master scheduling pursuant to 45^{th} SW Instruction 13-206, Space, Missile, Command and Control Eastern Range Scheduling. Space Florida would provide launch site scheduling requirements to all launch and reentry vehicle operators prior to launch operations. At least 2 days prior to a launch, Space Florida would notify appropriate parties, including local officials and the 45^{th} Space Wing. Space Florida would comply with all CCSFS requirements. The Proposed Action is consistent with local, regional, and state comprehensive plans, and would not result in adverse impacts to land use compatibility.

Chapter 252: Emergency Management

CCSFS, Kennedy Space Center (KSC), the City of Cape Canaveral, and Brevard County have a mutual-aid agreement in the event of an on- or off-station emergency. During launch activities, CCSFS maintains communication with KSC, Brevard County Emergency Management, the Florida Marine Patrol, the U.S. Coast Guard, and the state warning point, Division of Emergency Management. CCSFS Missile Flight Analysis, Ground Safety, Range Safety, Ocean Clearance, Transportation Safety and Fire and Crash Safety procedures would be followed to ensure the safety of workers and members of the public. The Proposed Action is not anticipated to adversely affect emergency management.

Chapter 253: State Lands

The Proposed Action would not involve the sale, lease, or transfer of state lands. Any ground-breaking activities would occur on federally owned land (i.e., CCSFS). See **Section 3.4.1** of the PEA/OEA for an analysis of the terrestrial and marine biological resources on and near CCSFS. The Proposed Action would comply with all provisions of Chapter 253 of the Florida Statutes.

Chapter 258: State Parks and Preserves

The Proposed Action does not consist of and would not impact any state parks or preserves. Routine safety protocols for public safety would be followed. Therefore, noadverse effects are expected.

Chapter 259: Land Acquisition for Conservation or Recreation

Property agreements are in place with USAF and Space Florida. The agreements transfer the responsibility for certain facilities and land areas to Space Florida, including LC-46. These agreements include design/construction standards and approval processes required by NASA and USAF that must be followed by Space Florida and its Tenants. Plans have been in place since 2013 for modernization and growth potential. The Proposed Action would not affect the current or future potential of land acquisition for conservation or recreation purposes.

Chapter 260: Florida Greenways and Trails Act

The Proposed Action would not adversely affect trails or public access to trails. Routine safety protocols for public safety would apply. Therefore, the Proposed Action would comply with all provisions of Chapter 260 of the Florida Statutes.

Chapter 267: Historic Preservation

JFC flight tests are not activities that have potential to cause direct or indirect effects on historical, architectural, archaeological, or traditional resources. No impacts to cultural or historic resources would be expected as a result of the Proposed Action. Therefore, the Proposed Action would not adversely affect historic preservation.

Chapter 288: Economic Development and Tourism

There would be a temporary, short-term increase in personnel (less than 100) at CCSFS due to a JFC flight test. No impacts to socioeconomic resources would be expected as a result of the Proposed Action.

Chapter 334: Transportation Administration

The U.S. Navy Strategic Systems Programs (SSP) and the U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) would arrange to transport the AUR via truck or military aircraft. Once unloaded, they would be placed either in the Trident Magazines or at the MACA Complex building. The transportation network at CCSFS would be capable of absorbing any potential stressors from the JFC Flight Launch. Fewer than 100 support personnel would be at each JFC Flight Test, and are required to follow all applicable federal, state, DoD and local traffic laws, rules, and regulations Therefore, the Proposed Action would not be expected to adversely affect the state’s transportation administration, circulation, or organization.

Chapter 339: Transportation Finance and Planning

No changes to transportation infrastructure or funds / funding would occur as a result of the Proposed Action. The Proposed Action would not be expected to have any effect on transportation finance or planning.

Chapter 373: Water Resource

Based on an estimation of the JFC flight tests potential releases, and the current regulations and infrastructure specific to CCSFS, it was determined that any impacts to water resources from the JFC flight tests would not have adverse impacts on hydrologic function or quality at CCSFS. CCSFS potable water management, wastewater, and stormwater management resources are adequate and would be capable of absorbing any potential stressors from the JFC Flight Launch. No impact to water resources would be expected as a result of the Proposed Action.

Chapter 375: Outdoor Recreation and Conservation Lands

Implementation of the Proposed Action would be consistent with Florida's Statewide Comprehensive Outdoor Recreation Plan.

Chapter 376: Pollutant Discharge Prevention and Removal

Any ground-breaking activities required to implement the Proposed Action would include Best Management Practices (BMPs) to minimize pollutant discharges. Rule 40C-4 of the Florida Administrative Code would be followed. All necessary permits would be obtained and followed. Based on an estimation of the JFC flight tests potential releases, current regulations, and infrastructure specific to CCSFS, it was determined that any impacts to water resources from the JFC flight tests would not have adverse impacts on hydrologic function or quality at CCSFS. Therefore,no adverse effect to pollution discharge prevention and removal would be expected.

Chapter 377: Energy Resources

The Proposed Action would not affect energy resource production, including oil and gas, or the transportation of oil and gas resources.

Chapter 379: Fish and Wildlife Conservation

Avoidance and minimization of potential impacts to federal and state-protected species have been considered as part of the Proposed Action at CCSFS. Proposed Action activities would include implementation of SOPs and BMPs to avoid adverse effects to biological resources according to CCSFS launch operation requirements. Avoidance and minimization measures are listed in **Table 4-8** of the PEA/OEA. Therefore, the Proposed Action would be expected to remain consistent with the state's policies concerning the protection of wildlife.

Chapter 380: Land and Water Management

The Proposed Action would not be expected to result in adverse effects to upland habitats or surface waters. Land and water management issues are addressed appropriately in the PEA/OEA. The Proposed Action would occur on existing launch facilities and would not occur in any designated areas of critical state concern. The Proposed Action would not be expected to adversely affect any beach, shoreline areas, or lighthouses. Statewide guidelines and procedures outlined in Chapter 380 of the Florida Statutes would be followed.

Chapter 381: Public Health, General Provision

The Proposed Action would not affect the state's policies concerning the public health system.

Chapter 388: Mosquito Control

The Public Health Office monitors the mosquito population through the use of light traps, CO_2 traps, and mosquito magnets. The Pest Management shop conducts daily surveys and works with base facility managers to reduce the amount of standing water to control breeding grounds for Zika carrying mosquitoes. Currently, CSI 4-4 and BP-100 with mineral oil are used to fog for adult mosquitoes. Also, Altosid briquettes are placed in all storm water drains and Bactimos briquettes are used in low-lying water collection areas throughout the base as a larvicide control. The Proposed Action would not be expected to increase the numbers of pestilence or affect existing mosquito control practices at CCSFS.

Chapter 403: Environmental Control

The PEA/OEA addresses the issues of conservation and protection of environmentally sensitive living resources; protection of groundwater and surface water quality and quantity; water supply resources; protection of air quality; hydrogeological impacts; protection of endangered or threatened species; public health and safety; hazardous material and waste management; and protection of wetlands and habitats. No significant impacts to these resources were identified;however, mitigation or conservation measures identified in the PEA/OEA would be incorporated.

Chapter 583: Building and Construction Standards

While CCSFS is federal land, Space Florida has been granted development rights and the right to permit others to develop sites and projects under numerous property agreements with the USAF at CCAFS (Space Florida 2016). Space Florida's powers are detailed in Sec. 331.305 of the Florida Statutes. All federal, state, Local and CCSFS-specific SOPs would be followed during MSS modification to ensure worker safety and environmental protection.

Chapter 582: Soil and Water Conservation

Implementation of the Proposed Action would not result in any construction or ground disturbance that would potentially affect soil or water resources because any ground-disturbing activities would occur on existing facilities (MSS at LC-46). No impacts to any contaminated sites are anticipated as they are not present on the site of the Proposed Action area. Therefore, the Proposed Action would not be expected to adversely affect existing soil and water conservation efforts.

Chapter 597: Aquaculture

The Proposed Action is not anticipated to adversely affect the growth, development, or prosperity of local or state aquacultures. No aquaculture, shellfish production or harvesting, or any other related activity is included in the Proposed Action.

CONCLUSION

The findings indicate that the Proposed Action as presented in the PEA/OEA is consistent with the FCMP.