Final
Environmental Assessment /
Overseas Environmental
Assessment (EA/OEA)

Hypersonic Flight Test 3 (FT-3)

U.S. Department of the Army

April

2021

This page intentionally left blank

REPORT DOCUMENTATION PAGE	*Form Approved* *OMB No. 0704-0188*

1. REPORT DATE ***(DD-MM-YYYY)***
02-APR-2021

2. REPORT TYPE
NEPA Document

3. DATES COVERED ***(From – To)***
SEP 2019 – MAR 2021

4. TITLE AND SUBTITLE
Hypersonic Flight Test 3 (FT-3) Environmental Assessment / Overseas Environmental Assessment (EA/OEA)
Final

5a. CONTRACT NUMBER
W9113M-17-D-0009

5b. GRANT NUMBER
N/A

5c. PROGRAM ELEMENT NUMBER
N/A

6. AUTHOR(S)
U.S. Army Space and Missile Defense Command,
U.S. Army Rapid Capabilities and Critical Technology Office, and KFS, LLC

5d. PROJECT NUMBER
N/A

5e. TASK NUMBER
W9113M-19-F-2128

5f. WORK UNIT NUMBER
N/A

7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES)
U.S. Army Space and Missile Defense Command
PO Box 1500
Huntsville, AL 35807-3801

8. PERFORMING ORGANIZATION
USASMDC-EN

9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)
U.S. Army Space and Missile Defense Command
U.S. Army Rapid Capabilities and Critical Technology Office

10. SPONSOR/MONITOR'S ACRONYM(S)

11. SPONSOR/MONITOR'S REPORT

12. DISTRIBUTION/AVAILABILITY STATEMENT

DISTRIBUTION A: Approved for Public Release, Distribution Unlimited.

13. SUPPLEMENTARY NOTES
N/A

14. ABSTRACT
The U.S. Army Rapid Capabilities and Critical Technology Office proposes to conduct a single developmental hypersonic flight test, FT-3, between March 2021 and September 2021 from the Pacific Spaceport Complex Alaska (PSCA) to Kwajalein Atoll, Republic of the Marshall Islands.

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	298	19b. TELEPHONE NUMBER *(include area code)* (256) 955-5585

This page intentionally left blank

Table of Contents

Appendices

Figures

Tables

Acronyms and Abbreviations

AAC	Alaska Aerospace Corporation
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
AFB	Air Force Base
ALTRV	Altitude Reservation
ARTCC	Air Route Traffic Control Center
BCC	Birds of Conservation Concern
BMDS	Ballistic Missile Defense System
BMP	Best Management Practices
BOA	Broad Ocean Area
CAA	Clean Air Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
dB	Decibel(s)
dBA	A-weighted Decibel(s)
DEP	Document of Environmental Protection
DLIS	Defense Logistics Information Service
DNL	Day-Night Level
DOD	Department of Defense
DOT	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
EMT	Emergency Medical Technician
EO	Executive Order
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FE-1	Flight Experiment 1
FE-2	Flight Experiment 2
FL	Flight Level
FONSH	Finding of No Significant Harm
FONSI	Finding of No Significant Impact
ft	Foot/Feet
FT-2	Flight Test 2
FT-3	Flight Test 3
FTS	Flight Termination System
GBSD	Ground Based Strategic Deterrent
GHA	Ground Hazard Area
GHG	Greenhouse Gas
GRMI	Government of the Republic of the Marshall Islands
HAP	Hazardous Air Pollutant
HAPC	Habitat Areas of Particular Concern
ICAO	International Civil Aviation Organization
ICBM	Intercontinental Ballistic Missile
in.	Inch(es)
IPF	Integration and Processing Facility
KEEP	Kwajalein Environmental Emergency Plan
kg	Kilogram(s)
KLC	Kodiak Launch Complex (now PSCA)
km	Kilometer(s)
KMISS	Kwajalein Missile Impact Scoring System
lb	Pound(s)
LCC	Launch Control Center
LHA	Launch Hazard Area
LIDSS	Lawrence Livermore National Laboratory Independent Diagnostic Scoring System
L_{max}	Maximum A-weighted Sound Level
LP-1	Launch Pad 1
LSS	Launch Service Structure

m	Meter(s)
MBTA	Migratory Bird Treaty Act
MDA	Missile Defense Agency
mg/kg	Milligrams per Kilogram
mg/L	Milligrams per Liter
mi	Mile(s)
MMIII	Minuteman III
MMPA	Marine Mammal Protection Act
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSAT	Mobile Source Air Toxin
MSF	Maintenance Support Facility
N/A	Not Applicable
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NGA	National Geospatial-Intelligence Agency
nm	Nautical Miles
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOTAM	Notice to Airmen
NPA	Notice of Proposed Activity
NPDES	National Pollutant Discharge Elimination System
NPFMC	North Pacific Fishery Management Council
NTM	Notice to Mariners
OEA	Overseas Environmental Assessment
OSHA	Occupational Safety and Health Administration
Pb	Lead
PIRO	Pacific Islands Regional Office
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
PMRF	Pacific Missile Range Facility
PPF	Payload Processing Facility
PSCA	Pacific Spaceport Complex–Alaska
psf	Pounds Per Square Foot
PTS	Permanent Threshold Shift
RCC	Range Commanders Council
RCCTO	Army Rapid Capabilities and Critical Technologies Office
RMI	Republic of the Marshall Islands
RMIEPA	Republic of the Marshall Islands Environmental Protection Authority
RMSF	Rocket Motor Storage Facility
ROI	Region of Influence
RSL	Regional Screening Level
RTS	Ronald Reagan Ballistic Missile Defense Test Site (Reagan Test Site)
SDWA	Safe Drinking Water Act
SEL	Sound Equivalent Level
SOP	Standard Operating Procedure
SPL	Sound Pressure Level
STARS	Strategic Target System
TFR	Temporary Flight Restriction
TTS	Temporary Threshold Shift
U.S.	United States
UES	United States Army Kwajalein Atoll Environmental Standards
USACE	United States Army Corps of Engineers
USAG-KA	United States Army Garrison Kwajalein Atoll
USASMDC	United States Army Space and Missile Defense Command
USC	United States Code
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
UXO	Unexploded Ordnance
VAFB	Vandenberg Air Force Base
VOC	Volatile Organic Compound
μPa	Micropascal

1.0 Purpose of and Need for the Proposed Action

1.1 Introduction

The Proposed Action, Hypersonic Flight Test-3 (FT-3), is sponsored by the United States Department of the Army (U.S. Army), which has designated the U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) as the lead agency for the Proposed Action. The U.S. Army RCCTO proposes to conduct a single developmental hypersonic flight test, FT-3, from the Pacific Spaceport Complex Alaska (PSCA) to Kwajalein Atoll, Republic of the Marshall Islands (RMI). The Proposed Action entails one hypersonic flight test to take place between March 2021 and September 2021 subsequent to the completion of this Environmental Assessment / Overseas Environmental Assessment (EA/OEA) and signing of the Finding of No Significant Impact / Finding of No Significant Harm (FONSI/FONSH), if approved.

The U.S. Army RCCTO and the United States Army Space and Missile Defense Command (USASMDC), as Participating Agencies, have prepared this EA/OEA in accordance with the National Environmental Policy Act (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, July 1, 1986), the Department of the Army Procedures for Implementing NEPA (32 CFR Part 651), and Executive Order [EO] 12114, Environmental Effects Abroad of Major Federal Actions.

1.2 Locations

The locations analyzed in this EA/OEA are the PSCA, Kodiak Island, Alaska; a Broad Ocean Area (BOA) of the Pacific Ocean; the U.S. Army Garrison Kwajalein Atoll (USAG-KA); and the Ronald Reagan Ballistic Missile Defense Test Site (RTS) at Illeginni Islet, RMI. Notional trajectories are shown in **Figure 1-1**.

The PSCA was developed and is operated by the Alaska Aerospace Corporation (AAC) on Kodiak Island, Alaska, United States of America. It supports the launch of rockets and satellites for commercial and Government aerospace interests (AAC 2019). PSCA is located on State of Alaska land. AAC holds a Federal Aviation Administration (FAA) license to operate a commercial space launch site at PSCA. The proposed FT-3 vehicle would travel a distance of approximately 5,630 kilometers (km; 3,500 miles [mi]) to Kwajalein Atoll.

For the purposes of this document, the BOA is defined as an expanse of open ocean area of the Pacific Ocean displayed in **Figure 1-1**. The BOA includes only waters outside of the Exclusive Economic Zones (EEZs) of the United States and other countries with territory in the central Pacific Ocean. An EEZ is defined as an area no more than 370 km (200 nautical miles [nm]) from the territorial sea baseline (usually the mean low-water line) of these countries.

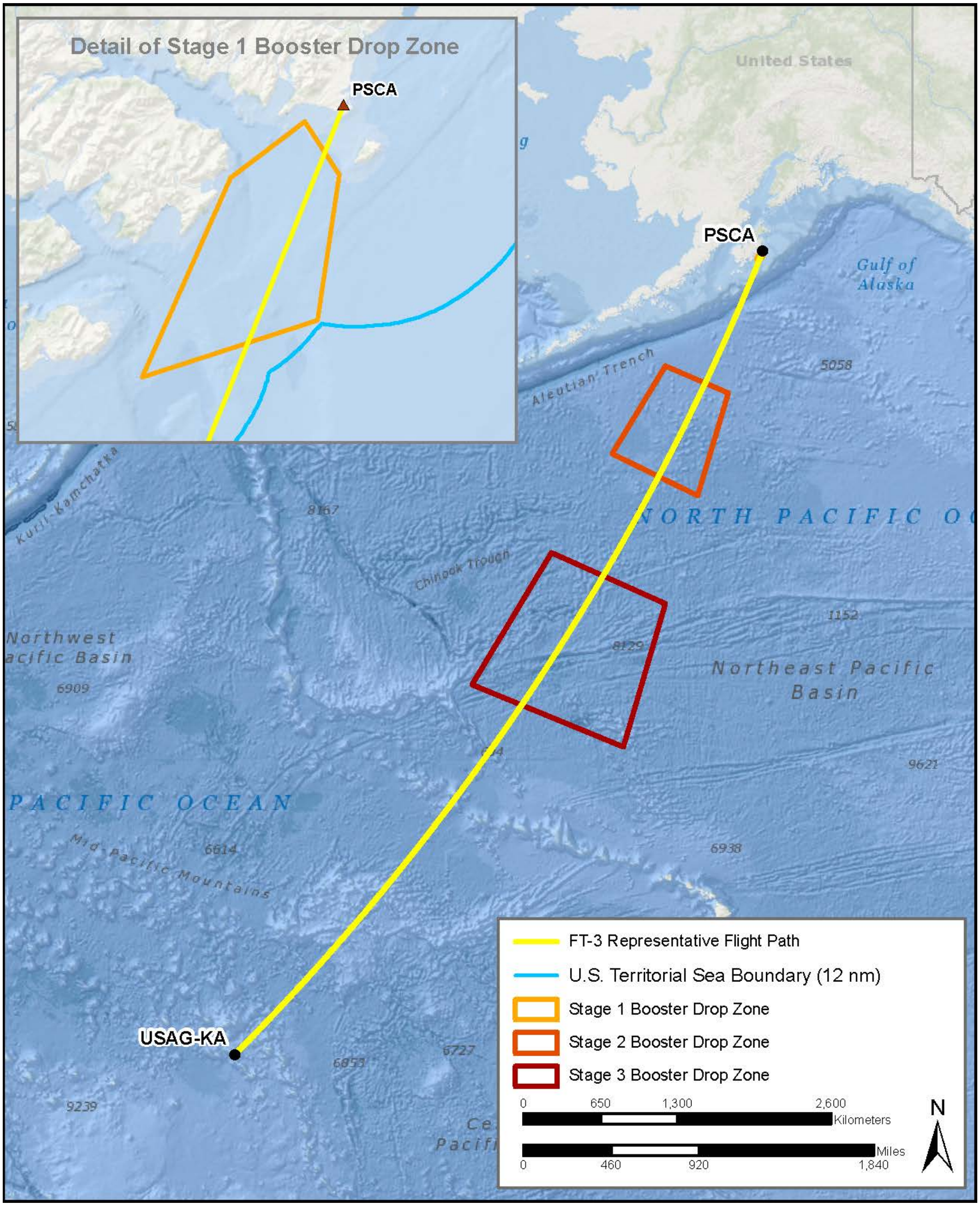


Figure 1-1. FT-3 Activity Location Map Pacific – General Map with PSCA – USAG-KA

Illeginni Islet is located on the western side of Kwajalein Atoll. Illeginni Islet has served as a flight test termination site for numerous missile test flights. The location is uninhabited, isolated, and has existing infrastructure and other surface assets to support the FT-3 at this location. Alternative payload impact locations would be in deep offshore waters of Kwajalein Atoll either southwest of Illeginni Islet or within the Kwajalein Missile Impact Scoring System (KMISS) area southeast of Gagan Islet.

Various other support 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 not included in this EA/OEA.

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

Storage Facilities	Camp Navajo, Arizona; Hawthorne Army Depot, Nevada; Redstone Arsenal, Alabama; Kirtland Air Force Base, New Mexico; Tooele Army Depot, Utah
Transportation Facilities	Redstone Army Airfield, Alabama; Kodiak State Airport, Alaska; Michael Army Airfield, Dugway Proving Ground, Utah; Bucholz Army Airfield, USAG-KA; Port of Seattle and Tacoma; Womens Bay Terminal Dock
U.S. Army Garrison Kwajalein Atoll (USAG-KA)	Ronald Reagan Ballistic Missile Defense Test Site
	Kwajalein Missile Impact Scoring System
Northrup Grumman Space Systems	Engineering and manufacturing
Redstone Arsenal, Alabama	U.S. Army Combat Capabilities Development Command Aviation & Missile Center (CCDC AvMC) provides testing support
Sandia National Laboratories, New Mexico	Department of Energy laboratory provides production and testing support

1.3 Purpose of and Need for the Proposed Action

The Department of Defense (DOD) currently uses conventional delivery methods to deploy strikes on foreign threats primarily with forward-based systems, such as tactical aircraft, cruise missiles, unmanned aerial vehicles, and heavy bombers. Effective use of these systems requires time to pre-position assets, have those assets within range of targets, and have mission support assets available. FT-3 is designed to test a long-range, global strike capable technology. The purpose of this technology test is to stool-launch a payload to high altitude for accurate delivery. The need for this Proposed Action is to keep the warfighter prepared and to help enhance their knowledge of the performance of the hypersonic missile.

The Proposed Action, FT-3, is needed to gain progress in testing, modeling, and simulating developmental payload systems. FT-3 will also advance technologies necessary to ultimately establish operational strike capabilities. The purpose of FT-3 is to demonstrate a reduction of risk for a longer-range payload system. FT-3 would continue to develop, integrate, and flight test the system to demonstrate the maturity of key technologies. Data collected would be utilized to improve the models that predict the performance of the system. The Proposed Action would also provide an opportunity to observe the FT-3 launch vehicle and payload system from launch-to-impact and record all data that is transmitted throughout the flight path.

To meet the objectives described above, FT-3 must satisfy certain physical and technical constraints. For example, it is essential that the system can execute the planned flight profile within acceptable tolerances. FT-3 must have observational instrumentation with sufficient fidelity to evaluate system performance from launch to flight to terminal impact. There is also a programmatic requirement to conduct FT-3 between March 2021 and September 2021.

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 U.S. Army has considered alternate launch and impact locations, and only the launch from PSCA with alternate impact locations in Kwajalein Atoll meets the screening criteria and the test requirements for vehicle performance and data collection. This EA/OEA analyzes potential impacts to the launch area (PSCA), the over-ocean flight corridors in the Pacific Ocean BOA, booster drop zones in the BOA, and the impact location in Kwajalein Atoll. The U.S. Army's Proposed Action is a launch from PSCA with a payload impact on land at Illeginni Islet because it best meets 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, public health and safety, hazardous materials and wastes, socioeconomics, environmental justice, and aesthetics/visual resources. The study area for each resource may differ due to how the Proposed Action interacts with or impacts the resource. **Table 1-2** summarizes the potential impacts to the resources associated with each of the alternative actions analyzed.

Table 1-2. Summary of the Anticipated Impacts to the Resources Associated with the Proposed Action: PSCA – USAG-KA

Location / Resource Area	No Action Alternative	Proposed Action Alternative
Pacific Spaceport Complex Alaska		
Air Quality	No change	Minor, short-term impact
Water Resources	No change	Minor, short-term impact
Biological Resources	No change	No significant impact
Airspace	No change	No impact
Noise	No change	Minor, short-term impact
Public Health and Safety	No change	No significant impact
Hazardous Materials and Wastes	No change	No significant impact
Pacific Ocean Flight Corridor		
Air Quality	No change	No significant impact
Biological Resources	No change	No significant impact
Water Quality	No change	No significant impact
USAG-KA, RMI – Illeginni Islet		
Biological Resources	No change	No significant impact
Noise	No change	Minor, short-term impact
Public Health and Safety	No change	No significant impact
Hazardous Materials and Wastes	No change	No significant impact
USAG-KA, RMI – Offshore Waters – Southwest and Northeast		
Biological Resources	No change	No significant impact
Noise	No change	Minor, short-term impact
Public Health and Safety	No change	No significant impact
Hazardous Materials and Wastes	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.

Proposed Action – PSCA – USAG-KA

- *Preliminary Final Supplemental Environmental Assessment for the Pacific Spaceport Complex Alaska Missile Defense System Flight Test Support*, 2020. The Missile Defense Agency (MDA) proposes to integrate Aegis Missile Defense ship launch interceptors and air-breathing targets into ongoing missile defense system integrated flight tests conducted from the PSCA, with intercepts occurring over offshore waters and BOAs.
- *Final Environmental Assessment/Overseas Environmental Assessment for Flight Experiment-2 (FE-2), 2019.* The FE-2 EA/OEA addresses the probable environmental

effects of conducting Navy Flight Experiment-2 from the Pacific Missile Range Facility (PMRF) on Kauai, Hawai`i to Illeginni Islet, RTS, RMI.

- *Final Environmental Assessment/Overseas Environmental Assessment for Flight Experiment-1 (FE-1),* 2017. This assessment addresses the probable environmental effects of conducting Navy Flight Experiment-1 from PMRF on Kauai, Hawai`i to Illeginni Islet, RTS, RMI.
- *Pacific Spaceport Complex Alaska Ballistic Missile Defense Flight Test Support Environmental Assessment,* 2017. The MDA proposes to conduct defensive weapon system flight tests of various Ballistic Missile Defense systems from PSCA. The flight tests would include the launch and intercept of target missiles over the BOA.
- *Final Environmental Assessment, Finding of No Significant Impact/Record of Decision for the Kodiak Launch Complex Launch Pad 3*, 2016. The FAA prepared this EA to analyze the potential environmental impacts of AAC's proposal to expand the launch capabilities at the Kodiak Launch Complex (KLC; now PSCA), located on Kodiak Island's Narrow Cape, Alaska. Under the proposed action, the FAA would issue a Launch Site Operator License modification to AAC to include a new launch pad and medium-lift launch capability at KLC. This would allow AAC to expand their KLC operations from a small-lift launch site to a small- and medium-lift launch site. Under the Launch Site Operator License modification, AAC would construct a launch pad, vehicle processing facility, rocket staging facility, air plant/liquid fueling facility, and a mission control center, and modify an existing road. The EA also may be used to support licenses for future vehicle operators and license renewals.
- *Advanced Hypersonic Weapon Flight Test 2 (FT-2) Hypersonic Technology Test Environmental Assessment*, 2014. The FT-2 EA documents the demonstration flight test of a flight test vehicle launched from KLC, now renamed PSCA, 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 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 USAG-KA/RTS (on or near Illeginni Islet) in the RMI.
- *Flexible Target Family Environmental Assessment,* 2007. The MDA prepared this EA to assess the environmental impacts of providing a Flexible Target Family to support the testing of the Ballistic Missile Defense System (BMDS). The Flexible Target Family would consist of a collection of common boosters, front sections, and components that could be used to assemble a variety of different target configurations. The purpose of the proposed action is to provide a flexible family of targets that MDA can use to test the BMDS under increasingly realistic scenarios.

- *North Pacific Targets Program Environmental Assessment*, 2001. This EA analyzes the impacts of using the STARS launch vehicle for strategic target launch services from KLC, now renamed PSCA, on Kodiak Island, Alaska. The STARS target would also continue to be launched from Kauai Test Facility at PMRF, Kauai, Hawai`i to the BOA near USAG-KA in the Marshall Islands. The proposed action is to increase the launch capability of the STARS by adding a new STARS flight trajectory from Kauai Test Facility and providing a launch capability from KLC. 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.
- *Environmental Assessment of the Kodiak Launch Complex, Kodiak Island, Alaska*, 1996. The KLC EA analyzes the impacts of a proposed commercial space rocket launch facility on Kodiak Island, Alaska. The purpose of this EA is to examine the potential for environmental impacts resulting from proposed KLC construction and operation. The proposed KLC would support commercial rocket launches to place small satellites into orbit.
- *U.S. Army Kwajalein Atoll Supplemental Environmental Impact Statement (EIS)*, 1993. This Final Supplemental EIS evaluates the environmental impacts of two proposed actions at USAG-KA. The first proposed action is the types and levels of test activities, including test facilities and support services at USAG-KA. The second proposed action is the adoption of new environmental standards and procedures for U.S. Government activities at USAG-KA.
- *Environmental Assessment Missile Impacts, Illeginni Island at the Kwajalein Missile Range, Kwajalein Atoll Trust Territory of the Pacific Islands*, 1977. This assessment addresses the probable environmental effects of missile impacts on the Illeginni Islands District, Trust Territory of the Pacific Islands.

1.5 Relevant Laws and Regulations

The U.S. Army has 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)
- Army Procedures for Implementing NEPA (32 CFR Part 651), which provides Army policy for implementing CEQ regulations and NEPA

- Environmental Effects Abroad of Major Department of Defense Actions (32 CFR Part 187), which provides DOD policy and procedures for environmental considerations outside of the United States
- 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 (54 USC Section 306108 et seq.)
- Endangered Species Act (ESA) (16 USC Section 1531 et seq.)
- Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (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 (16 USC Section 668-668d)
- Executive Order (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 13175, Consultation and Coordination with Indian Tribal Governments
- EO 13834, Efficient Federal Operations
- Compact of Free Association Between the United States and the Republic of the Marshall Islands, which became effective on October 21, 1986, under Presidential Proclamation No. 5564 on November 3, 1986; and was amended pursuant to Public Law 108-188 – December 17, 2003; 17 STAT 2723
- Compact of Free Association Military Use and Operating Rights Agreement between the United States of America and the Marshall Islands, March 23, 2004
- Environmental Standards and Procedures for United States Army Kwajalein Atoll Activities in the Republic of the Marshall Islands (UES), Fifteenth Edition, September 2018

1.6 Public and Agency Participation and Intergovernmental Coordination

U.S. Army RCCTO accepted the U.S. Army's invitation to participate as lead agency (40 CFR Part 1501.5) in the preparation of this EA/OEA. Regulations from the CEQ (40 CFR Part 1506.7) direct agencies to involve the public in preparing and implementing their NEPA procedures.

For actions at PSCA, USASMDC has coordinated or consulted with state and federal agencies, Alaskan Native Tribal Governments, and other Alaska agencies relative to Kodiak. These include:

- U.S. Environmental Protection Agency (USEPA), Region 10, Alaska Operations Office
- U.S. Fish and Wildlife Service (USFWS)
- Federal Aviation Administration (FAA)
- Sun'aq Tribe of Kodiak
- City of Old Harbor
- Alaska Department of Fish and Game
- Alaska State Historic Preservation Office
- Alaska Department of Transportation & Public Facilities
- Alaska Aerospace Corporation (AAC)

For actions in the RMI, USASMDC has coordinated or consulted with the USFWS, the National Marine Fisheries Service (NMFS), and the other UES Appropriate Agencies regarding the Proposed Action. A project-specific Document of Environmental Protection (DEP) was prepared and submitted to the UES Appropriate Agencies and to the RMI.

Agencies coordinated with for RMI actions include:

- RMI Environmental Protection Authority (RMIEPA)
- USEPA
- USFWS Pacific Islands Fish and Wildlife Office
- NMFS Pacific Islands Regional Office (PIRO)
- U.S. Army Corps of Engineers (USACE)
- U.S. Army Garrison Kwajalein Atoll (USAG-KA)

A Notice of Availability was published, indicating when the document was to be issued; where copies could be obtained or reviewed; the duration of the comment period; where comments should be sent; and location, date, and times regarding the Draft EA/OEA and Draft FONSI/FONSH. The Notice of Availability was published as follows:

- *The Kwajalein Hourglass* – December 19, 2020 and December 26, 2020
- *The Marshall Islands Journal* – December 18, 2020
- *Kodiak Daily Mirror* – December 18, 2020
- *Anchorage Daily News* – December 18, 2020

Comments on the EA/OEA and FONSI/FONSH were accepted in any of three ways:

1. Through the website https://FT3EAOEA.govsupport.us, or
2. Emailed to ft-3-eaoea-comments@govsupport.us, or
3. 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. Army circulated the Draft EA/OEA for public review from December 18, 2020 to January 20, 2021. Substantive comments received from U.S., Tribal, and RMI agencies on the Draft EA/OEA and their responses are provided in the Final EA/OEA. 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://FT3EAOEA.govsupport.us. Those agencies, organizations, and repositories that were directly notified about the NOA or received a copy of the document are listed in the appropriate appendices.

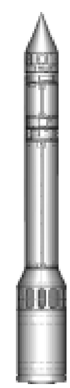
Following the public review period (as specified in the newspaper notice), the U.S. Army will decide whether to sign the FONSI/FONSH, which would allow the Proposed Action to be implemented, or to prepare an EIS. If the U.S. Army decides to sign the FONSI/FONSH, the Final EA/OEA will include both the written comments (i.e., letters and electronic messages received) and their resolutions. The Final EA/OEA and FONSI/FONSH will be accessible on the internet at https://FT3EAOEA.govsupport.us.

2.0 Description of the Proposed Action and Alternatives

2.1 Proposed Action

The U.S. Army FT-3 Proposed Action would consist of a flight test designed to prove various aspects of the launch vehicle and payload system's capabilities. The Proposed Action would occur between March 2021 and September 2021 after signing of the FONSI/FONSH, if approved. The FT-3 launch vehicle would consist of a three-stage booster system and payload (**Figure 2-1**). This test would be designed to collect data to evaluate key payload technologies and demonstrate performance capabilities of the payload system for current and future use. The Proposed Action entails ground preparations for the flight test, launch and flight test, impact of the payload, and post-test operations. The Proposed Action is an FT-3 launch from PSCA, flight over the Pacific Ocean BOA, and payload impact at Illeginni Islet. Deep water impact zones are also analyzed as possible payload impact locations in **Sections 2.5.4.2** and **2.5.6.2**.

Characteristics of the launch vehicle are presented in **Table 2-1** based on preliminary data on the FT-3 launch vehicle. The payload system general characteristics are presented in **Table 2-2**.



Payload	Sandia Lab	750 lb
Stage 2 (third)	Orion 50 XLT	8,632 lb
Stage 1 (second)	Orion 50-S XLT	33,152 lb
Stage 0 (first)	C4	38,677 lb
Launch Method	Ground	
Launcher	Launch Stand	

Source: MDA 2019

Figure 2-1. FT-3 Launch Vehicle (Not Drawn to Scale)

Table 2-1. Launch Vehicle Characteristics

Major Components	Rocket motors, propellant, magnesium thorium (booster interstage), nitrogen gas, halon, asbestos, battery electrolytes (lithium-ion, silver zinc)
Communications	Various 5- to 20-watt radio frequency transmitters; one maximum 400-watt radio frequency pulse
Power	Rechargeable lithium batteries
Other	Small Class C (1.4) electro-explosive devices

Table 2-2. FT-3 Payload System Characteristics

Structure	Aluminum, titanium, steel, tungsten, carbon, silica, Teflon®, and alloys containing chromium, magnesium, and nickel
Communications	Various 5- to 20-watt (radio frequency) transmitters
Power	Lithium-ion batteries
Propulsion	None
Other	Mechanical and Flight Termination Systems (FTS): initiators and bulk explosive charge

Source: USASMDC/ARSTRAT 2014, U.S. Navy 2019b

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. Only those alternatives determined to be reasonable and which meet the purpose and need require detailed analysis.

Alternative locations for the FT-3 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 FT-3 such that:
    a. The launch pad is capable of supporting a stool-launched booster system; and
    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; and
    c. FT-3 motors 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 provide the required range distance to conduct the test.

3. 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 between March 2021 and September 2021; 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).

4. The launch and impact location must be capable of providing required range safety.

5. The launch and impact location must have known environmental documentation so that there are no existing or potential issues with testing.

6. The launch and impact location must meet security requirements.

2.3 Alternatives Carried Forward for Analysis

Based on the screening criteria/evaluation factors described in **Section 2.2**, the U.S. Army's Proposed Action is a launch from PSCA, flight over the Pacific Ocean Corridor, and impact at Illeginni Islet. This alternative best meets the screening criteria/evaluation factors and the requirements of the purpose of and need for the Proposed Action.

2.4 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur, and the U.S. Army would not pursue the FT-3 Proposed Action. The No Action Alternative would not meet the purpose of 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 Proposed Action.

2.5 Proposed Action – PSCA Launch, Pacific Ocean Corridor, USAG-KA Impact

2.5.1 Pre-Flight Activities

PSCA, USAG-KA, RTS, and various other support facilities would participate in routine pre-flight support operations related to the Proposed Action. Support operations of the FT-3 Proposed Action would include base support, range safety, flight test support, and test instrumentation, at a minimum. 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.

Prior to launch, routine activities would take place at PSCA to prepare for FT-3. All activities would adhere to the guidance and limitations of PSCA's certified oversight. Project personnel would execute ground equipment checks, FT-3 vehicle and booster assembly and checks, as well as other numerous pre-flight preparations. These activities would be directed by the U.S. Army RCCTO. All activities would use existing facilities and infrastructure.

2.5.2 Rocket Motor Transportation

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

The surface and air transportation activities associated with the Proposed Action utilize established Government and commercial facilities. As such, analysis of these support operations is not included in this EA/OEA.

2.5.3 Launch Site Preparations and Operations

PSCA is located on Narrow Cape of Kodiak Island, Alaska. The relative isolation of PSCA and existing infrastructure that supports this test were significant factors in PSCA's selection as the Proposed Action launch site. PSCA's ground safety lead will adhere to the Range Safety Data Package requirements for this type of launch. FT-3 would be launched from launch pad-1 (LP-1).

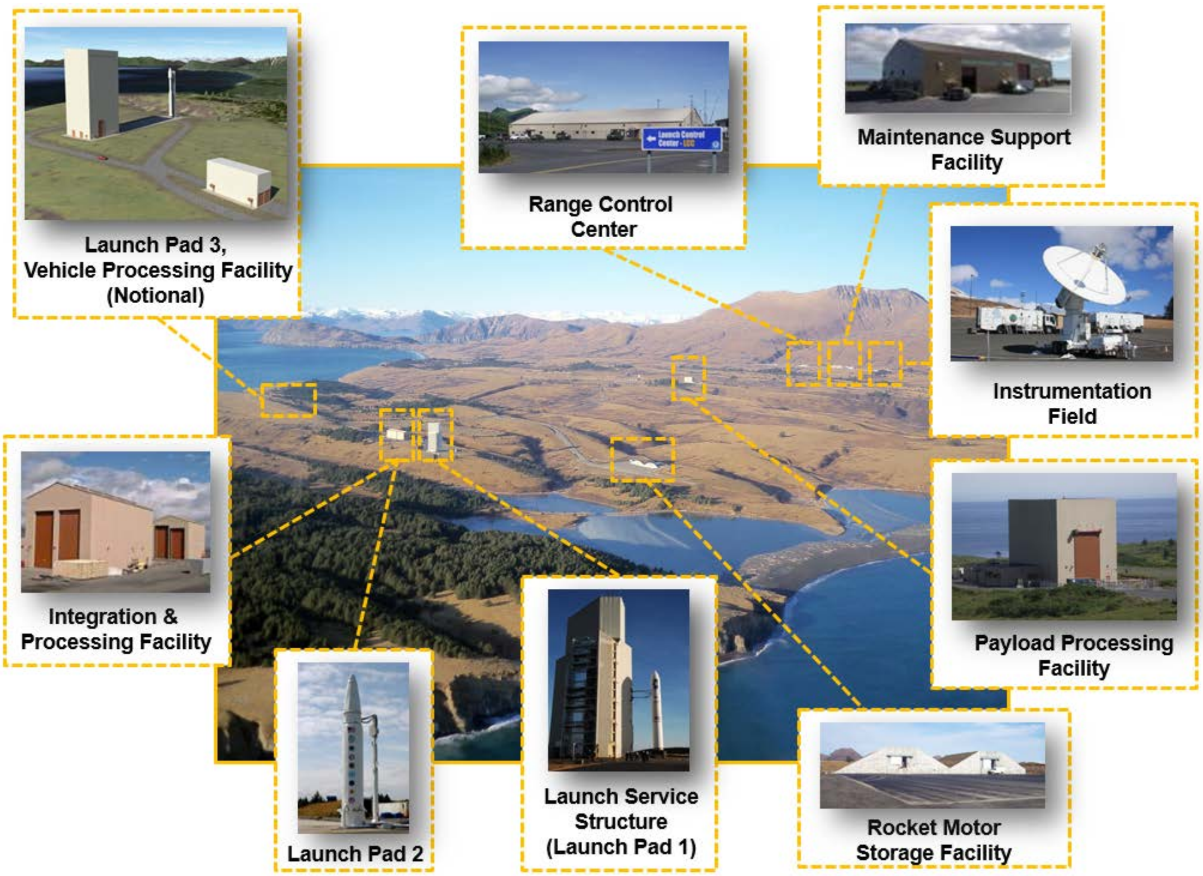
Prior to launch, routine activities would take place at PSCA to prepare for FT-3. All activities would adhere to the guidance and limitations of PSCA's certified oversight. Project personnel would execute ground equipment checks, FT-3 vehicle and booster assembly and checks, as well as other numerous pre-flight preparations.

These activities would be directed by the U.S. Army RCCTO. All activities would use existing facilities and infrastructure. U.S. Army RCCTO representatives would coordinate activities with PSCA, USAG-KA, and other range organizations. Other launch supporting activities might include the following:

- Final motor and payload assembly and integration
- Placement of missile on existing pad
- Mechanical and electrical checkouts (equipment testing, 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 PSCA routine operations for any launch, PSCA personnel would also conduct various range responsibilities to ensure appropriate launch preparation, including explosive safety, support to PSCA range safety, and inter-range coordination with USAG-KA.

Figure 2-2 shows the primary existing facilities that would support the Proposed Action at PSCA.



From PSCA EA (DOD 2017).

Figure 2-2. Primary Support Locations at PSCA

2.5.4 Terminal Location Preparations and Operations

RTS has been a flight test impact area for more than 40 years (GlobalSecurity.org 2019). Target sites for test impacts are generally located in the deep ocean area east of Kwajalein Atoll or in the vicinity of Illeginni Islet. Vehicle impacts from other tests have occurred within the Kwajalein Atoll lagoon, on and in the vicinity of Illeginni Islet, and in the BOA outside the atoll. The impact scenarios covered in this EA/OEA are an Illeginni Islet land impact, and a deep water impact near Kwajalein Atoll.

USAG-KA and RTS support of the FT-3 flight test would include base support, range safety, flight test support, and test instrumentation. USASMDC would ensure that all relevant personnel associated with the Proposed Action are fully briefed on the best management practices (BMP) and the requirement to adhere to them for the duration of the Proposed Action. All activities would comply with the UES (USASMDC/ARSTRAT 2018). A project-specific DEP would be prepared to present requirements and limitations.

To ensure the safe conduct of this type of test, a Mid-Atoll Corridor would be established across Kwajalein Atoll (**Figure 2-3**). A number of strict precautions would be taken to protect personnel. Such precautions may consist of evacuating nonessential personnel and sheltering all other personnel remaining within the Mid-Atoll Corridor. Notices to Airmen (NOTAMs) and Notices to Mariners (NTMs) would be published and circulated in accordance with established procedures to provide warning to personnel, including local Marshall Islands residents, concerning any potential hazard areas that should be avoided. Standard practice is to distribute an announcement from Kwajalein Islet regarding the upcoming mission that is then provided to the public in Marshallese and English on the televised “Roller” and in radio announcements. Additionally, notices of upcoming missions are provided by the U.S. Embassy to the Government of the RMI (GRMI) for the GRMI to distribute. A fact sheet describing the project and the environmental controls would be prepared in English and Marshallese and would be provided at locations on Ebeye and Kwajalein Islets. Radar and visual sweeps of the hazard area would be accomplished immediately prior to FT-3 to ensure the clearance of non-critical personnel.

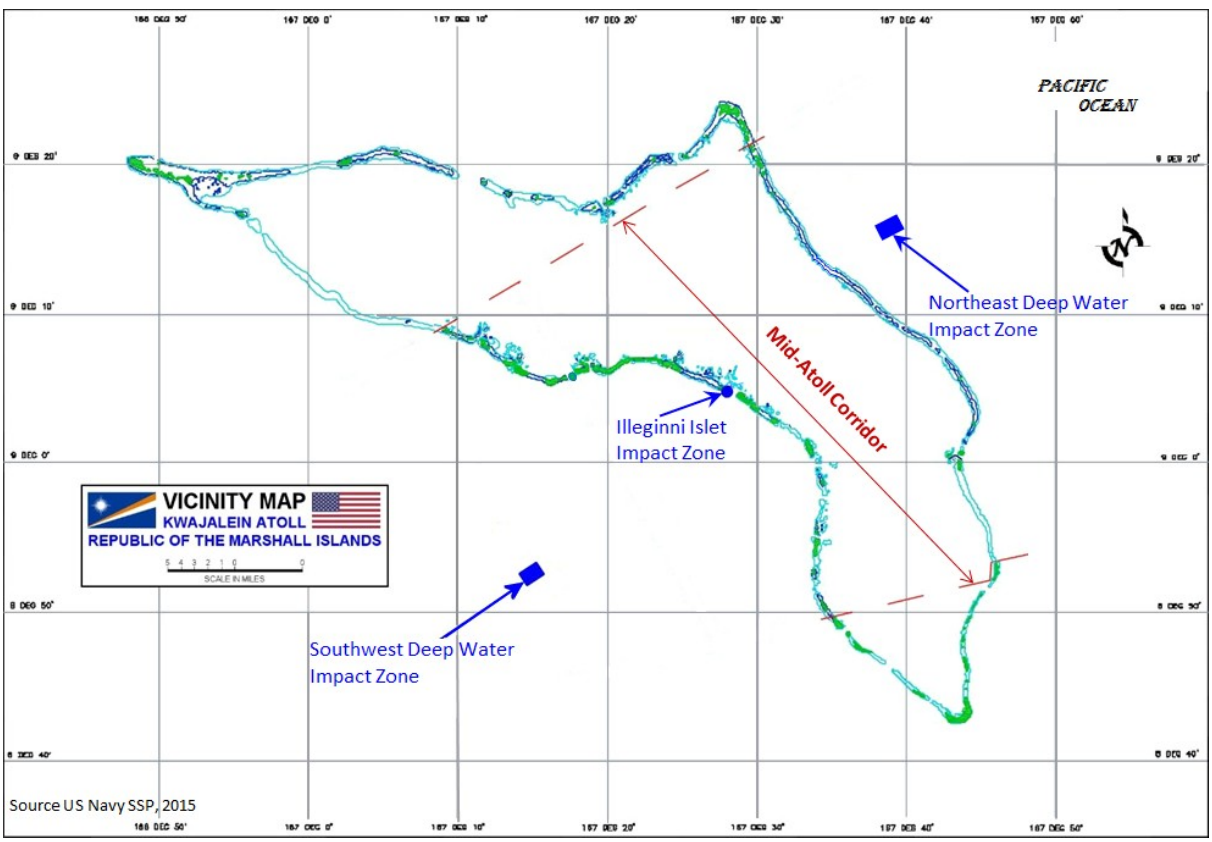


Figure 2-3. Notional Impact Areas and Mid-Atoll Corridor in the Vicinity of Kwajalein Atoll

2.5.4.1 Illeginni Land Impact

For the Proposed Action at Illeginni Islet, activities would include several vessel round-trips and helicopter trips from Kwajalein to support test activities and surveys. Additionally, raft-borne sensors may be deployed and recovered on both the ocean and lagoon sides. There would also be increased human activity on Illeginni Islet that would involve up to 15 persons over a 2-month period. Additionally, radars could be placed on previously disturbed areas on Illeginni Islet outside the impact area to gather information on the payload. Heavy equipment placement and use would occur at times. The proposed impact point for FT-3 would be in the non-forested area to avoid affecting the bird habitat (**Figure 2-4**). A reef or shallow water impact is not part of the Proposed Action, would be unintentional, and is unlikely.

Figure 2-4. Potential Land Impact Area on Illeginni Islet

In addition to land-based and sensor vessel support, up to 12 Lawrence Livermore National Laboratory Independent Diagnostic Scoring System (LIDSS) rafts with onboard optical, acoustical, and/or radar sensors (**Figure 2-5**) may be placed in the Kwajalein Atoll lagoon or ocean near Illeginni Islet. Within a day of the flight test, one or two vessels would be used to deploy the rafts. The rafts would be equipped with battery-powered electric motors for propulsion to maintain position in the water, without the use of an anchor. Sensors on the rafts would collect data during the payload's descent until impact.

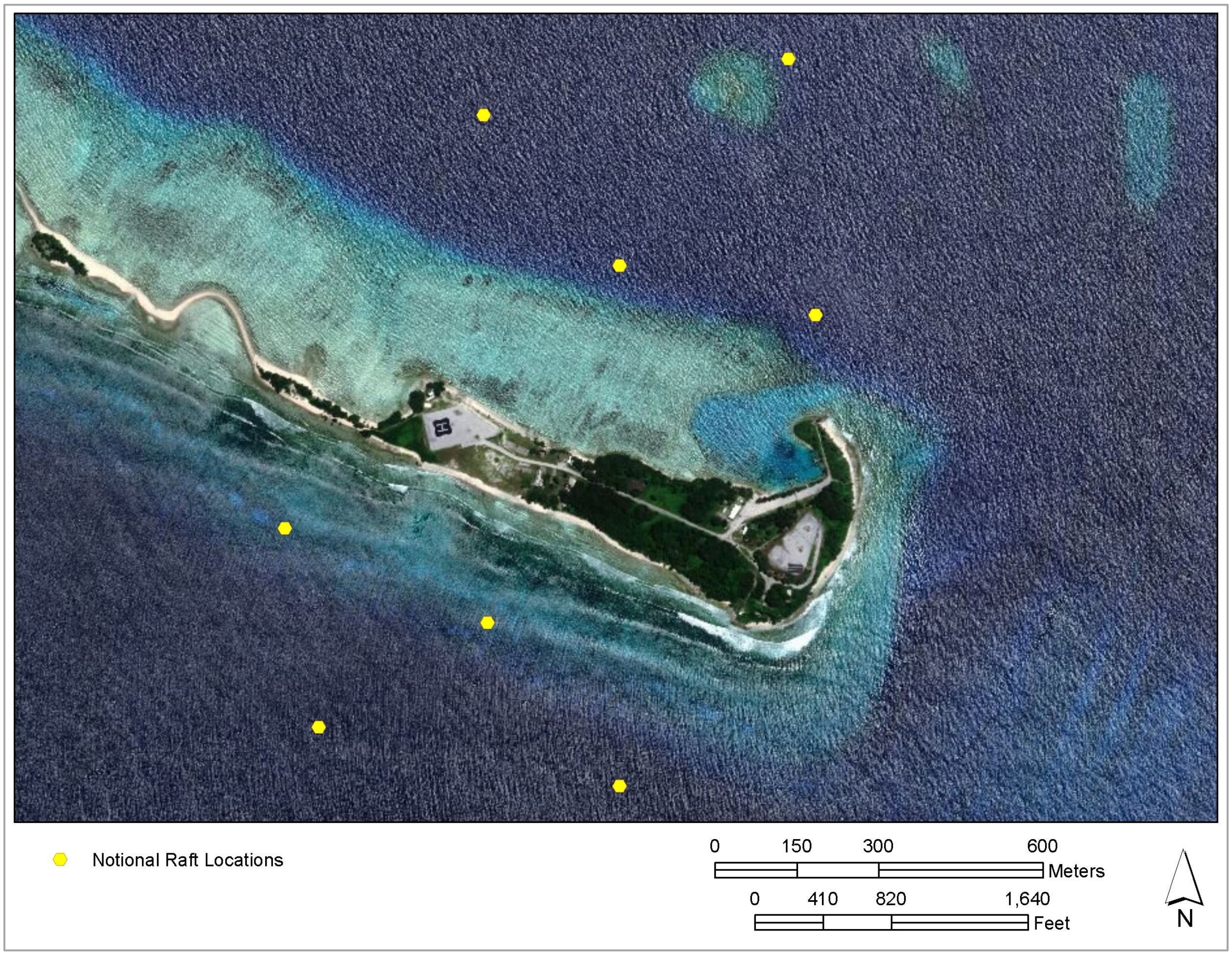


Figure 2-5. Notional Locations of Precision Scoring Augmentation Rafts

For at least 8 weeks preceding the FT-3 launch, Illeginni Islet would be surveyed by qualified persons for sea turtles, sea turtle nesting activity, and sea turtle nests. The area would be inspected within a day preceding the flight test. On-site personnel would report any observations of sea turtles or sea turtle nests on Illeginni Islet to the USAG-KA Environmental Engineer to provide to NMFS and the USFWS.

During ocean travel, travel to and from impact zones, including Illeginni Islet, and during potential 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. Any marine mammal or sea turtle sightings during overflights or ship travel would be reported to the USAG-KA Environmental Engineer, the RTS Range Directorate, and the Flight Test Operations Director for consideration in approving the launch. Any records of marine mammal and sea turtle observations would include species, number of individuals, location and behavioral observations which would be provided to NMFS and the USFWS after the test. Vessel operations around Illeginni Islet 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.

On Illeginni Islet, the impact area would be searched for black-naped tern nests and chicks prior to any pre-flight equipment mobilization. Any discovered nests would be covered with an A-frame structure per current USFWS guidance. The area would be monitored to ensure no black-naped tern nests are disturbed when heavy equipment would position diagnostic equipment. Likewise, to prevent birds from nesting on the support equipment after initial setup, the equipment would be appropriately covered with tarps or other materials and “scare” techniques (e.g., scarecrows, mylar ribbons, and/or flags) would be used on or near the equipment.

2.5.4.2 Deep Water Impact Zones

An alternative to impact at Illeginni Islet would be to impact in one of the Deep Water Impact Zones shown in **Figure 2-3**. This figure depicts a region southwest of Illeginni Islet, which has an approximate area of 488 meters (m; 1,600 feet [ft]) by 244 m (800 ft); and a region northeast of Illeginni Islet, which is within the KMISS area encompassing 2,400 m by 366 m (7,874 ft by 1,200 ft). The use of the existing KMISS would be factored into the final data collection architecture.

To ensure the safe conduct of this type of test a Mid-Atoll Corridor would be established across Kwajalein Atoll, as well as NOTAMs, NTMs, announcements published in English and Marshallese, and radar and visual sweeps of the hazard area. **Section 2.5.4** provides details on the strict precautions that would be taken to protect personnel and the general public.

It is anticipated that up to 4 weeks of increased activities would be required for either deep-water impact zone highlighted in **Figure 2-3**. Included among these activities are as follows:

- Set up mobile terminal area scoring using an ocean-going tug to tow and set up a station-keeping barge
- Deploy landing craft utility vessels and as many as 12 LIDSS-type rafts
- Deploy telemetry assets

The main instrumentation raft would be supplemented with the LIDSS self-stationing rafts with associated radar, acoustic, and optical sensors. The main instrumentation raft includes considerations for maritime safety (e.g., running lights and station-keeping), international policy (e.g., no intentional ocean dumping should the instrumentation raft be inadvertently struck during the conduct of the mission), and visual deterrents to birds loafing or resting on the raft (e.g., scarecrows, mylar flags, helium-filled balloons, and strobe lights). It is anticipated that the instrumentation suite would be installed on the raft prior to being deployed to the test support location; however, a station-keeping barge may also be used to provide primary scoring and sensor coverage for the flight test. After transit, it is expected that the raft would remain in place for up to 2 weeks while waiting for the test to occur.

The self-stationing 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, including Deep Water Zones, and during potential 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. Any marine mammal or sea turtle sightings during overflights or ship travel would be reported to the USAG-KA Environmental Engineer, the RTS Range Directorate, and the Flight Test Operations Director for consideration in approving the launch. Any records of marine mammal and sea turtle observations would include species, number of individuals, location, and behavioral observations which would be provided to NMFS and the USFWS after the test. Vessel operations 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.

2.5.5 Flight Test

Flight testing activities would include the launch from PSCA and the impact of the payload at USAG-KA. The flight path would essentially be the same as that analyzed in the FT-2 EA (USASMDC/ARSTRAT 2014). Following motor ignition and liftoff from the launch location, the first-stage motor would burn out downrange and separate from the second stage. Farther into flight, the second-stage would burn out and separate, with the shroud assembly also being jettisoned prior to third stage ignition. Farther into flight, the third-stage would burn out and separate from the payload. **Figure 2-6** depicts the rocket motor drop zones for the launches at PSCA, and **Figure 1-1** shows the estimated stage drops in the BOA toward USAG-KA. Splashdown of all three spent motor stages and the shroud assembly would occur in the estimated stage drop zones. The drop zones in the BOA are between 130 and 2,778 km (70 and 1,500 nm) from the launch pad.

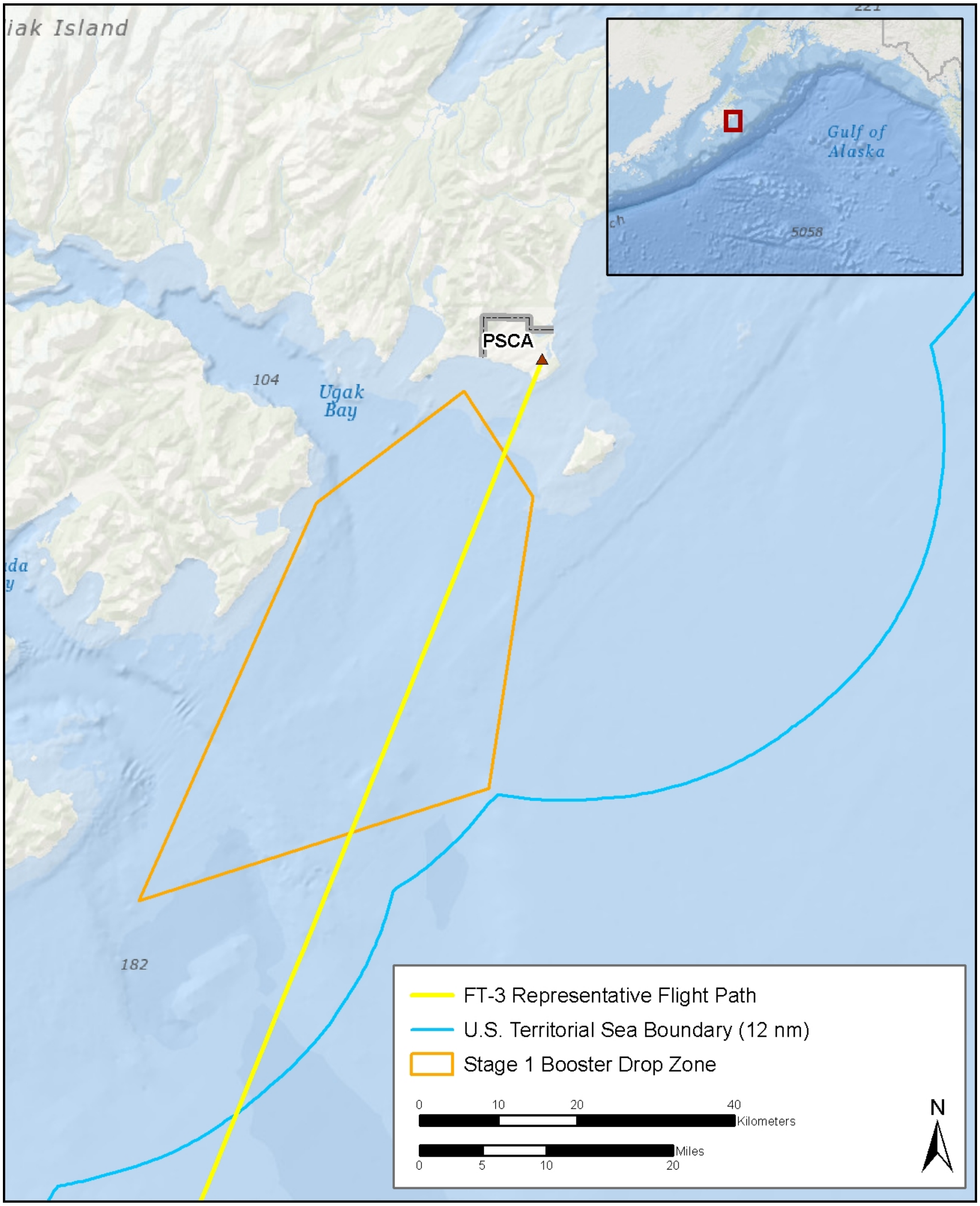


Figure 2-6. Representative Trajectory and Drop Zone

A series of sensors would overlap coverage of the flight from launch at PSCA until impact at USAG-KA. All of these sensors are used for existing programs and would be scheduled for use based on availability. The sensors would include:

- Ground based optics, telemetry, and radars at PSCA and USAG-KA
- Sea based sensors including the Range Safety System onboard the U.S. Motor Vessel *Pacific Collector*, the Kwajalein Mobile Range Safety System, and the Pacific Tracker
- Additional airborne and waterborne sensors on military or commercial aircraft are not planned as part of the FT-3 flight test. Other agencies might collect data on FT-3 for their own purposes, but these extra sensors are speculative and outside the scope of this EA/OEA.

The vehicle would fly in a southwesterly direction from PSCA towards USAG-KA. Jettison of the fairing and separation of the payload would occur outside the atmosphere, and the payload would fly toward pre-designated target sites at Illeginni Islet or in the offshore waters. Payload impact on Illeginni Islet would form a crater that is expected to be similar to the payload impacts analyzed in the Navy's FE-1 EA/OEA (U.S. Navy 2017) and FE-2 EA/OEA (U.S. Navy 2019b). It is expected that FT-3's impact would be less than the previous Minuteman III (MMIII) test impacts on Illeginni Islet. The cratering from MMIII test flights will be used as a comparison for the maximum extent of the Proposed Action. The MMIII craters were documented to be 6 to 9 m (20 to 30 ft) in diameter and 2 to 3 m (7 to 10 ft) deep (U.S. Navy 2017). Prior tests have resulted in craters on land averaging 6 to 7.6 m (20 to 25 ft) across and 4.6 m (15 ft) deep.

If the launch vehicle were to deviate from its course or should other problems occur during flight that might jeopardize public safety, the onboard flight termination system (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 pre-programmed 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 (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 Marshall Islands. This failsafe requires positive action to be taken by range safety personnel to allow the payload to continue flight to the vicinity of Illeginni Islet. Data would be transmitted to range safety personnel to allow a complete evaluation of the "health" of the FTS and the performance of the payload against the safety criteria. The FTS also would contain logic to detect a premature separation of the booster stages and initiate a thrust termination action on all of 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 any protected area.

2.5.6 Post Flight Test

At the launch location on PSCA, 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.

2.5.6.1 Illeginni Land Impact

On Illeginni Islet, the impact could form a crater. Should the FT-3 impact in areas adjacent to the existing paved helipad at Illeginni Islet, soil containing residual concentrations of beryllium and depleted uranium from prior intercontinental ballistic missile (ICBM) flight tests could be scattered over the area. Prior to debris recovery and cleanup actions on Illeginni Islet, unexploded ordnance (UXO) personnel will first inspect the impact crater and surrounding area for any residual explosive materials. Test support personnel will conduct an impact assessment and cleanup and recovery operations once the site is clear for safe entry.

Following completion of the impact area assessment, personnel will manually recover FT-3 debris from land and, if present, from surrounding shallow waters (less than 55 m [180 ft] deep) as reasonably possible. Range equipment similar to that used during site preparation would be transported to Illeginni Islet on a barge and/or landing craft as part of operations to remove payload debris and temporary support equipment and materials, and to assist with cleanup and repair activities. The impact area will be wetted with freshwater to stabilize the disturbed soil. The impact crater will be excavated using a backhoe or front-end loader, and the excavated material will be screened to recover debris. Following debris removal, the crater will be backfilled and, if necessary, repairs made to surrounding structures. USAG-KA and RTS personnel will be involved in these operations. In preparation for the FT-3, USASMDC would prepare a post-test recovery/cleanup plan detailing specific actions which ought to be taken. Accidental spills from support equipment operations will be contained and cleaned up according to the UES Kwajalein Environmental Emergency Plan (KEEP). All waste materials will be appropriately stored and returned to Kwajalein Islet for proper disposal.

Within 1 day after the land impact test at Illeginni Islet, USAG-KA environmental staff would survey the islet and the near-shore waters for any injured wildlife, damaged coral, or damage to sensitive habitats. For recovery and rehabilitation of any injured migratory birds or sea turtles found at Illeginni Islet, the USFWS and NMFS would be notified to advise on best care practices and qualified biologists would be allowed to assist in recovering and rehabilitating any injured sea turtles found. Post-survey monitoring would be conducted to observe any impacts to adult black-naped terns or their nests. Results of the monitoring would be reported to the USAG-KA Environmental Engineer to provide to the USFWS. During inspections of the islet and near-shore waters, USAG-KA environmental staff would assess any sea turtle mortality. Any impacts to biological resources would be reported to the appropriate agencies, with the USFWS and NMFS offered the opportunity to inspect the impact area to provide guidance on mitigations.

If an inadvertent impact occurs on the reef, reef flat, or in shallow waters less than 3 m (10 ft) deep, an inspection by project personnel would occur within 24 hours. Representatives from NMFS and the USFWS would also be invited to inspect the site as soon as practical after the test. The inspectors would assess any damage to coral and other natural and biological resources and, in coordination with USASMDC, USAG-KA, and RTS representatives, decide on any response measures that may be required. In the event of an unintentional shallow water impact, visible debris would be removed as feasible and while protecting sensitive shallow-water resources. Payload recovery/cleanup operations and removal of surface floating debris in the lagoon and ocean reef flats, within 152 to 300 m (500 to 1,000 ft) of the shoreline, would be conducted similarly to land operations when tide conditions and water depth permit. A backhoe would be used to excavate any crater. Excavated material would be screened for debris, and the crater would be backfilled with material ejected around the rim of the crater. Following removal of all payload items and any remaining test debris from the impact area, all waste materials would be returned to Kwajalein Islet for proper disposal.

Should the payload inadvertently impact in deeper waters offshore of Illeginni Islet (up to approximately 55 m [180 ft] deep), a dive team from USAG-KA or RTS would be brought in to conduct underwater searches for payload debris. Using a ship for recovery operations, the debris field would be located and certified divers in scuba gear would attempt to recover the debris manually. If warranted due to other factors, such as significant currents or mass of debris to be recovered, the recovery team would consider the use of remotely operated vehicles instead of divers. Due to the potential presence of sensitive species on the ocean bottom offshore of Illeginni Islet, NMFS and USFWS would be notified of an inadvertent lagoon or ocean side payload impact and would be provided the opportunity to provide input on debris recovery to protect UES-protected benthic species. A remotely operated vehicle video or dive inspection would be conducted where necessary to evaluate the presence of UES consultation species. If UES consultation species were found at a lagoon or ocean bottom impact site, recovery efforts would be coordinated with NMFS.

2.5.6.2 Post Deep-Water Impact Zones

For the deep-water impact zone scenarios at KMISS or southwest of Illeginni Islet, the proposed impact would occur in the deep ocean waters surrounding the Kwajalein Atoll (depicted in **Figure 2-3)**. 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 deep-water areas surrounding the Kwajalein Atoll 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. Although no payload debris is expected post-impact, any floating debris would be recovered and disposed of according to UES standards. Post-test recovery efforts may result in increased vessel traffic to the payload impact site. The self-stationing rafts and the large instrumentation raft would be recovered, and the data collected for analysis.

2.6 Alternatives Considered but not Carried Forward for Detailed Analysis

The following alternative was considered, but not carried forward for detailed analysis in this EA/OEA as it did not meet the purpose and need for the Proposed Action and satisfy the screening criteria / evaluation factors presented in **Section 2.2**.

2.6.1 Vandenberg Air Force Base

Vandenberg Air Force Base (VAFB) currently supports U.S. Air Force ICBM launches as well as space launch orbital missions. However, the potential launch locations do not have support infrastructure in place to perform the FT-3, nor is there a precedent for this kind of test at VAFB, so planning would be more time-consuming and costly than at PSCA. In addition, scheduling between March 2021 and September 2021 precludes VAFB as a launch site at this time.

This page intentionally left blank.

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 Spaceport Complex–Alaska

AAC holds an FAA license to operate a commercial space launch site at PSCA, allowing AAC to offer the launch site for small- and medium-lift rocket launches. The environmental resource areas considered in this EA/OEA include air quality, water resources, biological resources, airspace, noise, 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:

Geological Resources: These resources include topography, soil, bedrock, and marine sediments. As a result of plate tectonics and glacial cover, the topography of PSCA is characterized by a series of gently undulating, northeast-southwest trending ridges approximately 43 to 107 m (140 to 350 ft) in elevation (FAA 2016). Vegetation is prevalent, and the soils are well-drained but moist from the frequent rainfall (FAA 1996). Changes in soil pH due to acid deposition from launch combustion products would not be expected to occur for the Proposed Action. Marine sediments on the Kodiak Shelf consist of various proportions of terrigenous, volcanic, and biogenic debris (USGS 1982). PSCA is located within the Middle Albatross Bank of the Kodiak Shelf, which is separated into banks and troughs (USGS 1982). NOAA Fisheries has jurisdiction over the marine sediment resources surrounding PSCA (FAA 2016). Impacts to marine sediments are not expected to occur as a result of the Proposed Action. The FT-3 flight test requires no ground-disturbing activities at PSCA. Thus, no impacts to geological resources would be expected.

Cultural Resources: Cultural resource surveys were done by the Alaska Department of Natural Resources – Office of History and Archaeology in 1994 for the original construction of KLC, and again in 2005 in the Launch Pad 3 construction area (FAA 2016). No evidence of new cultural resources was found during any of these surveys; however, two archaeological sites (KOD-81 and KOD-441) and one historic World War II era bunker complex (KOD-456) are within approximately 1.6 km (1 mi) from PSCA (FAA 2016). Subsistence is an important aspect of social, cultural, and economic life on Kodiak Island, especially in the isolated traditional villages (Akhiok, Karluk, Larsen Bay, Old Harbor, Ouzinkie, and Port Lions) (FAA 2016). Kodiak Island subsistence resources include finfish, crab, and shrimp fisheries, all of which require permits from the Alaska Department of Fish and Game (ADFG 2020a). Safety zone closures resulting from launch operations would have the potential to adversely affect local sport, subsistence, and commercial fisherman for up to 8 hours on the launch day (FAA 2016). However, launch operations for FT-3 would only interrupt fishing activities for 1 day between March 2021 and September 2021, so the impact would be insignificant. The FT-3 flight test is not an activity that has potential to cause direct or indirect effects on historical, architectural, archaeological, or traditional resources. No impacts to cultural resources would be expected as a result of the Proposed Action.

Land Use: Before PSCA was constructed, Narrow Cape was generally used for ranching and recreation (FAA 1996). Although still used for these purposes, there are now public safety measures in place that allow PSCA to close off recreational areas accessible to the public for launch purposes (FAA 2016). These include Fossil Beach, Surf Beach, Twin Lakes, and other state land within the PSCA boundary (FAA 2016). The only Section 4(f) resource that occurs nearby PSCA is the Pasagshak State Recreation Site, which is located 9.7 km (6 mi) away (FAA 2016). The Proposed Action would not result in Section 4(f) impacts to land use. No impacts to land use resources would be expected as a result of the Proposed Action.

Infrastructure: Existing facilities at PSCA include seven primary installations with a network of supporting infrastructure (FAA 2016). These facilities include the Launch Control Center (LCC), the Maintenance Support Facility (MSF), the Instrumentation Field, the Payload Processing Facility (PPF), the Rocket Motor Storage Facility (RMSF), the Integration and Processing Facility (IPF), the Launch Service Structure (LSS), and the Spacecraft and Assemblies Transfer Building (FAA 2016). Supporting infrastructure for these facilities includes a site-wide public water system, Pasagshak Point Road, several access roads leading from Pasagshak Point Road to the various installations, and other utilities (FAA 2016). The Proposed Action does not propose any new developments in PSCA's infrastructure and will utilize existing government and commercial infrastructure resources which are all covered by existing NEPA documents and not discussed in this EA/OEA. The Proposed Action would not impact PSCA's infrastructure resources beyond the limits of current operations.

Transportation: The proposed transportation activities and pre-launch activities that would utilize PSCA's transportation network make use of established government and commercial facilities during the test life cycle and are therefore not addressed in this EA/OEA. The transportation of hazardous materials to the launch facility is covered under a separate transportation safety plan. No changes to PSCA's transportation network are expected to occur as a result of the Proposed Action.

Socioeconomics: These resources include Environmental Health and Safety Risks for Children and the economy. The population on Kodiak Island is concentrated primarily within the city of Kodiak and in other smaller population centers along the highway on the northeastern portion of Kodiak Island (FAA 2016). There are no population centers on Narrow Cape, where PSCA is located (FAA 2016). The closest communities are the mainly seasonal town of Pasagshak (roughly 50 people) although there is no census information specific to the Pasagshak population (FAA 2016). There are no playgrounds or schools within PSCA, but families with children may travel to Surf Beach, Fossil Beach, Twin Lakes and other recreation areas near PSCA (FAA 2016). Due to PSCA's distance from any population centers, children are generally only present in the area if accompanied by an adult. No children are present within PSCA at the time of a launch when the facilities and surrounding areas are closed to the general public (FAA 2016). Kodiak was the third largest commercial fishing port in the United States by volume in 2017 (AlaskaSeafood.org 2020). Kodiak's seafood processors employ the highest percentage of local residents of any major production region in Alaska, with 51% being year-round residents of Kodiak in 2017 (AlaskaSeafood.org 2020. This high rate of industry employment is due to Kodiak waters' production of several commercial species that have consistent production rates (AlaskaSeafood.org 2020). Sport fishing is also a major industry on Kodiak Island due to guided fishing and chartered fishing experiences available (ADFG 2020b). PSCA is located in the southeast corner of the Kodiak Road Zone, which allows year round fishing for saltwater and freshwater fish (ADFG 2020b). There would be a temporary increase in personnel at PSCA as a result of the Proposed Action. Safety zone closures resulting from launch operations would have the potential to adversely affect local sport, subsistence, and commercial fisherman for up to 8 hours on the launch day (FAA 2016). However, launch operations for FT-3 would only interrupt fishing activities for 1 day between March 2021 and September 2021, so the impact would be insignificant. No impacts to socioeconomic resources would be anticipated as a result of the FT-3 flight test.

Environmental Justice: The 2017 total estimated population for the Kodiak Island Borough was approximately 13,448 (FAA 2016 and U.S. Census Bureau). This census estimated the Borough population as roughly 53.6 percent minority, with the two largest races identifying as Asian (22.2 percent) and Alaska Native or American Indian (12.8 percent). Specific information is not available about the race, ethnicity, or income of the communities that could experience interruptions in traffic when rockets are being transported to PSCA; however, the racial, ethnic, and income characteristics of populations affected by specific impacts (such as temporary road closures) are expected to be similar to those of the general population in the area (FAA 2016). The FT-3 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. No impacts related to Environmental Justice would be expected from the Proposed Action.

Visual Resources: The FT-3 flight test does not require any new construction, and the visual aesthetics at PSCA would not be changed. No effects to visual resources would be anticipated as a result of the Proposed Action in this EA/OEA.

3.1.1 Air Quality (PSCA)

This discussion of air quality includes National Ambient Air Quality Standards (NAAQS), 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., unpaved roads, factories, refineries, power plants), as well as indoor sources (e.g., wood-burning stoves, some building materials and cleaning solvents). Air pollutants are also released from natural sources such as volcanic eruptions and forest fires.

The launching of solid-propellant rockets produces emissions of hydrogen chloride, carbon monoxide, carbon dioxide, nitrogen oxides, black carbon, and aluminum oxide.

3.1.1.1 Regulatory Setting

Criteria Pollutants and National Ambient Air Quality Standards

The principal pollutants considered harmful to public health and the environment, 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 CAA, USEPA has established 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 (annual averages) and short-term (1-, 8-, and 24-hour periods) 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.

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.

USEPA Region 10 and Alaska Department of Environmental Conservation (ADEC) regulate air quality in Alaska. While each state has the authority to adopt standards stricter than those set by the federal NAAQS, the State of Alaska has accepted the federal standards (DOD 2017).

The CAA 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 CAA Amendments. The *National Emission Standards for Hazardous Air Pollutants* regulate HAP emissions from stationary sources (40 CFR Part 61).

Sources

HAPs emitted from mobile sources are called Mobile Source Air Toxins (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 involve reducing their content in fuel and altering the engine operating characteristics to reduce the volume of pollutant generated during combustion.

According to ADEC's Ambient Air Quality Network Assessment (ADEC 2016a, ADEC 2020), $PM_{2.5}$ problems are exacerbated by increased exposure to fine particulates during extended wintertime temperature inversions with extreme cold temperatures, and wildland fires during the summer months. During wintertime, strong inversions trap emitted particles close to the ground surface. In small communities, this is associated with wood smoke, but in larger communities, the pollution stems from wood smoke from home heating, emissions from oil-based home heating, automobile emissions, and coal-fired power generation emissions.

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) 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 3-1**.

Table 3-1. General Conformity *De minimis* Levels

Pollutant	Area Type	Tons per Year
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: FE-2 EA/OEA (U.S. Navy 2019b); https://www.epa.gov/general-conformity/de-minimis-tables (2017)

Abbreviations: $PM_{2.5}$ = 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, VOC = volatile organic compound

Because Kodiak Island is located within an attainment area for all NAAQS, the General Conformity Rules do not apply to the Proposed Action (DOD 2017). Kodiak Island has been in attainment for all NAAQS since at least 2015 (ADEC 2016b, ADEC 2020). For the purposes of this EA/OEA, the least restrictive *de minimis* level of 100 tons per year for each criteria pollutant will be used to determine whether the Proposed Action would be regarded as significant under NEPA.

Permitting

Organizations 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. The ADEC Title V permitting threshold for annual pollutant emissions at PSCA is 100 tons (DOD 2017).

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. 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 (NOAA 2020c). 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 (NOAA 2020a). 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 (NOAA 2020a).

On 26 June 2019 the CEQ issued draft guidance on when and how federal agencies should consider GHG emissions and climate change in NEPA analyses (84 FR 30097). This guidance was carried forward to see if additional quantitative analysis would be required for the Proposed Action. The amount of emissions from the FT-3 vehicle test is not substantial enough to warrant quantification; therefore, GHG impacts will be analyzed qualitatively.

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* are carbon dioxide, methane, nitrogen oxides, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and other fluorinated gases including nitrogen trifluoride and hydrofluorinated ethers. 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.

3.1.1.2 Region of Influence

A detailed description of the PSCA air quality region of influence (ROI) can be found in two NEPA references: the PSCA EA (Pages 3-3 through 3-4; DOD 2017) and the FT-2 EA (Pages 3-1 through 3-4; USASMDC/ARSTRAT 2014).

Launch Pad 1, which is proposed for the FT-3 launch, is equipped with an exhaust trench beneath the pad that contains and diverts exhaust from initial ignition and vehicle lift (USASMDC/ ARSTRAT 2014).

Because of the rapid acceleration of the stool-launched 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.

For inert pollutants (all pollutants other than ozone and its precursors: volatile organic compounds and nitrogen oxides), the ROI is generally limited to an area extending several kilometers (miles) downwind from the source. Consequently, for the air quality analysis, the ROI for project activities is the existing airshed (the geographic area responsible for emitting 75 percent of the air pollution reaching a body of water) surrounding the various sites, which encompasses Narrow Cape on the southeast side of Kodiak Island. The ROI for ozone may extend much farther downwind than the ROI for inert pollutants. As Kodiak Island has no heavy industry and relatively few automobiles, ozone and its precursors are not of concern. The ROI for ozone depleting gases and GHG emissions is global.

Climate

Weather is an important factor in the dispersal of air pollutants. The climate at PSCA is characterized as maritime, with long, mild winters and short, cool summers (DOD 2017). Average annual precipitation is 165 centimeters (cm; 65 inches (in.)) with monthly average precipitation ranging from 8 to 18 cm (3 to 7 in.) and highest averages typical between September and March (Climate-Data.org 2020). The prevailing wind direction is northwesterly every month except May, June, and July, and the average wind speed is about 10 knots (12 miles per hour) (The Alaska Climate Research Center 2019). Wind speeds are greatest in the winter months, between November and March, and lowest from May to September (DOD 2017). During the summer months, the mean wind speed is 4 knots (5 miles per hour) or greater, which is sufficient for good dispersion of air pollutants (DOD 2017).

Regional Air Quality

USEPA Region 10 and ADEC regulate air quality in Alaska. The air quality at Narrow Cape, next to PSCA, is generally considered to be unimpaired. The nearest large population center to PSCA is Kodiak, Alaska, approximately 72 km (45 mi) away with roughly 6,000 people. Low emissions of pollution at PSCA are mostly due to the sporadic use of generators, the low volume of vehicle traffic, and sparse residential population, which generates low levels of emissions from building heating.

Kodiak Island is also classified as a class II air quality control region (USASMDC/ARSTRAT 2014). A moderate change in air quality due to industrial growth would be allowed while still maintaining air quality that meets NAAQS (USASMDC/ARSTRAT 2014).

Existing Emission Sources

Existing launch activities, ranching, and vehicular traffic are the only activities in the vicinity of Narrow Cape that typically affect background air quality. Low emissions of pollution at PSCA are mostly due to the sporadic use of generators, the low volume of vehicle traffic, and sparse residential population, which generates low levels of emissions from building heating. This intermittent usage contributes to annual pollutant emissions below the ADEC Title V permitting threshold (100 tons) (DOD 2017).

Mobile sources from PSCA-associated testing include aircraft, missile launches, diesel-fueled vehicles, and vehicular traffic. Aircraft are operated and supported at the Kodiak Airport. Missile launches are a source of mobile emissions at PSCA. The launching of solid-propellant rockets produces emissions of hydrogen chloride, carbon monoxide, carbon dioxide, nitrogen oxides, black carbon, and aluminum oxide.

3.1.2 Water Resources (PSCA)

Water resources include those aspects of the natural environment related to the availability and characteristics of water. For the purposes of this document, water resources can be divided into three main sections: groundwater, surface waters, and wetlands.

Groundwater is water that collects or flows beneath the Earth's surface and saturates porous spaces in soil or rock, supplying springs and wells. Groundwater discussions focus on aquifer characteristics (such as depth from the surface, geologic composition and recharge rate), as well as general groundwater quality and water supply.

Surface water includes natural, modified, and constructed water confinement and conveyance features that may or may not have a defined channel and discernable water flows. These surface water features generally consist of marine waters, wetlands, lakes, rivers, streams, and natural or artificial ponds and lakes. Surface water includes discussions of runoff, changes to surface drainage, and general surface water quality.

Wetlands are jointly defined by USEPA and USACE as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Wetlands generally include "swamps, marshes, bogs and similar areas" (40 CFR Section 230.3[t] and 33 CFR Section 328.3[b]).

Where practicable, water resources are described quantitatively (volume, mineral concentrations, salinity, etc.); otherwise they are described qualitatively (good, poor, etc.) when necessary.

3.1.2.1 Regulatory Setting

USEPA enforces requirements under the Safe Drinking Water Act (SDWA) and CWA. The SDWA sets minimum standards to protect potential drinking water sources, both above and underground. It focuses on protection of public drinking water systems and underground injection control. A Total Maximum Daily Load is the maximum amount of a substance that can be assimilated by a water body without causing impairment. A water body can be deemed impaired if water quality analyses conclude that exceedances of water quality standards occur.

The CWA establishes federal limits, through the National Pollutant Discharge Elimination System (NPDES) program, on the amounts of specific pollutants that can be discharged into surface waters to restore and maintain the chemical, physical, and biological integrity of the water. Compliance monitoring under NPDES takes place largely at the state level, including by ADEC. NPDES permits are issued to any facility that discharges directly into Waters of the United States.

A new definition of Waters of the United States was proposed in EO 13778 and is currently under review by the State of Alaska. A 2017 letter from the State of Alaska to USEPA states that the new definition would be applied to Alaska's waters as follows: (1) rivers and streams in Arctic Alaska; (2) wetlands and wetland mosaics in Arctic and Western Alaska; and does not include the following unless there is an obvious, established surface connection (1) Geographically separated waters (2) areas with permafrost; (3) ponds and lakes; (4) other non-jurisdictional waters (State of Alaska Comments 2017). Wetlands are currently regulated by the USACE under Section 404 of the CWA as a subset of all "Waters of the United States."

PSCA's non-transient, non-community "Class A" public water system is permitted by ADEC (FAA 2016). It has secured a Certificate of Appropriation for groundwater usage from the State of Alaska Department of Natural Resources (number LAS 24062) (FAA 2016). PSCA is authorized to use 1.03 acre-feet (1,270,486 liters (L) [335,627 gallons (gal)]) of groundwater per year, but as of the KLC Launch Pad 3 EA (FAA 2016), only uses approximately 0.34 acre-feet (416,395 L [110,000 gal]) annually.

Section 307 of the CZMA stipulates that where a federal project initiates reasonably foreseeable effects to any coastal use or resource (land or water use, or natural resource), the action must be consistent to the maximum extent practicable with the enforceable policies of the affected state's federally approved coastal management plan. If, however, 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. There is no approved coastal zone management program in the Kodiak Island region (NOAA 2019b).

3.1.2.2 Region of Influence

A detailed description of the PSCA water resources ROI can be found in two NEPA references: the PSCA EA (Pages 3-13 through 3-14; DOD 2017), and the KLC Launch Pad 3 EA (Pages 3-32 through 3-37; FAA 2016).

The ROI for water resources includes PSCA and the near-shore area within and surrounding the PSCA property boundaries that would be affected by the Proposed Action. The following discussions provide a description of the existing conditions for each of the categories under water quality resources at PSCA.

Groundwater

Bedrock wells supply much of Kodiak Island (DOD 2017). No one geologic unit supplies the majority of the water; instead, many types of surficial materials—such as fill, till, sand, gravel, volcanic ash—may yield groundwater (USGS 1995). The groundwater is added to a 567,812 L (150,000 gal) storage tank for emergency fire suppression, and to supply facilities with water as needed to support launches (FAA 2016). The position of freshwater and saltwater mixing has not been determined on Kodiak Island, but near the Kodiak Airport as much as 180 m (591 ft) depth of freshwater may overlie the transition zone (USGS 1995).

Surface Water

Surface water features such as streams, rivers, and lakes are abundant throughout Alaska; however, they are seasonally affected and covered with ice for much of the year. PSCA is located within the Kodiak-Afognak Islands Watershed (HUC 19020701) (DOD 2017). Surface water features that drain to the northwest tend to be wide and deep, flowing over long distances; surface water features that drain to the southeast toward the Pacific Ocean flow from steep terrain and short distances (DOD 2017). Peak discharge can occur during any month of the year; however, flow may increase during periods of intense snowmelt in late spring and early summer (USGS 1995).

Typical to a previously glaciated area, Kodiak Island has numerous streams, ponds, and elongated lakes. PSCA is host to East and West Twin Lakes (freshwater) and Triple Lakes and Barry Lagoon (saltwater-influenced lagoons) (DOD 2017). There are no flood hazards designated at PSCA, although marine-influenced and low elevation lands are subject to high tides, tsunamis, and storm surges (USASMDC/ARSTRAT 2014).

Under the CWA Section 303(d) there are no Impaired Waters at PSCA.

Wetlands

Narrow Cape has several wetlands, several of which are seasonally affected (FAA 2016). The wetlands are mostly regarded as Palustrine, emergent, saturated/seasonally flooded, and are geographically small areas that are divided into two categories: meadow and forested/shrub (FAA 2016).

Wetlands are scattered across the entire PSCA, though no wetlands have been identified near the test pad areas proposed for use for this EA/OEA.

3.1.3 Biological Resources (PSCA)

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 resources, (4) threatened and endangered species (i.e., those listed or proposed for listing under the Endangered Species Act [ESA]), and (5) environmentally sensitive habitats. 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 3.1.3.1**.

3.1.3.1 Regulatory Setting

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

Endangered Species Act (ESA). The purpose of the ESA is to conserve and recover listed species and to conserve the ecosystems upon which threatened and endangered species depend. Under Section 9 of the ESA, it is unlawful for any person subject to the jurisdiction of the United States to take ESA-listed species within the United States or territorial sea of the United States. As defined in the ESA, the term "take" means to harass, harm, pursue, hunt, wound, kill, trap, capture, or collect an ESA listed species (16 USC §§ 1532, 1538). Section 7(a)(2) of the ESA requires action proponents to consult with the USFWS or NMFS 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 that 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 that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns, including 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 marine fisheries in U.S. waters. Under the MSA, Essential Fish Habitat (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 EEZs (seaward boundary out to a distance of 370 km [200 nm]) and covers all fish species within 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 [17 January 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 FY 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) [16 USC 1374(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 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). Migratory birds 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 the USFWS. Birds listed as BCC are species with the highest conservation priority that 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. The final rule authorizing DOD to take migratory birds without a permit in such cases (72 FR 8931[28 February 2007]), includes a requirement that the Armed Forces must confer and cooperate with the USFWS to develop and implement appropriate conservation measures to minimize or mitigate adverse effects of the proposed military readiness activity if the activity may result in a significant adverse effect on a population of a migratory bird species.

Bald and Golden Eagle Protection Act. This act protects both bald and golden eagles (*Haliaeetus leucocephalus* and *Aquila chrysaetos*) by prohibiting the take, possession, sale, purchase, export or import of eagles (16 USC § 668). This prohibition includes living or dead eagles as well as any eagle part, nest, or egg. Under the act, the definition of “take” includes pursuit, shooting at, poisoning, wounding, killing, capture, trapping, molesting, or disturbing of eagles, all of which are prohibited without a permit.

Other Biological Resource-Related Executive Orders. 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.

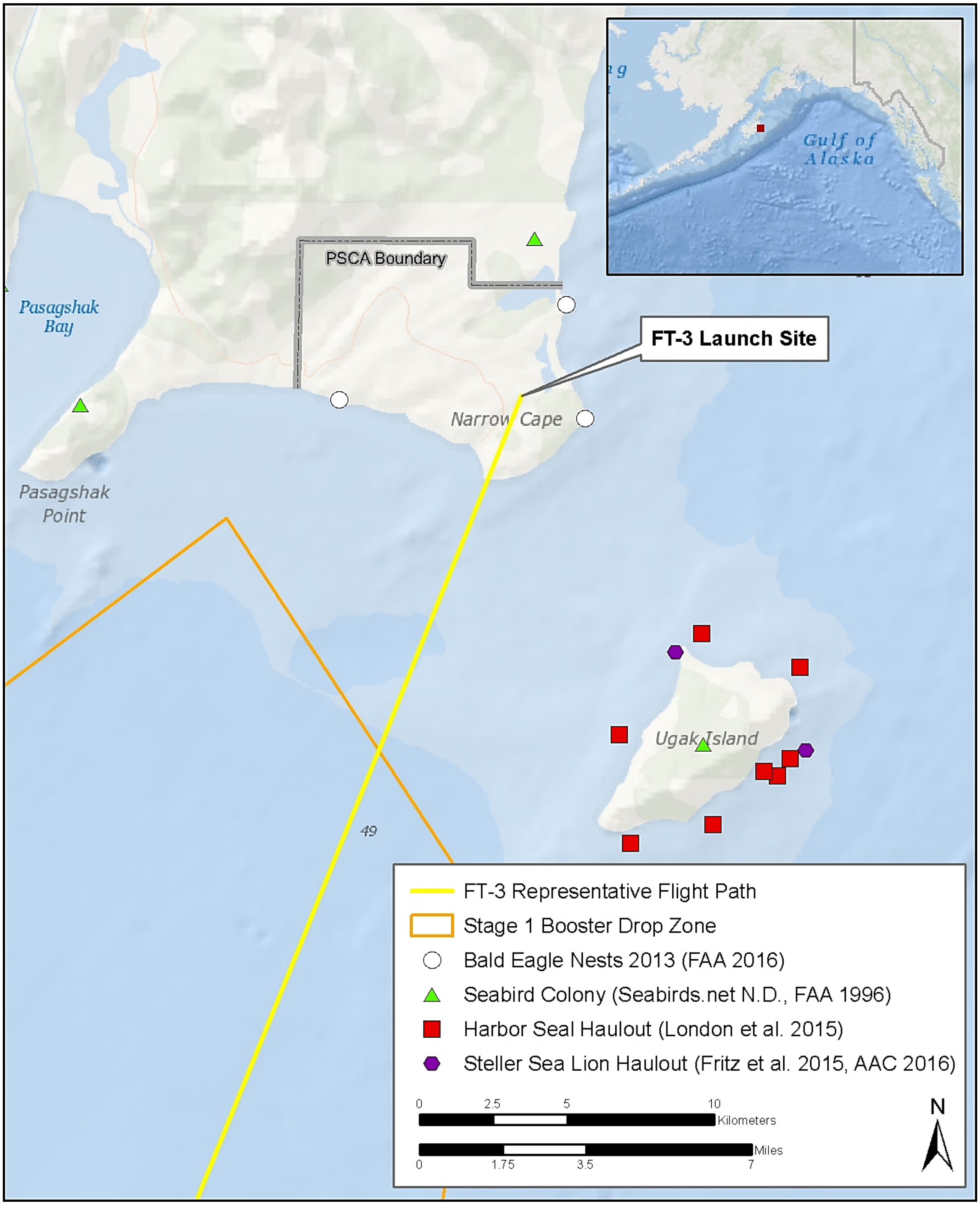
3.1.3.2 Region of Influence

The ROI for biological resources at PSCA 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 PSCA to be used for the Proposed Action (**Figure 2-2**);
- The over-ocean flight corridor near Kodiak Island;
- The stage 1 booster drop zone; 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.

This section summarizes existing information on plant and animal species and habitat types in the ROI with special emphasis on the presence of any special status species. 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. Due to the limited potential for effects of the Proposed Action to extend into the marine environment (evaluated in **Chapter 4.0**), marine resources are only briefly summarized in this section rather than being discussed in detail. Pinnipeds that haul out on land are discussed in the terrestrial wildlife subsection due to the potential for acoustic effects from proposed vehicle launch in these terrestrial areas.

PSCA is located on Narrow Cape of Kodiak Island, Alaska (**Figure 3-1**). Located in the temperate coastal Alaska Peninsula Mountains ecoregion of the state, this area has a predominantly maritime climate influence with higher precipitation and relatively more stable air temperatures compared to inland areas (Gallant et al. 1995). PSCA, formerly KLC, is a commercial launch site which has been used by federal agencies and commercial launch companies since 1998 (FAA 2016). The site has been used for DOD target and intercept missile launches for missile defense testing and also for space vehicle launches (FAA 2016). Biological resources in the PSCA launch ROI were recently described in the KLC Launch Pad 3 EA (FAA 2016). The status of biological resources in PSCA launch ROI as described in the KLC EA Launch Pad EA (FAA 2016) remains the best available information for the ROI and is incorporated here by reference. This section provides a brief summary of biological resources in the ROI, but detailed species descriptions and occurrence information can be found in the FE-2 EA/OEA (U.S. Navy 2019b) and in the FT-3 Biological Assessment (U.S. Army 2020). The FAA and AAC have recently evaluated the effects of launch activities at PSCA on biological resources, including up to nine annual sub-orbital, small-lift orbital, and/or medium-lift orbital launches from the three PSCA launch pads (FAA 2016). The FAA and AAC consulted with the USFWS and NMFS regarding potential effects of PSCA launch activities on protected biological resources, and the results of those consultations are included in **Section 4.1.3**.



Basemap Source: Esri World Ocean Base

Figure 3-1. Terrestrial Biological Resources near PSCA, Kodiak Island, Alaska.

3.1.3.2.1 Terrestrial Vegetation

Vegetation at PSCA is dominated by grass-forb meadows and low scrub communities with interspersed taller scrub communities and forest communities (FAA 2016, Gallant et al. 1995). Vegetation surveys of Narrow Cape were conducted in 1994, updated in 2004, and are considered still accurate representation of existing vegetation conditions at PSCA (FAA 2016). Complete descriptions of the vegetation communities on PSCA based on these surveys can be found in the KLC EA (Appendix C in FAA 1996) and are incorporated here by reference. The most prevalent plant community in the PSCA ROI is hairgrass-mixed forb meadow (FAA 2016, FAA 1996). Other vegetation communities present in the ROI include alder and mixed alder-willow shrublands, lupine meadow, palustrine wetlands, and scattered islands of spruce forest (FAA 2016, FAA 1996; **Figure 2-2**). Natural vegetation in the area immediately adjacent to the proposed launch pad (PSCA Launch Pad 1) includes hairgrass-mixed forb meadow with pockets of Sitka spruce forest and alder-willow shrubland nearby and palustrine wetlands in nearby drainages (FAA 2016, FAA 1996).

No ESA-listed or other special status plant species are known to occur in the ROI (USASMDC/ ARSTRAT 2014, FAA 2016).

3.1.3.2.2 Terrestrial Wildlife

Freshwater Fish. A few freshwater streams and two freshwater lakes occur within PSCA and support a number of freshwater and anadromous fish species (FAA 2016). Baseline biological resource surveys of PSCA indicate that resident fish populations are limited but may include stickleback (*Gasterosteus aculeatus* or *Pungitius pungitius*), Dolly Varden char (*Salvelinus malma*), coho salmon (*Oncorhynchus kisutch*), rainbow trout (*Oncorhynchus mykiss*), and sculpin (*Cottus* sp.; FAA 2016). The Alaska Department of Fish and Game stocks East Twin Lake with sterile rainbow trout each spring for sport fishing. No streams supporting anadromous fishes occur near Launch Pad 1, and East Twin Lake is approximately 1 km (0.6 mi) from the proposed launch pad.

Birds. At least 221 bird species have been documented on Kodiak Island, with at least 143 of those species using PSCA seasonally (FAA 2016, FAA 1996). Comprehensive bird surveys of Narrow Cape (including PSCA) and offshore areas were conducted in 1994 and are still considered the best available and relevant data for bird assemblages at PSCA (FAA 2016). A summary of bird assemblages observed at PSCA during these surveys is available in Table 3.5-1 of the KLC EA (FAA 1996). All native bird species occurring in the ROI are protected under the MBTA. In addition to MBTA listing, other special status bird species in the ROI include a number of species listed as BCC (USFWS 2008, FAA 1996), bald eagles (protected under the Bald and Golden Eagle Protection Act), and some ESA-listed species which are discussed further in **Section 3.1.3.2.4**.

The USFWS conducted an aerial survey for bald eagle nests at and near PSCA in 2013 (Appendix E in FAA 2016). During these surveys, a total of seven bald eagles and three nests were recorded on and near PSCA (**Figure 3-1**). Based on the 2013 nest locations, it is anticipated that the closest nesting eagle would occur approximately 2.3 km (1.4 mi) from the proposed launch site. Based on annual eagle surveys of Kodiak Island National Wildlife Refuge, the bald eagle population on the island remains one of the most abundant in North America and is considered healthy (USFWS 2007). Launch activities have occurred at PSCA since 1998 and known bald eagle nest sites were monitored during the first five launches from PSCA (FAA 2016). Based on monitoring data, the USFWS concluded that launch operations were not likely to affect the species (FAA 2016). Bald eagles have continued to successfully use nest sites on and near PSCA (FAA 2016).

The coastal and nearshore habitats within the ROI support a large number and diversity of both resident and migrant birds including a great concentration of seabirds. The coastal nesting colonies of Alaska support breeding populations of at least 30 species of seabird with an estimated 50 million breeding individuals (ADFG 2015, Seabirds.net N.D.). A number of seabird nesting colonies have been recorded in the vicinity of PSCA (**Figure 3-1**). The closest of these colonies include Arctic tern (*Sterna paradisaea*) and Aleutian tern (*Onychoprion aleuticus*) colonies on Narrow Cape, and nesting pigeon guillemonts (*Cepphus columba*), tufted puffins (*Fratercula cirrhata*), horned puffins (*F. corniculata*), glaucous-winged gulls (*Larus glaucescens*), common murres (*Uria aalge*), and black oystercatchers (*Haematopus bachmani*) on Ugak Island (Corcoran 2013, Seabirds.net N.D., FAA 1996). All of these species are listed under the MBTA. Pelagic cormorants, black oystercatchers, Aleutian terns, and Arctic terns are listed as BCC species. At-sea distributions of seabirds are discussed in **Section 3.1.3.2.3**, *Marine Resources*.

Mammals. Eleven terrestrial mammals have the potential to occur near the proposed launch pad and launch support facilities including common species such as tundra vole (*Microtus oeconomus*), little brown bat (*Myotis lucifugus*) and red fox (*Vulpes vulpes*; FAA 2016). Five of the eleven species are introduced species on Kodiak Island, and none are considered special status or ESA-listed species.

Two pinniped species have the potential to haul out in terrestrial habitats of the ROI: harbor seals (*Phoca vitulina*) and Steller sea lions (*Eumetopias jubatus*). Steller sea lions on Kodiak Island belong to the Western Distinct Population Segment (DPS) and are listed as an endangered species under the ESA. As such, this species is discussed further in **Section 3.1.3.2.4**, *Threatened and Endangered Species*.

Harbor seals have a number of rookeries on Kodiak Island (**Figure 3-1**; London et al. 2015). In the vicinity of the ROI, harbor seals are known to haul out on Ugak Island year-round (AAC 2016). The majority (97 percent) of harbor seals using Ugak Island haul out on the eastern shore approximately 8 km (5 mi) from Launch Pad 1 (AAC 2016). An average of 10 (plus or minus a standard deviation of 25) harbor seals also use the northwest spit of the island (AAC 2016), approximately 6.4 km (4 mi) from Launch Pad 1. Harbor seals generally have pups between May and June in Alaska and likely breed on Ugak Island (AAC 2016). Harbor seals are also likely to molt on Ugak Island from June to October (AAC 2016). Quarterly surveys of pinnipeds on Ugak Island have been conducted since 2011 and monitoring was also conducted during launches from

PSCA between 2006 and 2008 (AAC 2016). Based on the data from these surveys and other pinniped surveys, the total count of harbor seals using Ugak Island has increased steadily since the 1990s from several hundred up to a peak of around 1,500 seals in 2008 (AAC 2016). Overall, monitoring data indicate that previous launch activity at PSCA has not depressed the number of pinnipeds hauling out on Ugak Island (AAC 2016).

3.1.3.2.3 Marine Resources

The PSCA ROI includes the over ocean flight corridor and stage 1 booster drop zone within the U.S. EEZ (370 km [200 nm] from shore). The coastal and pelagic waters offshore of Kodiak Island provide a diversity of highly productive habitats for marine organisms. The relatively deep and broad continental shelf offshore of Kodiak Island has gravel, sand, silt, mud and rocky substrates (Fautin et al. 2010). Biodiversity studies in Gulf of Alaska waters have documented hundreds of species in plankton assemblages as well as hundreds of pelagic and benthic invertebrate species (Fautin et al. 2010). Waters of the Aleutian Islands host the highest diversity and abundance of cold-water corals in the world (Fautin et al. 2010) and several species of shellfish important to commercial and subsistence fisheries (ADFG 2020a). Marine vertebrate diversity and abundance are also high in Alaska waters. Over half of the commercial fish landings from U.S. waters come from Alaskan fisheries and Gulf of Alaska waters support large feeding congregations of many seabirds and marine mammals (Fautin et al. 2010). The following sections focus on rare, sensitive, or special status species with the potential to occur in the ROI.

Invertebrates. In Alaskan waters, there are 141 documented unique coral taxa. These highly diverse cold-water coral communities include six major taxonomic orders: Scleractinia, Antipatharia, Alcyonacea, Gorgonacea, Pennatulacea, and Anthoathecatae (Lumsden et al. 2007). Coral communities in the Gulf of Alaska are formed primarily by octocorals (soft corals and sea pens) along the continental slope (Malyutin 2015). The Gulf of Alaska is also home to a diversity of shrimp, snails, amphipods, crabs, mussels, clams, and hundreds of species of plankton (Fautin et al. 2010).

Fish. Over 100 marine fish species are native to near-shore and offshore waters around Kodiak Island, and commercial, recreational, and subsistence fishing is important in the region (ADFG 2020a). Common or important marine fishes in the ROI include species of salmon (*Oncorhynchus* spp.), sole, pollock (*Gadus chalcogrammus*), cod (*Gadus macrocephalus*), halibut (*Hippoglossus stenolepis*), rockfish (*Sebastes* spp.), lingcod (*Ophiodon elongatus*), and Pacific herring (*Clupea pallasii*; FAA 2016, ADFG 2020a).

Fourteen ESA-listed evolutionarily significant units (ESUs) of five salmon and steelhead species (see **Table 3-2**) have the potential to occur in the ROI (NMFS 2019). These ESA-listed salmon ESUs are discussed in **Section 3.1.3.2.4**, *Threatened and Endangered Species*.

Sea Turtles. Four species of sea turtles have been observed very rarely in Alaska waters: the leatherback (*Dermochelys coriacea*), loggerhead (*Caretta caretta*), green (*Chelonia mydas*), and olive ridley (*Lepidochelys oliveacea*). Observations of loggerhead, green, and olive ridley turtles are very rare, and the Gulf of Alaska is considered to be outside the normal range for these species (U.S. Navy 2016). Since the ROI is outside of the normal range for these three species, they are considered to be very unlikely to occur, would not be affected by the Proposed Action, and are not considered further in this EA/OEA. Leatherback turtles are discussed further in **Section 3.1.3.2.4**, *Threatened and Endangered Species*.

Birds. As discussed in **Section 3.1.3.2.2**, at least 30 species of seabirds breed in Alaska and at least 30 more species occur in Alaska seasonally (ADFG 2015, Seabirds.net N.D.). Seabirds spend the majority of their lives at sea and many of the highly productive nearshore waters of Alaska are considered Biologically Important Areas for seabirds (Smith et al. 2012). The waters offshore of PSCA make up one of the areas considered a biologically important feeding area for seabirds due to abundant food resources (i.e., forage fish and krill; Smith et al. 2012, ADFG 2015).

During baseline surveys of marine waters near PSCA, an abundance and diversity of birds were observed in the Ugak Pass, the strait between Narrow Cape and Ugak Island (FAA 1996). In addition to gulls, murres, guillemots, puffins, and other seabirds; eiders and sea ducks are common in the Ugak Pass (FAA 1996). Species such as king eiders (*Somateria spectabilis*), Steller's eiders (*Polysticta stelleri*), harlequin ducks (*Histrionicus histrionicus*), long-tailed ducks (*Clangula hyemalis*), black scoters (*Melanitta americana*), surf scoters (*M. perspicillata*), and white-winged scoters (*M. deglandi*) occur in the Pass in large numbers from November to May (FAA 1996). All of these bird species are protected under the MBTA and Steller's eiders listed under the ESA (discussed in **Section 3.1.3.2.4**). King eiders commonly form large rafts of 500 to 2,000 or more birds near the middle of the pass and Steller's eiders are commonly observed in numbers ranging up to 600 off Narrow Cape in the winter months (FAA 1996).

Mammals. Several marine mammal species occur in the ROI. All marine mammals in the ROI are protected under the MMPA, and six ESA-listed species have the potential to occur in the waters offshore of Kodiak Island (discussed in **Section 3.1.3.2.4**, *Threatened and Endangered Species*). Some marine mammals are known to occur in the Gulf of Alaska year-round; however, many migratory species use the Gulf of Alaska and the greatest numbers of marine mammals are present in the ROI between spring and fall (Rone et al. 2014).

The most commonly observed cetaceans in the offshore waters near the debris zones are fin whales (*Balaenoptera physalus*), humpback whales (*Megaptera novaeangliae*), and Dall's porpoises (*Phocoenoides dalli*; Rone et al. 2017). Killer whales (*Orcinus orca*), harbor porpoises (*Phocoena phocoena*), Pacific white-sided dolphins (*Lagenorhynchus obliquidens*), gray whales (*Eschrichtius robustus*), sperm whales (*Physeter macrocephalus*), and other unidentified large cetaceans are also regularly sighted in Kodiak Island nearshore waters (Rone et al. 2017). While not regularly sighted, North Pacific right whales (*Eubalaena japonica*) are known to occur in the waters near Kodiak Island (Rone et al. 2017). Beaked whales are cryptic species which spend large amounts of time submerged; however, beaked whales (Baird's [*Berardius bairdii*], Cuvier's [*Ziphius cavirostris*], and Stejneger's [*Mesoplodon stejnegeri*]) have been detected visually and acoustically (Rone et al. 2017, Rone et al. 2014) in continental shelf waters near the ROI.

Three species of pinniped are likely to occur in marine habitats near PSCA: the Northern fur seal (*Callorhinus ursinus*), Steller sea lion, and harbor seal. Northern fur seals are regularly observed in shelf, slope, and deeper offshore waters (Rone et al. 2014) and are likely to occur offshore of PSCA from January through April (FAA 1996). Harbor seals have numerous haulout sites on Kodiak Island and near PSCA (discussed in **Section 3.1.3.2.2**). Harbor seals are year-round residents and are considered to be the most abundant marine mammal in waters near PSCA (FAA 2016).

Northern sea otters (*Enhydra lutris kenyoni*) have the potential to occur in nearshore waters of the ROI and are discussed further in **Section 3.1.3.2.4**, *Threatened and Endangered Species*.

3.1.3.2.4 Threatened and Endangered Species

There are no ESA listed plants or terrestrial wildlife species which would occur at PSCA (FAA 2016). Several ESA-listed species may occur in nearshore waters of Narrow Cape and Ugak Island (**Table 3-2**), and Steller sea lions have the potential to haul out on Ugak Island. This section provides a brief summary of threatened and endangered species in the ROI, but detailed species descriptions and occurrence information can be found in the FT-3 Biological Assessment (U.S. Army 2020).

Threatened and Endangered Fishes. Individuals belonging to 14 ESUs of 5 salmon and steelhead species have the potential to occur in the ROI (**Table 3-2**; NMFS 2019). These anadromous fish ESUs spawn in waters of the west coast of Oregon, Washington, California, and British Columbia but may occur in the Gulf of Alaska during the marine phase of their life cycles (NMFS 2019). The density and distribution of salmonids in the ROI likely varies yearly, seasonally, with ocean conditions and prey density, and remains unknown for the ROI and much of the Gulf of Alaska. While it is possible, and even likely for some ESUs, that fish from these ESA listed salmon and steelhead populations may occur in the ROI, the number of listed fish in the ROI is likely very low.

Threatened and Endangered Sea Turtles. The only species of sea turtle with the potential to occur in the ROI is the leatherback sea turtle. Four species of sea turtles have been observed very rarely in Alaska waters but the other species are extralimital and very unlikely to occur in the ROI. Leatherback sea turtles are known to forage at higher latitudes in the North Pacific during the summer months (March-August) when water temperatures are higher and increased primary production allows for greater prey abundance (Benson et al. 2011, Bailey et al. 2012). The Gulf of Alaska is not known to be a high-use area for leatherback turtles (Benson et al. 2011). Between 1960 and 2006, only 19 leatherback turtle observations were documented in Alaska (U.S. Navy 2016). No density estimates are available for leatherbacks in the Gulf of Alaska, but leatherbacks may be present in the ROI in the summer to fall months in extremely low (but unknown) numbers.

Table 3-2. Threatened and Endangered Species with the Potential to Occur in the PSCA ROI.

Common Name	Scientific Name	ESA Listing Status	Occurrence in ROI
Fishes			
Chum Salmon[1]	*Oncorhynchus keta*		
Hood Canal Summer-run ESU/DPS		T	Potential
Coho Salmon[1]	*Oncorhynchus kisutch*		
Lower Columbia River ESU/ DPS		T	Potential
Steelhead[1]	*Oncorhynchus mykiss*		
Lower Columbia River ESU/DPS		T	Potential
Middle Columbia River ESU/DPS		T	Potential
Snake River Basin ESU/DPS		T	Potential
Upper Columbia River ESU/DPS		T	Potential
Upper Willamette River ESU/DPS		T	Potential
Sockeye Salmon[1]	*Oncorhynchus nerka*		
Snake River ESU/DPS		E	Potential
Chinook Salmon[1]	*Oncorhynchus tshawytscha*		
Lower Columbia River ESU/DPS		T	Likely
Puget Sound ESU/DPS		T	Potential
Snake River Fall ESU/DPS		T	Potential
Snake River Spring/Summer ESU/DPS		T	Likely
Upper Columbia River Spring ESU/DPS		E	Likely
Upper Willamette River ESU/DPS		T	Likely
Sea Turtles			
Leatherback Turtle	*Dermochelys coriacea*	E	Potential
Birds			
Short-tailed albatross	*Phoebastria albatrus*	E	Likely
Steller's eider	*Polysticta stelleri*		Likely
Alaska Breeding DPS		T	Potential
Cetaceans			
Blue whale	*Balaenoptera musculus*	E	Potential
Fin whale	*Balaenoptera physalus*	E	Likely
Gray whale[2]	*Eschrichtius robustus*		
Eastern Pacific DPS[2]		-	Likely
Western North Pacific DPS[2]		E	Potential
North Pacific right whale	*Eubalaena japonica*	E	Potential
Humpback whale[3]	*Megaptera novaeangliae*		
Hawai`i DPS[3]		-	Likely
Mexico DPS[3]		T	Potential

Common Name	Scientific Name	ESA Listing Status	Occurrence in ROI
Western North Pacific DPS[3]		E	Potential
Sperm whale	*Physeter macrocephalus*	E	Likely
Pinnipeds			
Steller sea lion – Western DPS	*Eumetopias jubatus*	E	Likely
Mustelids			
Northern sea otter – Southwest DPS	*Enhydra lutris kenyoni*	E	Likely

Sources: FAA 2016, NMFS 2019, AAC 2016, FAA 1996, Rone et al. 2017, U.S. Navy 2016

Note: Species for which the ROI is considered extralimital (i.e., very few confirmed sightings and the area is outside the normal range for the species) are not included in this table.

[1] These fish species spawn elsewhere but may occur in the Gulf of Alaska during the marine phase of their life cycles (NMFS 2019). Occurrence for these species is based on general patterns of migration for these species; no specific occurrence data for ESA listed ESUs in the ROI are known.

[2] Gray whales in the ROI are likely from the Eastern Population which is not listed under the ESA. It is possible that a small (but unknown) number of gray whales in the ROI would be from the ESA-endangered Western DPS.

[3] Humpback whales in the ROI may include whales from three DPSs (Barlow et al. 2011, Bettridge et al. 2015, Calambokidis et al. 2001). Wade et al. (2016) reported the probability of humpback whales feeding in the Gulf of Alaska being from a given DPS as 89% for the Hawai`i DPS, 10.5% for the Mexico DPS, and 0.5% for the Western North Pacific DPS.

Abbreviations and Definitions: DPS = Distinct Population Segment, ESA = Endangered Species Act, ESU = Evolutionarily Significant Unit, E = Endangered; T = Threatened, Likely = regularly observed, Potential = rare, with few or no confirmed observations.

Threatened and Endangered Birds. Threatened and endangered species that could occur in the ROI include the Steller's eider and the short-tailed albatross (*Phoebastria albatrus*).

Short-tailed albatross spend the majority of their lives at-sea, only coming to land to breed on remote islands in the western Pacific (USFWS 2009a). Outside of the breeding season, this species migrates to productive feeding grounds in waters of the Bering Sea, Aleutian Islands, and Gulf of Alaska (USFWS 2009a). Short-tailed albatross feed on prey seized from the water surface including squid, shrimp, fish, fish eggs, and crustaceans (USFWS 2009a). The waters offshore of Kodiak are part of the core habitat for immature short-tailed albatross (USFWS 2014). Short-tailed albatross are considered rare in nearshore areas of the ROI (FAA 2016) but likely occur in outer shelf waters.

The Alaska breeding DPS of Steller's eider is listed as a threatened species under the ESA. Birds from the northern and western Alaska breeding populations winter in coastal waters of southwest Alaska where they mix with the larger Russian-Pacific breeding population of eiders (USFWS 2019). Steller's eiders spend most of the year in shallow, near-shore marine waters (generally within 402 m [1,320 ft] of shore) where they feed on invertebrates such as bivalves, amphipods, gastropods, crustaceans, and polychaete worms (USFWS 2019, USFWS 2000). Steller's eiders have the potential to occur in the ROI during the winter months (mid-October through March; FAA 2016). Baseline studies of the Narrow Cape area in 1995 indicated that Steller's eiders were commonly observed in numbers ranging up to 600 off Narrow Cape in the winter months (FAA 1996). However, systematic surveys conducted for seven launches from PSCA (then KLC) recorded only small rafts of 30 to 60 birds on two occasions (FAA 2016). In a study of Steller's eiders wintering off Kodiak Island in Chiniak Bay (north of PSCA), most tagged birds migrated to eastern Arctic Russia and likely belonged to the Pacific-Russian breeding population, which is not ESA-listed (Rosenberg et al. 2014, USFWS 2019). At this time, there is not enough information to determine the proportion of eiders in the ROI which are members of the ESA-listed Alaska breeding population (USFWS 2019)

Threatened and Endangered Marine Mammals. Six ESA-listed cetacean species, Steller sea lions, and northern sea otters may occur in the ROI (**Table 3-2**).

Blue whales are known to occur in the Gulf of Alaska during summer months. Blue whales are primarily found in deeper pelagic waters of the Gulf of Alaska but have rarely been observed along the shelf break off Kodiak Island (Rone et al. 2017). This baleen whale preys almost exclusively on various types of zooplankton, especially krill (Bannister 2002). Blue whales are considered very rare in the relatively shallow coastal waters of the ROI and are not likely to occur in the intercept debris zones.

Fin whales (*Balaenoptera physalus*) generally inhabit deep offshore waters in temperate to polar latitudes (Reeves et al. 2002). However, fin whales are also often seen close to shore after periodic patterns of upwelling and the resultant increase in the density of krill upon which they feed (Azzellino et al. 2008). Fin whales were one of the most frequently sighted large whales during summer ship-board line-transect surveys of the Gulf of Alaska between 2009 and 2015 and are known to occur in shelf waters of the ROI (Rone et al. 2017).

The gray whale (*Eschrichtius robustus*) is found in coastal waters of the North Pacific. Gray whales have been observed year-round near Ugak Bay since 2009 (Moore et al. 2007, Rone et al. 2017) and likely feed on abundant benthic organisms such as amphipods and cumaceans (Moore et al. 2007, NMFS 1991). The Albatross Bank region off Kodiak Island has been identified as a biologically important summer feeding area for gray whales (see **Section 3.1.3.2.5**). Gray whales in the ROI are most likely from the ESA-delisted (59 FR 31094 [June 16, 1994]) Eastern Pacific Population. However, recent evidence (Mate et al. 2015, Weller et al. 2012) indicates that it is possible that a very small number of gray whales in the ROI may be from the ESA-endangered Western DPS.

North Pacific right whales (*Eubalaena japonica*) likely number less than 1,000 individuals between both the eastern and western populations and remain one of the most critically endangered marine mammals (NMFS 2017). The eastern stock of the North Pacific right whale is estimated to have 31 individuals (Wade et al. 2011). These whales are known to feed in Gulf of Alaska waters during the summer months when zooplankton densities are high (NMFS 2017, Wade et al. 2011). All North Pacific right whales recorded in the Gulf of Alaska since 1998 were observed/detected in shelf waters adjacent to Kodiak Island (NMFS 2017, Rone et al. 2015).

These waters are considered biologically important feeding grounds for this species, with highest whale densities between June and September (Ferguson et al. 2015). Critical habitat for North Pacific right whales has been designated southeast of Kodiak and is discussed further in **Section 3.1.3.2.5**, *Environmentally Sensitive Habitats*.

Humpback whales (*Megaptera novaeangliae*) are among the most abundant whales sighted in Gulf of Alaska waters (Rone et al. 2017). Humpback whales that feed in the Gulf of Alaska during the summer months belong to at least two DPSs (Barlow et al. 2011, Bettridge et al. 2015) and likely three (Calambokidis et al. 2001). Most humpback whales that feed in the Gulf of Alaska winter and breed either in the Hawaiian Islands (Hawai`i DPS, not listed) or along the coast or coastal islands of Mexico (Mexico DPS, ESA-threatened), but a small number may be from the Western North Pacific DPS (ESA-endangered; Calambokidis et al. 2001, Barlow et al. 2011, Bettridge et al. 2015, Wade et al. 2016). The continental shelf waters near Kodiak are known to be a primary feeding ground for humpback whales (Barlow et al. 2011, Witteveen et al. 2011, Rone et al. 2017).

Sperm whales typically occur in deep water areas with high densities of deep-water prey which are generally near drop-offs such as the edges of continental shelves (Rice 1989, Whitehead 2002). Sperm whales are known to be present in the Gulf of Alaska year-round but are more common in the summer months (peak July through September; Mellinger et al. 2004). Adult males are most common in Gulf of Alaska waters and are most likely to be observed in deeper, productive waters.

Steller sea lions born at rookeries from Prince William Sound westward, including those located on and near Kodiak Island, belong to the ESA-endangered Western DPS (62 FR 24345 [May 5, 1997]). These large pinnipeds primarily forage near shore and in pelagic waters and may dive several hundred feet to catch fish and cephalopods (NMFS 2008). Adult females with pups generally forage within 20 km (12 mi) of rookery sites, while adult sea lions without pups forage at larger distances from haulout sites (average 133 km [82.6 mi]) and dive to greater depths (NMFS 2008, 58 FR 165).

Several known Steller sea lion haulout and rookery sites occur on Kodiak Island (details in **Section 3.1.3.2.5**, *Environmentally Sensitive Habitat*s; NMFS 2008) and sea lions occasionally haul out on Ugak Island (AAC 2016). Mature and sub-adult male Steller sea lions have been observed hauled out on a northwestern spit of Ugak Island, approximately 5.6 km (3.5 mi) from Launch Pad 1 (**Figure 3-1**; AAC 2016). NMFS has surveyed Steller sea lions on Ugak Island since the 1990s and in the years since 2000, counts of sea lions have generally been zero (AAC 2016). This reduction is consistent with the general decline in Steller sea lion populations seen throughout Kodiak Island (AAC 2016). During quarterly surveys of pinnipeds on Ugak Island, the only record of Steller sea lions was of 19 individuals in September 2011 (AAC 2016). AAC also reports that Steller sea lions seasonally haul out on a supratidal rock east of Ugak island known as East Ugak Rock which is 8.4 km (5.2 mi) from Launch Pad 1 (AAC 2016).

The range of the listed Southwest DPS of northern sea otters extends from Attu Island in the Aleutians to Western Cook Inlet. Sea otters use all types of coastal habitats within their range but are often found off rocky coasts or in large bays with kelp beds (USFWS 2009b). While northern sea otters can be found at the surface in deeper waters, sea otters are primarily found in waters less than 100 m (328 ft) deep, which is the approximate extent of their diving ability (USFWS 2009b). A small number of northern sea otters (0 to eight individuals) are likely to occur in nearshore marine water of the ROI (FAA 2016). However, given the distance from shore and water depth in the stage 1 drop zone, it is not likely that sea otters would occur in the booster drop zone.

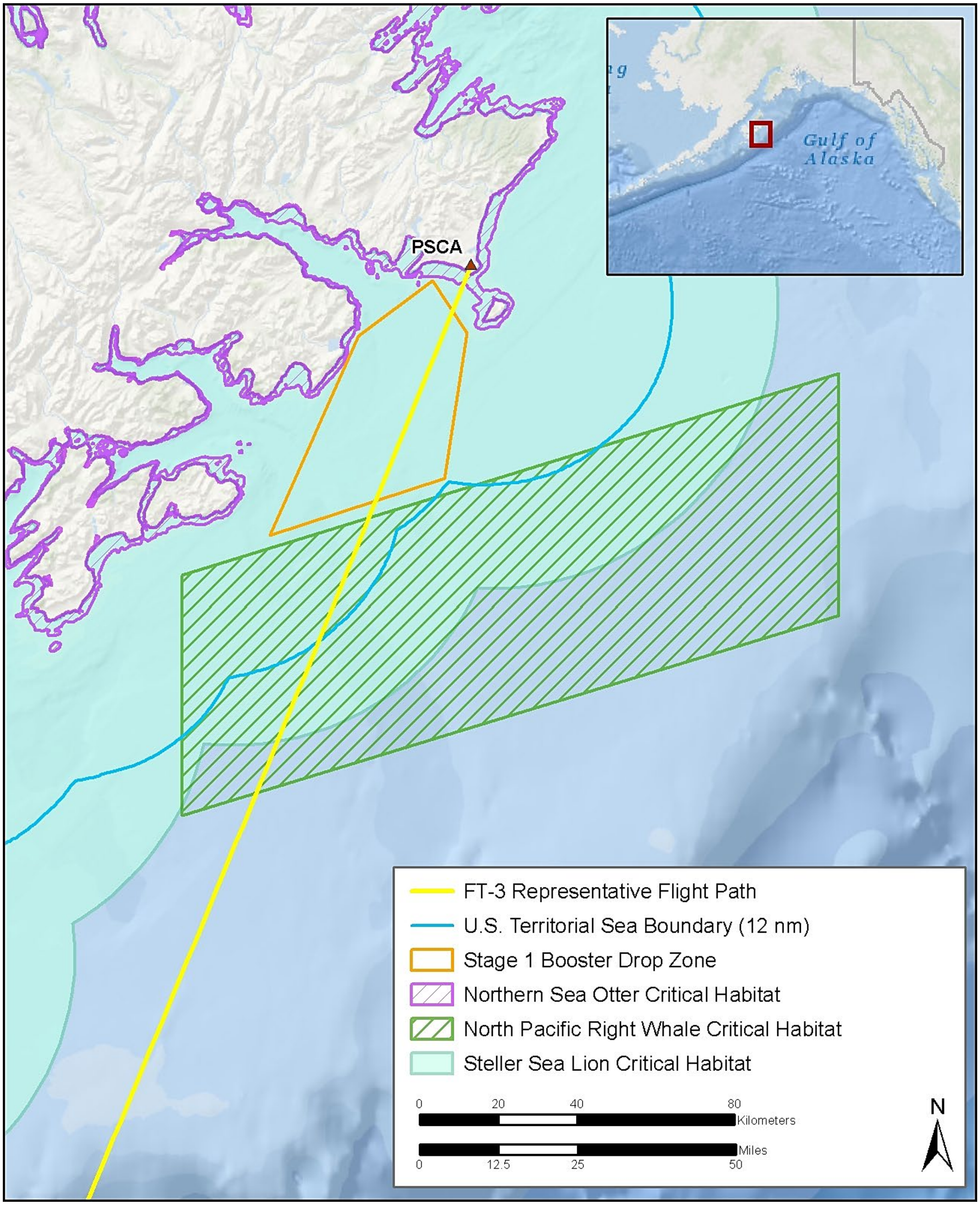
3.1.3.2.5 Environmentally Sensitive Habitats

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). Designated critical habitats and protected areas in the vicinity of the PSCA ROI are discussed in this section as well as EFH in the ROI.

Critical Habitats. There is no designated critical habitat on PSCA; however, designated critical habitat occurs offshore of PSCA for northern sea otters, Steller sea lions, and North Pacific right whales (**Figure 3-2**). Designated critical habitat for ESA-listed species is described in detail in the FT-3 Biological Assessment (U.S. Army 2020).

Designated critical habitat for North Pacific right whales includes an offshore area near Kodiak Island (**Figure 3-2**; 73 FR 19000 [8 April 2008]). This area was designated as critical habitat primarily because the majority of North Pacific right whale sightings in the Gulf of Alaska had been documented within it and also because it supports high prey densities (71 FR 38277 [6 July 2006]). The primary constituent elements essential for conservation of North Pacific right whales are “species of large copepods and other zooplankton in areas where they concentrate in densities sufficient to support and encourage feeding” (71 FR 38277). This designated critical habitat is approximately 54 km (34 mi) south of PSCA’s Launch Pad 1. The Proposed Action would not alter the presence or density of prey species such as large copepods and other zooplankton; therefore, the Proposed Action would have no effect on designated critical habitat for North Pacific right whales and it is not discussed further in this EA/OEA.

Steller sea lion critical habitat is centered on major rookery and haulout sites as defined in 58 FR 45281 (NMFS 1993). Designated critical habitat for this species includes “the physical and biological habitat features that support reproduction, foraging, rest, and refuge are essential to the conservation of the Steller sea lion” (NMFS 1993). Steller sea lion critical habitat includes a terrestrial zone (0.9 km [0.6 mi] landward from the baseline of major rookeries and haulouts), an air zone (0.9 km [0.6 mi] above the terrestrial critical habitat), an aquatic zone (37 km [23 mi] seaward from the baseline of major rookeries and haulouts), and special foraging areas (NMFS 1993). Special foraging areas do not occur in the ROI and the Proposed Action would not extend



Data Sources: NMFS 1993, USFWS 2009b, 73 FR 19000 [8 April 2008], Basemap Source: Esri World Ocean Base

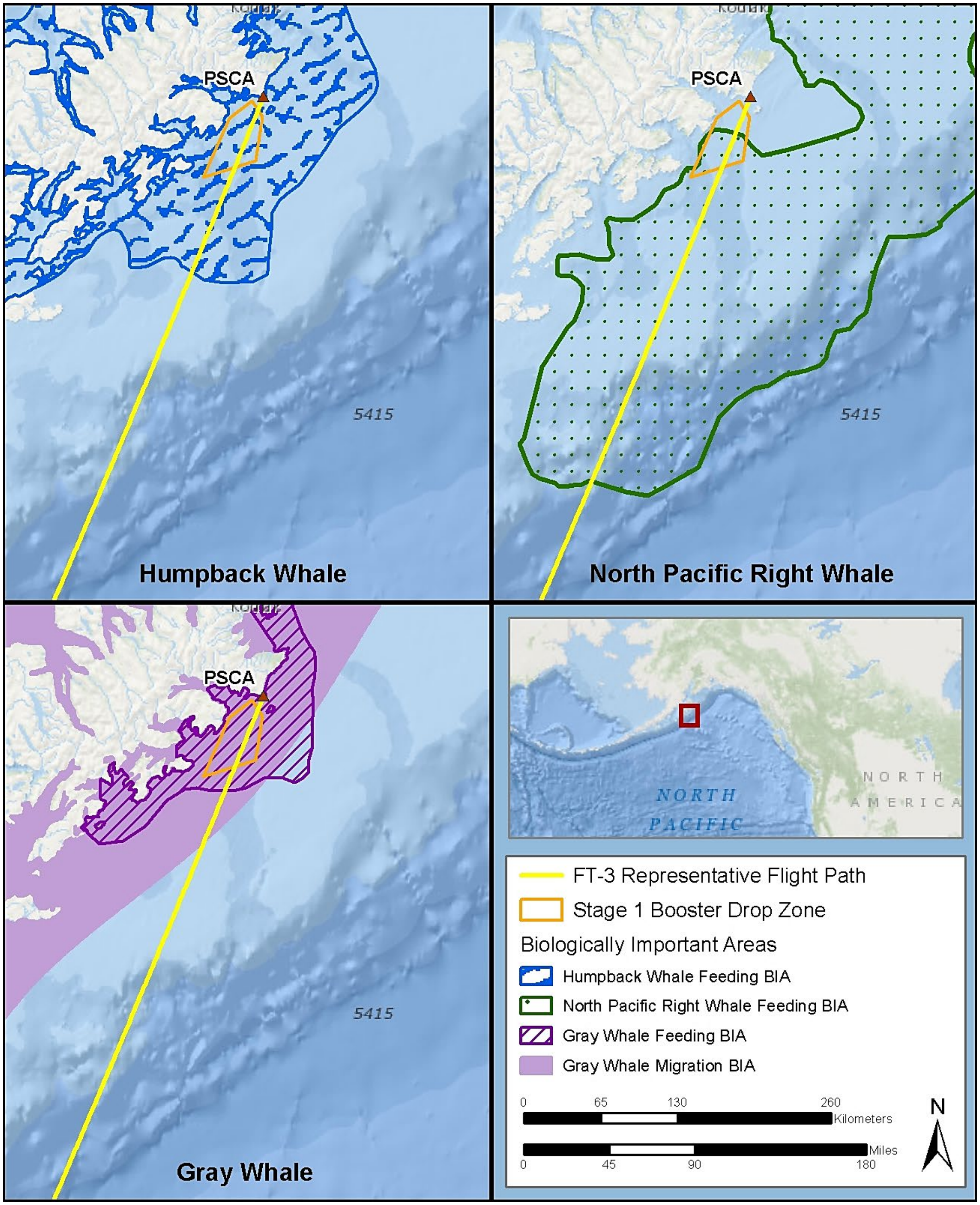
Figure 3-2. Designated Critical Habitat near Kodiak Island, Alaska.

into terrestrial or air zones of sea lion critical habitat; the following description focuses on the aquatic zone. There are several Steller sea lion haulouts near the ROI (**Figure 3-2**) and critical habitat extends into the ROI (NMFS 1993). The essential component of Steller sea lion aquatic critical habitat is adequate food resources (NMFS 1993), especially for lactating adult females, young-of-the-year, and juveniles.

Designated critical habitat for the Southwest DPS of the northern sea otter extends from the end of the Aleutian Islands to lower western Cook Inlet and includes waters around Kodiak Island (**Figure 3-2**). This Kodiak-Kamishak-Alaska Peninsula Unit of critical habitat includes nearshore marine waters ranging from the mean high tide line seaward for a distance of 100 m (328 ft), or to a water depth of 20 m (66 ft; USFWS 2009b). The primary constituent elements of sea otter critical habitat include shallow rocky areas, nearshore waters, and kelp forests that provide protection and escape from predators; and sufficient quantities of prey resources (USFWS 2009b) The Proposed Action would have no effect on these primary constituent elements, as the stage 1 booster drop zone is outside of designated critical habitat. Therefore, the Proposed Action would have no impact on this critical habitat and it is not discussed further in this EA/OEA.

Biologically Important Areas. Biologically Important Areas are areas considered important to a species for all or part of the year. These areas are generally based on compilation of the best available information from scientific literature, unpublished species accounts, and expert knowledge to identify areas shoreward of the U.S. EEZ that are important reproductive, feeding, or migratory areas for species or groups. Biologically Important Areas have been identified for seabirds and four cetacean species in the ROI.

The ROI includes some seasonal Biologically Important Areas for cetaceans, as identified by NOAA's Cetacean Density and Distribution Mapping Working Group (**Figure 3-3**; Ferguson et al. 2015). Biologically Important Areas for both gray whale feeding and migration occur offshore of Kodiak Island (**Figure 3-3**; Ferguson et al. 2015). Gray whales feed on abundant zooplankton in the Albatross Bank region between June and August and also use the area as a migratory corridor November through January and March through May (Ferguson et al. 2015). Humpback whales concentrate in large numbers near Kodiak Island for feeding during the summer months (Witteveen et al. 2011, Rone et al. 2017). The waters of Albatross Bank have been determined to be a biologically important feeding ground for humpback whales with highest whale densities from July to September (Ferguson et al. 2015). North Pacific right whales are also known to feed near Kodiak Island in the summer months when zooplankton densities are high (Wade et al. 2011). The area around the North Pacific right whale designated critical habitat in the vicinity of Albatross Bank (see **Section 3.1.3.2.5**) is the only location in the Gulf of Alaska where this species has been consistently identified in recent decades (NMFS 2017, Wade et al. 2011). These waters are considered biologically important feeding grounds for North Pacific right whales with highest whale densities between June and September (Ferguson et al. 2015).



Data Sources: Ferguson et al. 2015; Basemap Source: Esri World Ocean Base

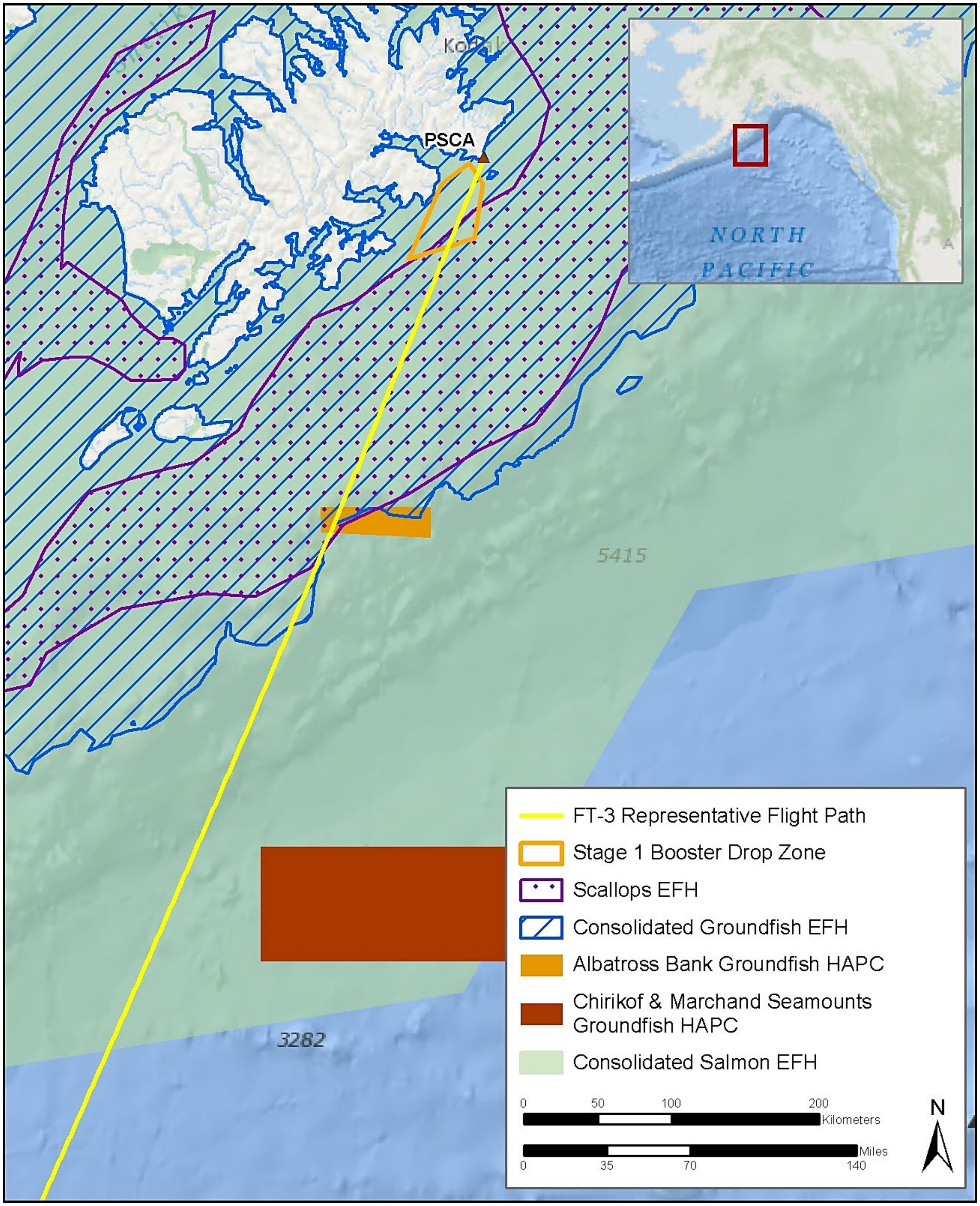
Figure 3-3. Biologically Important Areas for Cetaceans near Kodiak Island, Alaska.

The nearshore waters off Kodiak Island within the ROI are also considered a biologically important feeding area for seabirds due to abundant food resources (i.e., forage fish and krill; Smith et al. 2012, ADFG 2015). Important seabird areas were identified by Audubon Alaska by determining the nesting colonies and pelagic foraging areas that contained more than 1 percent of the population of a species (Smith et al. 2012). According to these analyses, the most important colonial nesting areas occur along the Aleutian Islands chain, remote islands within the Bering Sea, and islands in the Gulf of Alaska (e.g., Kodiak Archipelago; Smith et al. 2012). Important pelagic Biologically Important Areas in the region tend to be associated with highly productive areas such as the continental shelf break and boundaries between major water masses (Smith et al. 2012). This seabird Biologically Important Areas is located under the flight corridor out to 51 km (32 mi) from the shoreline, and the stage 1 drop zone is within this area.

Essential Fish Habitat (EFH). EFH and its geographic boundaries in the waters near Alaska have been designated by the North Pacific Fishery Management Council under the MSA. EFH has been designated for managed species by life history stage (i.e., eggs, larvae, juvenile, and adults) and has been described in detail in Fisheries Management Plans (as amended) and the *Final Environmental Assessment for Essential Fish Habitat Omnibus Amendments* (NMFS 2018). A general description of EFH in the ROI is included here; however, more detailed descriptions of EFH and the species included in specific Fisheries Management Plans are incorporated here by reference to these plans and their amendments (NPFMC 2012, NPFMC 2014, NPFMC 2018, NMFS 2018).

In the ROI, EFH has been designated for all life stages of groundfish of the Gulf of Alaska; immature, juvenile, and mature salmon species; and late juvenile and adult weathervane scallops (*Patinopecten caurinus*) and other scallop species not currently exploited (**Figure 3-4**). Gulf of Alaska groundfish include species such as pollock, cod, sole, rockfish, sharks, skates, octopuses, and squids (NMFS 2018).

Habitat areas of particular concern (HAPCs) are areas within EFH that are of particular ecological importance to the long-term sustainability of managed species, are of a rare type, or are especially susceptible to degradation or development (NPFMC 2018). Two designated HAPCs for groundfish occur in the proposed over ocean flight corridor (**Figure 3-4**). The Albatross Bank HAPC is a Gulf of Alaska Slope Habitat Conservation Area and the Chirikof and Marchand Seamounts HAPC is an Alaska Seamount Habitat Protection Area (NPFMC 2018). Vehicle overflight would not affect designated HAPCs in any way and there are no HAPCs within the stage drop zones. Since there would be no impacts to HAPC as a result of the Proposed Action, these areas are not discussed further in this EA/OEA.



Data Sources: NOAA Fisheries 2019, NOAA Fisheries 2018: Basemap Source: Esri World Ocean Base

Figure 3-4. Essential Fish Habitat (EFH) and Habitat Areas of Particular Concern (HAPCs) near Kodiak Island, Alaska.

3.1.4 Airspace (PSCA)

For detailed information about types of airspace and its regulation at PSCA, see the Pacific Spaceport Complex–Alaska Range User's Manual (AAC 2015) and the following NEPA documents: the FT-2 EA (Pages 3-4 through 3-5; USASMDC/ARSTRAT 2014), the Flexible Target Family EA (Pages 3-7; 3-18; MDA 2007b).

The FAA manages all airspace within the United States and the U.S. territories in accordance with procedures of the International Civil Aviation Organization (ICAO) (USASMDC/ARSTRAT 2014). Airspace, which is defined in vertical and horizontal dimensions and also temporally, is considered to be a finite resource that must be managed for the benefit of all aviation sectors including commercial, general, and military aviation (MDA 2007b).

There are four recognized categories of airspace: controlled airspace, uncontrolled airspace, special use airspace, and other airspace. They are assigned based on the complexity or density of aircraft movements, the nature of operations conducted within the airspace, the level of safety required, and the national and public interest in the airspace (MDA 2007b). PSCA is a launch site located on Narrow Cape on Kodiak Island serving both government and commercial launch customers and is designated a Space Launch Activity Area (FAA 2016; FAA 2019).

3.1.4.1 Regulatory Setting

Under Public Law 85-725, Federal Aviation Act of 1958, the FAA is charged with the safe and efficient use of our nation's airspace and has established certain criteria and limits to its use. The method used to provide this service is the National Airspace System.

Airspace over the United States out to the 5-km (3-mi) limit offshore defines the National Airspace System (DOD 2017). Airspace outside of the 22-km (12-nm) limit is international airspace governed by the rules of the ICAO. ICAO has designated administration of much of the airspace offshore to the United States through international agreements. The FAA, as the functional level of the United States Government, administers such airspace similar to the National Airspace System (DOD 2017).

Because the airspace beyond the 22-km (12-nm) limit from the coastline is in international airspace, the procedures of the ICAO, Procedures for Air Navigation Services: Air Traffic Management (ICAO 2016), are followed in this airspace (DOD 2017). These ICAO procedures are the equivalent air traffic control manual to the FAA Order JO 7110.65Y, Air Traffic Control (FAA 2019); however, the ICAO is not an active air traffic control agency and has no authority to allow aircraft into a sovereign nation's airspace. Nor does it set international boundaries for air traffic control purposes. FAA Air Traffic Service outside U.S. airspace is provided in accordance with Annex 2, Rules of the Air, and Annex 11, Air Traffic Regulations and Air Traffic Services, of the ICAO Convention (DOD 2017; ICAO 2001, 2005).

The FAA has issued AAC a license (LSO 03-008) to operate a commercial space launch site at PSCA. The AAC has responsibility to ensure their customers comply with the policies and procedures developed as a condition of the operators' license (AAC 2015).

For information regarding local regulation of PSCA airspace, see the FT-2 EA (Pages 3-4 through 3-5; USASMDC/ARSTRAT 2014). The Anchorage Air Route Traffic Control Center (ARTCC) and the Kodiak Air Traffic Control Tower regulate air traffic in the vicinity of PSCA (USASMDC/ARSTRAT 2014). Air traffic in the region is managed by the Anchorage ARTCC (USASMDC/ARSTRAT 2014). Control of oceanic air traffic from/to the United States is carried out from oceanic centers in Anchorage, Oakland, and New York (USASMDC/ARSTRAT 2014). The procedures for scheduling each piece of airspace are performed in accordance with letters of agreement with the controlling FAA facility, and the Anchorage and Honolulu Control Facilities, as well as the Oakland ARTCC. Schedules are provided to the FAA facility as agreed among the agencies involved. Real-time airspace management involves the release of airspace to the FAA when the airspace is not in use or when extraordinary events occur that require drastic action, such as weather requiring additional airspace.

The FT-3 launch would be conducted in compliance with DOD Instruction 4540.01, Use of International Airspace by U.S. Military Aircraft and for Missile and Projectile Firings (DODI 4540.01 2017).

PSCA will issue NOTAM and NTM at least 24 hours before launch and continuously monitor the established safety area to ensure it remains clear (FAA 1996). Any restrictions imposed would be short term and would not significantly impact airspace.

3.1.4.2 Region of Influence

A detailed description of the PSCA airspace ROI can be found in two NEPA references: the PSCA EA (Pages 3-28 through 3-31; DOD 2017) and the FT-2 EA (Pages 3-4 through 3-5; USASMDC/ARSTRAT 2014).

The ROI for airspace includes the airspace over and surrounding Kodiak Island. The airspace over and surrounding PSCA includes commercial air corridors (USASMDC/ARSTRAT 2014). Launches at PSCA are high inclination, aimed almost straight up (FAA 1996). Launch azimuths can range anywhere from 110 degrees to 220 degrees True based on a Universal Transverse Mercator grid (FAA 2018). The eastern-most possible azimuth paths would cross over the eastern edge of Ugak Island. At the western-most possible azimuth, paths would pass along the southern edge of the Kodiak Archipelago (FAA 1996). Kodiak Island is ideal for polar orbits because it provides a wide launch azimuth with unobstructed downrange flight path for launching targets, satellites, and space-science payloads into low-earth-orbits, including polar, sun synchronous, and highly elliptical orbits (AAC 2015).

Affected airspace in the PSCA ROI is described below in terms of its principal attributes of the National Airspace System: controlled and uncontrolled airspace, special use airspace, en route airways and jet routes, and airports and airfields. There are no military training routes in the ROI.

Controlled and Uncontrolled Airspace

The closest controlled airspace is approximately 40 km (25 mi) northeast of PSCA at the Kodiak Airport (USASMDC/ARSTRAT 2014). Class C and Class D airspace is in effect at Kodiak Airport (USASMDC/ARSTRAT 2014). The Kodiak Air Traffic Control Tower jurisdiction is only within the Class D airspace above the Kodiak Airport and thus has no control over air traffic at PSCA. The Kodiak Airport Class D airspace has been modified on one side due to terrain (DOD 2017). Class E airspace from 366 m (1,200 ft) mean sea level up to flight level (FL) (pressure altitude) 5,486 m (18,000 ft) surrounds the Kodiak Airport to protect the instrument approaches to that airport. Above 5,486 m (18,000 ft) and up to FL 18,288 m (60,000 ft) is Class A controlled airspace.

Airspace above PSCA up to FL 180 (5,486 m [18,000 ft] altitude) is uncontrolled class G airspace (USASMDC/ARSTRAT 2014). Airspace above FL 180 is controlled airspace (USASMDC/ ARSTRAT 2014). The Anchorage ARTCC regulates air traffic in the vicinity of PSCA above 5,486 m (18,000 ft) in Class A airspace.

Special Use Airspace

PSCA coordinates launches with airspace users through the existing airspace coordination protocol among PSCA, commercial aircraft carriers, and military aircraft (USASMDC/ARSTRAT 2014). PSCA issues a Temporary Flight Restriction (TFR) for the airspace above the launch complex and the adjacent waters (up to 4.8 km [3 mi] offshore) (DOD 2017). The TFR is a notice distributed to aviators by the FAA that a hazard to flight exists in the area of the TFR. Launches from PSCA do not affect U.S. Air Force training exercises (USASMDC/ARSTRAT 2014).

En Route Airways and Jet Routes

Commercial air corridors enter and exit Kodiak Airport to and from the west, north, and south (USASMDC/ARSTRAT 2014). Routes include G2 (J604), G10, R341, B27 (J123), V506, V439, V438, and V357 (DOD 2017). These corridors are north of the Narrow Cape area, more than 24 km (15 mi) from the launch area to the edge of the V506 Corridor (USASMDC/ARSTRAT 2014).

Two Instrument Flight Rules en route low altitude airways, V15 (through W-188) and V16 (through W-186), are used by commercial aircraft that pass through the PSCA Warning Areas. Use of these low altitude airways comes under the control of the Anchorage Control Facility. In addition, provision is made for surveillance of the affected airspace either by radar or patrol aircraft. Safety regulations dictate that hazardous activities will be suspended when it is known that any non-participating aircraft has entered any part of the training danger zone until the nonparticipating entrant has left the area or a thorough check of the suspected area has been performed.

Airports and Airfields

Kodiak Airport is the airport closest to PSCA. It is located approximately 40 km (25 mi) northeast of the launch site. It is a state operated regional airport that routinely handles daily passenger and cargo jet service and has accommodated 737, 727, Dash 8, general aviation aircraft, C-130, C-141 and C-5 military aircraft (AAC 2015, DOD 2017). The Kodiak Coast Guard Base is connected to the Kodiak Airport, and uses its runways and taxiways for its own operations (DOD 2017). The airport has a preselected "hot spot" for off-load of hazardous or ordnance items (AAC 2015).

3.1.5 Noise (PSCA)

For a discussion of the basics of noise in the environment, refer to the FE-2 EA/OEA (Pages 3-27 through 3-30; U.S. Navy 2019b). Noise at PSCA in relation to biological resources and wildlife species is discussed in the biological resources section (**Section 3.1.3**).

A noise study at PSCA was conducted by the FAA in 2012 in preparation of the KLC Launch Pad 3 EA (FAA 2016). The 2012 Noise Report determined that local noise sensitive areas included the Kodiak Game Ranch & Cattle Company, areas on Narrow Cape used for recreation, Pasagshak State Recreation Site, and private homes along Pasagshak Bay. Ambient noise levels from natural sources include wind, surf, and birds (USASMDC/ARSTRAT 2014).

For information about sonic booms occurring at PSCA, refer to the following NEPA documents: the FT-2 EA (Page 3-13; USASMDC/ARSTRAT 2014), KLC EA (Page 4-21; FAA 1996) and the KLC Launch Pad 3 (Pages 3-25 through 3-26; page 4-20; FAA 2016). The FAA estimated that a sonic boom generated during a launch would impact the ocean's surface approximately 33 to 56 km (21 to 35 mi) downrange from PSCA, beyond the edge of the Outer Continental Shelf and be heard by receptors only on the open ocean (FAA 1996). Models estimated that under typical conditions, a sonic boom on the open ocean would range from approximately 50 to 100 A-weighted decibels (dBA) in intensity (FAA 1996). The 2012 Noise Study did not analyze the potential for a sonic boom to impact the land surface (FAA 2016). Given the infrequency and short duration of launches, as well as the rural setting, impacts to the general public are minimal.

Table 3-3 is a chart of A-weighted sound levels from typical noise sources. Some noise sources (e.g., air conditioner) are continuous sounds that maintain a constant sound level for some period of time. Other sources (e.g., automobile, heavy truck) are the maximum sound produced during an event like a vehicle pass-by. Other sounds (e.g., urban daytime, urban nighttime) are averages taken over extended periods of time. A variety of noise metrics have been developed to describe noise over different time periods, as discussed below.

Table 3-3. Typical Noise Levels of Familiar Noise Sources and Public Responses

Thresholds/Noise Sources	Sound Level (dBA)	Subjective Evaluation[1]	Possible Effects on Humans[1]
Human threshold of pain	140	Deafening	Continuous exposure to levels above 70 dBA can cause hearing loss in the majority of the population
Siren at 100 ft	130		
Jet takeoff at 200 ft Auto horn at 3 ft	120		
Chain saw or noisy snowmobile	110		
Lawn mower at 3 ft Noisy motorcycle at 50 ft	100	Very loud	
Heavy truck at 50 ft	90		
Pneumatic drill at 50 ft Busy urban street, daytime	80	Loud	
Normal automobile at 50 mi per hour Vacuum cleaner at 3 ft	70		Speech interference
Air conditioning unit at 20 ft Conversation at 3 ft	60	Moderate	
Quiet residential area Light auto traffic at 100 ft	50		Sleep interference
Library or quiet home	40	Faint	
Soft whisper at 15 ft	30		None
Slight rustling of leaves	20	Very faint	
Broadcasting studio	10		
Threshold of human hearing	0		

Source: USEPA 1974

Note: [1] Both the subjective evaluations and the physiological responses are continuums without true threshold boundaries. Consequently, there are overlaps among categories of response that depend on the sensitivity of the noise receivers.

Abbreviations: dBA = A-weighted decibels, ft = feet

Research has indicated that about 87 percent of the population is not highly annoyed by outdoor sound levels below 65 decibels (dB) Day-Night Level (DNL) (Federal Interagency Committee on Urban Noise 1980). Therefore, the 65 dB DNL noise contour is used to help determine compatibility of military operations with local land use, particularly for land use associated with airfields.

The highest A-weighted sound level measured during a single event where the sound level changes value with time is called the maximum A-weighted sound level or L_{max}. During a missile launch such as that described in the Proposed Action, the noise level starts at the ambient or background noise level, rises to the maximum level and returns to the background level as the missile goes into the distance. L_{max} defines the maximum sound level occurring for a fraction of a second.

Noise Effects

The primary effect of missile launches on exposed communities is long-term annoyance. The scientific community has adopted the use of long-term annoyance as a primary indicator of community response, and there is a consistent relationship between DNL and the level of community annoyance (Federal Interagency Committee on Noise 1992).

The disturbance of sleep is a major concern for communities exposed to nighttime noise. In this EA/OEA, sleep disturbance uses the Sound Equivalent Level (SEL) noise metric and calculates the probability of awakening from single aircraft overflights. These are based on the particular type of aircraft, flight profile, power setting, speed, and altitude relative to the receptor. The results are then presented as a percent probability of people awakening (USEPA 1974).

For workplace noise the National Institute for Occupational Safety and Health published a criteria document in 1998 with a recommended exposure limit of 85 dBA as an 8-hour time-weighted average (National Institute for Occupational Health and Safety 1998).

Exposure to noise levels higher than those normally produced by aircraft in the community can elevate blood pressure and stress hormone levels. However, the response to such loud noise is typically short in duration: after the noise goes away, the physiological effects reverse and levels return to normal.

3.1.5.1 Regulatory Setting

Under the Noise Control Act of 1972, the Occupational Safety and Health Administration (OSHA) established workplace standards for noise. The minimum requirement states that constant noise exposure must not exceed 90 dBA over an 8-hour period. The highest allowable sound level to which workers can be constantly exposed is 115 dBA, and exposure to this level must not exceed 15 minutes within an 8-hour period. The standards limit instantaneous exposure, such as impact noise, to 140 dBA. If noise levels exceed these standards, employers are required to provide hearing protection equipment that will reduce sound levels to acceptable limits.

3.1.5.2 Region of Influence

The ROI for noise is the area within and surrounding PSCA and the Narrow Cape in which humans and wildlife may suffer disturbance or annoyance from noise sources (USASMDC/ARSTRAT 2014). This includes the Narrow Cape, PSCA, Pasagshak Community, and surrounding marine shorelines associated with Ugak Island and the Narrow Cape (USASMDC/ARSTRAT 2014). Local noise sensitive areas include a private property and structures that are occasionally used as a church camp, the Kodiak Game Ranch & Cattle Company, recreation areas on Narrow Cape, Pasagshak State Recreation Area, and private homes along Pasagshak (USASMDC/ARSTRAT 2014). Noise levels above baseline near PSCA are mostly attributed to traffic noise along Pasagshak Point Road, but other local noise sources include local residences, ongoing activities at PSCA, animals, wind, and rain (FAA 2016). Non-local noise sources include boats and aircraft that pass through the area (FAA 2016).

Existing sources of background noise at PSCA depend on the level of work for ongoing missions, but include launch operations, road traffic, boat traffic, and bird and animal vocalizations. The nearest noise receptors are located outside of the PSCA property boundary and greater than 1.6 km (1 mi) from the proposed launch site (DOD 2017). Launch-related noises are infrequent (nine times per year), short-lived, and return to background within minutes of launch (DOD 2017). All nearby land uses are compatible with the noise from infrequent launch activity (DOD 2017). Noise coming from PSCA varies with the intensity of the work happening at the facility. Range operations also include training and research and development activities support (USASMDC/ARSTRAT 2014). Range operations that may impact the sound environment include, but are not limited to, power generation, training and research and development activities support, maintenance operations, and construction or renovation (USASMDC/ARSTRAT 2014). Launch-related noise effects are infrequent (up to nine times per year) and short-lived, with return to baseline noise levels within minutes of a launch (FAA 2016).

3.1.6 Public Health and Safety (PSCA)

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 that 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. Fire, ambulance, and medical evacuation coverage is provided by Kodiak Island emergency services organizations within normal non-service district response times, but additional fire, ambulance, and medical support can be negotiated in the launch service agreement with the customer and AAC (DOD 2017).

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 National Geospatial-Intelligence Agency (NGA) / Defense Logistics Information Service (DLIS) Catalog of Hydrographic Products, United States Coast Pilots, NGA List of Lights, United States Coast Guard (USCG) Light Lists, and other related nautical publications produced by NGA, National Ocean Service, and the USCG (NGA 2019).

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 goal of the PSCA safety program is to protect the public, range activity participants, and site workers from any hazards in preparation for, during, and after the proposed launch (USASMDC/ARSTRAT 2014). According to the FT-2 EA (USASMDC/ARSTRAT 2014), the PSCA safety procedures focus on protecting workers and members of the public, as well as equipment and structures.

Site security consists of a state-of-the-industry Intrusion Detection System, building access via a cipher and combination spin locks and magnetic card readers, photo identification badges with color-coded access for authorized personnel, security guards, visitor procedures, an 8-foot fence around all individual facilities, and physical barricades at established check points when hazardous operations require them (AAC 2015).

The Range Safety Manual sets forth the PSCA safety policy and criteria governing all launch support operations and is applicable to all AAC personnel, contractors, tenants, and range users (DOD 2017).

A hazard potential is present during prelaunch transport, prelaunch processing, and launch of rockets due to the significant amount of propellant contained in the rocket engines. The exposure to launch mishaps is greatest within the early portions of the flight after launch. Measures currently in place to limit the number of personnel involved in launch operations include OSHA and DOT regulations and USAF procedures (for transporting hazardous materials), and DOD procedures (for handling explosives, and the DOD Range Safety program for the processing and launch of rockets) (USASMDC/ARSTRAT 2014).

Missile Flight Analysis

Missile flight safety includes analyses of flight performance capabilities and limitations, of hazards inherent in operation and destruct systems, and of the electronic characteristics of the technology and instrumentation.

Ground Safety

On arrival at PSCA, support equipment and material hazards are placed in secure storage until assembly and launch preparations. Explosive Safety Quantity Distances are established around ordnance storage and missile (rocket) assembly buildings (USASMDC/ARSTRAT 2014). Access to storage and support facility is limited to trained and authorized mission critical personnel. Pasagshak Point Road is closed at the site boundary and monitored during launch day to ensure that no unauthorized personnel enter the Ground Hazard Area (GHA). If the safety zone is compromised, the launch is delayed until the area is confirmed clear.

Ordnance Management and Safety

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

Ocean Area Clearance

The Launch Hazard Area (LHA) over the Gulf of Alaska and the Pacific Ocean is established based on the launch vehicle characteristics and potential associated hazards. The launch flight termination line is intended to minimize potential adverse effects on populated areas. 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. PSCA will publish NOTAMs and NTMs, coordinate security closures of lands and waters around PSCA and with the USCG, FAA, and the Alaska Department of Transportation and Public Facilities (USASMDC/ ARSTRAT 2014). Imminent launches will be announced of the local radio as well as in the newspaper.

Transportation Safety

The transportation of hazardous materials to PSCA are covered under a separate transportation safety plan. During the arrival of hazardous components, PSCA manages the safety aspects for handling and storage of rocket components (e.g., solid propellant boosters), the booster and rocket components, explosives, and other hazardous materials (USASMDC/ARSTRAT 2014).

Fire and Crash Safety

PSCA has a fire truck and a 946-L (250-gal) pumper mounted on a 1-ton (2000-lb) truck chassis to fight brush fires that may occur during a launch (USASMDC/ARSTRAT 2014). The PSCA water system includes a 567,811-L (150,000-gal) storage tank that can be used to supply fire-fighting operations (USASMDC/ ARSTRAT 2014). PSCA also has an ambulance to transport injured patients. During missions, Emergency Medical Technicians (EMT) are present at PSCA with the oversight of Northwest Medical. During launch day operations an EMT-3 is in attendance at PSCA (USASMDC/ ARSTRAT 2014).

3.1.6.1 Regulatory Setting

PSCA's safety policies and standard operating procedures (SOPs) for general operations and launch-specific safety plans have been developed to meet or exceed the requirements of the Range Commanders Council Common Risk Criteria for National Test Ranges and Standard 321-17 (RCC 321-17), AFSCMAN 2004, and FAA Notice of Proposed Rulemaking (USASMDC/ ARSTRAT 2014).

AAC maintains a Launch Site Safety Manual that details requirements for launch site safety such as: Range Safety Data Package submittal requirements and schedule outline, a Hazardous Operations Plan, roles of site personnel, licensee requirements, ground safety, and flight safety (AAC 2018).

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. 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."

All health and safety procedures prescribed by the manual are in accordance with applicable DOD, federal, and state regulations and standards. According to the 2017 PSCA EA, these include Army Pamphlet 385-64, Ammunition and Explosive Safety Standards; DOD 6055.09-M, DOD Ammunition and Explosive Safety Standards; and RCC Standard 321, Common Risk Criteria Standards for National Test Ranges.

3.1.6.2 Region of Influence

The ROI for health and safety is limited to the U.S. transportation network used in the transport of the FT-3 vehicle and support systems to the range, existing on-site facilities supporting the Proposed Action, and off-range areas within the missile flight path and established LHA (DOD 2017).

The size of the evacuation area is determined by the size and flight characteristics, the anticipated flight profile, and standard explosive safety rules for the FT-3 vehicle (USASMDC/ARSTRAT 2014). Exclusion zones would be established to eliminate unacceptable risks to the public and launch support personnel. PSCA range management and mission support personnel will monitor the ROI before and after the FT-3 test in both the GHA and over-water LHA (USASMDC/ARSTRAT 2014). This includes the hazard area outside the Kodiak Island region, where post-boost vehicle fragments sometimes impact (USASMDC/ARSTRAT 2014). Before a launch is allowed to proceed, the projected flight path and ROI will be confirmed and cleared by using surveillance from aircraft and ships in the area, as well as by radar (USASMDC/ARSTRAT 2014).

3.1.7 Hazardous Materials and Wastes (PSCA)

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.

For information about hazardous waste at PSCA, refer to the following NEPA documents: the KLC EA (Page 4-69 through 4-74; FAA 1996), and the KLC Launch Pad 3 EA (Pages 3-18 through 3-21; FAA 2016), and Pacific Spaceport Complex-Alaska Range User's Manual (Pages 2-9 through 2-11; 5-22 through 5-24; AAC 2015).

Hazardous Materials Management

The PSCA Vice-President and General Manager serve as the point of contact for all matters pertaining to the arrival of hazardous materials at PSCA. All contractors provide hazardous materials information (Safety Data Sheets) for hazardous chemicals brought to the facility.

AAC operates PSCA as a Conditionally Exempt Small Quantity Generator.

AAC aids with the removal of non-hazardous waste limited to routine materials generated from normal operations (AAC 2015).

AAC will dispose of facility-related hazardous waste not directly the result of the Range User's launch activities (AAC 2015). Hazardous materials used for maintenance, groundskeeping, and housekeeping activities would normally consist of various solvents and cleaners, paints and primers, adhesives, and lubricants (FAA 1996). Range Users shall manage hazardous waste generated by their operations including collection of and disposal of any by-products in compliance with applicable environmental regulations (AAC 2015). Small amounts of hazardous and non-hazardous wastes are expected to be generated during operations including spent solvents, lead-acid batteries, waste oil and anti-freeze, spill cleanup materials (if necessary), and empty containers (FAA 1996). AAC staff are Hazardous Waste Operations and Emergency Response (HAZWOPER) trained at the First Responder Operations Level (AAC 2015).

Pollution Prevention

Pollution prevention, waste minimization and recycling management practices and procedures are defined in the facility Spill Prevention, Control, and Countermeasure Plan, Emergency Response Plan and Contamination Control Procedures.

Solid Waste Management

Solid wastes of a non-hazardous nature are containerized at PSCA and periodically picked up by approved carriers and disposed of at the Kodiak Island Borough Landfill.

Existing Environmental Contamination

No National Priorities List sites are identified for the Narrow Cape area in USEPA Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) database (FAA 2016).

Information regarding the failed August 25, 2014 military launch from Launch Pad 1 is well documented in the KLC Launch Pad 3 EA (Pages 1-7; 3-19; FAA 2016) as well as the Report for KLC Environmental Monitoring and Remediation Activity (USASMDC/ARSTRAT 2016). The key steps addressed in the 2016 LP-3 EA by the Land and Shallow Water Impact Emergency Operations Procedures are presented in **Table 3-4** along with their implementation status:

Table 3-4. Status of Key Steps in Response to the 2014 Launch Failure

Launch Failure Response Process: Key Steps	Status
Determine the extent of the debris field and mark the field with temporary fencing	Complete
Clear the debris field with qualified hazardous material trained personnel	Complete
Conduct an environmental survey to determine the amount and extent of contamination, if any	Complete
Determine if the affected area is clear of hazards	Complete
Establish long-term safety measures, if necessary	Complete
Initiate environmental remediation, if necessary	Complete

Source: 2016 KLC Launch Pad 3 EA (FAA 2016) and 2016 No Further Action Letter (ADEC 2016a).

The launch customer (the U.S. Government) completed their environmental investigation of the affected area to identify and quantify any potential contamination as a result of the launch failure (FAA 2016). The environmental investigation plan was developed, coordinated, and approved by ADEC and other appropriate agencies, as required, and complied with local, state, and federal rules and regulations to include water and soil sampling (FAA 2016). The potential contaminants of concern identified for the environmental investigation included cyclo-tetra-methylene tetranitramine (HMX explosive), cyclotrimethylene trinitramine (RDX explosive), nitroglycerin, perchlorate, asbestos, and the metals aluminum, magnesium, and cadmium (USASMDC/ ARSTRAT 2016). The results of the investigation showed that the 2014 launch failure did not result in any contamination at PSCA that would require remediation (FAA 2016, ADEC 2016a).

3.1.7.1 Regulatory Setting

The FAA requires that each commercial launch site and each launch operation have a safety review that includes a complete disclosure of each hazardous material in the ground safety analyses report, as well as a hazardous materials management plan (FAA 2016).

Management of hazardous waste must comply with the Resource Conservation and Recovery Act, as amended by the Hazardous and Solid Waste Amendments of 1984 (FAA 2016). In Alaska, USEPA administers the Act, which requires that hazardous wastes be treated, stored, and disposed to minimize the present and future threat to human health and the environment (USASMDC/ARSTRAT 2014).

Transportation of hazardous materials is regulated by the U.S. DOT regulations codified in 49 CFR §§ 105-180 (DOD 2017).

Hazardous materials use, storage, and disposal are managed in accordance with the PSCA Safety Policy, the PSCA Emergency Response Plan, the PSCA General Compliance Plan for Emergency Planning and Community Right to Know Act, AAC's Hazardous Communication Program, the Kodiak Area Emergency Operation Plan, the Explosive Site Plan (as required by 14 CFR Part 420) and applicable state and federal environmental laws in such a way as to minimize impacts to the environment (FAA 2016). All mission-specific hazardous waste, such as propellants and explosives, is removed at the end of the mission by the launch vehicle provider. Additionally, PSCA maintains a Spill Prevention, Control, and Countermeasure Plan covering the fuel/oil storage facilities (**Table 3-5**) (FAA 2016). PSCA infrastructure currently has 18,000 gallons of capacity for petroleum products (gasoline, diesel fuel and lubricating fluids).

Table 3-5. PSCA Facility Fuel/Oil Storage Summary

Location	Storage Capacity (L/gal)	Content	Description
Stationary Above Ground Storage Tanks (ASTs)			
LCC	9,463 / 2,500	Diesel (Fuel Oil)	Saddle or skid mounted above-ground horizontal tank with double-wall secondary containment
LCC	568 / 150	Diesel (Fuel Oil)	Above-ground day tank with diked secondary containment
MSF (Dispensary)	7,571 / 2,000	Diesel	Saddle or skid mounted above-ground horizontal tank contained in sealed concrete vault
MSF (Heating)	11,356 / 3,000	Diesel (Fuel Oil)	Saddle or skid mounted above-ground horizontal tank contained in sealed concrete vault
MSF	3,785 / 1,000	Gasoline	Saddle or skid mounted above-ground horizontal tank contained in sealed concrete vault
MSF	1,325 / 350	Diesel/Fuel Oil	Two above-ground day tanks with diked secondary containment
PPF	9,463 / 2,500	Diesel (Fuel Oil)	Saddle or skid mounted above-ground horizontal tank with double-wall secondary containment
PPF	568 / 150	Diesel (Fuel Oil)	Above-ground day tank with diked secondary containment
RMSF	11,356 / 3,000	Diesel (Fuel Oil)	Saddle or skid mounted above-ground horizontal tank contained in sealed concrete vault
RMSF	189 / 50	Diesel (Fuel Oil)	Above-ground day tank with diked secondary containment
IPF	9,463 / 2,500	Diesel (Fuel Oil)	Saddle or skid mounted above-ground horizontal tank with double-wall secondary containment
IPF	568 / 150	Diesel (Fuel Oil)	Above-ground day tank with diked secondary containment
Portable Storage Tanks			
MSF	1,515 / 400	Diesel	379 L and 1,136 L (100 and 300-gallon) truck mounted tanks utilized as mobile refuelers
MSF	833 / 220	Assorted Lubricating Fluids	208 L (55-gallon) dispensary storage drums situated on spill pallets
MSF	208 / 55	Used Oil	208 L (55-gallon) used oil storage drum situated on spill pallet

Source: KLC Launch Pad 3 EA (FAA 2016), originally from KLC Spill Prevention, Control, and Countermeasure Plan (R&M 2011).

Abbreviations: gal = gallon, IPF = Integration Processing Facility, L = liter, LCC = Launch Control Center, MSF = Maintenance Support Facility, PPF = Payload Processing Facility, RMSF = Rocket Motor Storage Facility

3.1.7.2 Region of Influence

The ROI for hazardous materials and hazardous waste would be limited to facilities and test areas of PSCA, to be used for launch preparation, launch, and post-launch activities and in areas where hazardous materials are generated, stored and handled on a short-term basis (DOD 2017).

3.2 Pacific Ocean Flight Corridor

This section includes air quality, biological resources, and water quality resources within the Pacific BOA along the over-ocean flight corridor for the FT-3 flight test.

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:

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 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 feet. There would be no impacts to geological resources in the over-ocean flight corridor from the FT-3 flight test.

Cultural Resources: There are no identified cultural resources along the proposed flight path within the over-ocean flight corridor; therefore, there would be no impacts to cultural resources within the Pacific Ocean Flight Corridor from the FT-3 flight test.

Land Use: The FT-3 flight path would avoid populated land masses with their associated assigned land uses. There would be no changes, and therefore, no impacts, from the FT-3 flight test to land use along the proposed flight path over the Pacific Ocean Flight Corridor.

Airspace: This Pacific 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 U.S. Military Aircraft and for Missile/ Projectile Firings* (DODI 4540.01 2017). Commercial and private aircraft would be notified through NOTAMs issued through the FAA in advance of the FT-3 flight test launch at the request of RTS 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 FT-3 flight test.

Noise: The FT-3 flight would occur at high altitude where it would be generally undetected by vessels or aircraft at the ocean's surface. Sonic booms are generated following launch and during terminal flight and impact; these areas are not within the over-ocean flight corridor. Therefore, there would be no impacts to noise within the over-ocean flight corridor from the FT-3 flight test.

Infrastructure: No changes would occur to infrastructure in the over-ocean flight corridor from the FT-3 flight test; therefore, there would be no impacts to infrastructure in the over-ocean flight corridor.

Transportation: Transportation services would be unaffected by the FT-3 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 FT-3 flight test to transportation along the flight path over the open ocean.

Public Health and Safety: The FT-3 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 PSCA would monitor the flight until takeover by RTS range safety as the payload comes into USAG-KA. If the FT-3 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 FT-3 flight test to public health and safety along the flight path over the over-ocean flight corridor.

Hazardous Materials and Wastes: Each of the three 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 FT-3 flight test.

Socioeconomics: The FT-3 flight corridor is at high altitudes where there would be no impacts to socioeconomics from the FT-3 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 FT-3 flight test.

Visual Resources: The FT-3 flight would occur at high altitude where it would be generally undetected by vessels or aircraft. There would be no changes from the FT-3 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 feet. There would be no impacts to marine sediments in the over-ocean flight corridor from the FT-3 flight test.

3.2.1 Air Quality (Pacific Ocean Flight Corridor)

Air Quality

This section describes the baseline conditions within the Pacific BOA over-ocean flight corridor (**Figure 1-1**) that may be affected by the proposed FT-3 flight test.

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 along 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 2013)

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

GHG 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. There are four categories of GHG: carbon dioxide, nitrous oxide, methane, and fluorinated gases (hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride, and nitrogen trifluoride) (USEPA 2019a). Although the dominant GHGs (carbon dioxide, methane, and nitrous oxide) occur naturally in the atmosphere, human activities have increased global GHG atmospheric concentrations. Since the pre-industrial era (i.e., ending about 1750) to 2017, concentrations of carbon dioxide have increased globally by 45 percent (USEPA 2019b). Within the United States, fuel combustion accounted for 76 percent of all carbon dioxide emissions released in 2017 (USEPA 2019b). On a global scale, carbon dioxide emissions from fuel combustion reached 32.8 billion tons in 2017 (International Energy Agency 2019). The Earth's average land and ocean surface temperature has increased by about 1°C (1.8°F) from 1901 to 2016 (EPA 2019b). 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 2019a).

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 0.07°C (0.13°F) per decade since 1880 and at an average rate of 0.17°C (0.32°F) since 1981 (NOAA 2020c). 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 2019a). 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 (USASMDC/ARSTRAT 2014). 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 cm (0.13 in.) per year (NASA 2018).

3.2.1.1 Regulatory Setting (Over-Ocean Flight Corridor)

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*, DODD 6050.7, *Environmental Effects Abroad of Major Department of Defense Actions; and* EO 13693, *Planning for Federal Sustainability in the Next Decade*, which outlines policies to ensure that federal agencies evaluate climate-change risks and vulnerabilities, and to manage the short- and long-term effects of climate change on their operations and mission.

3.2.1.2 Region of Influence – Over-Ocean Flight Corridor

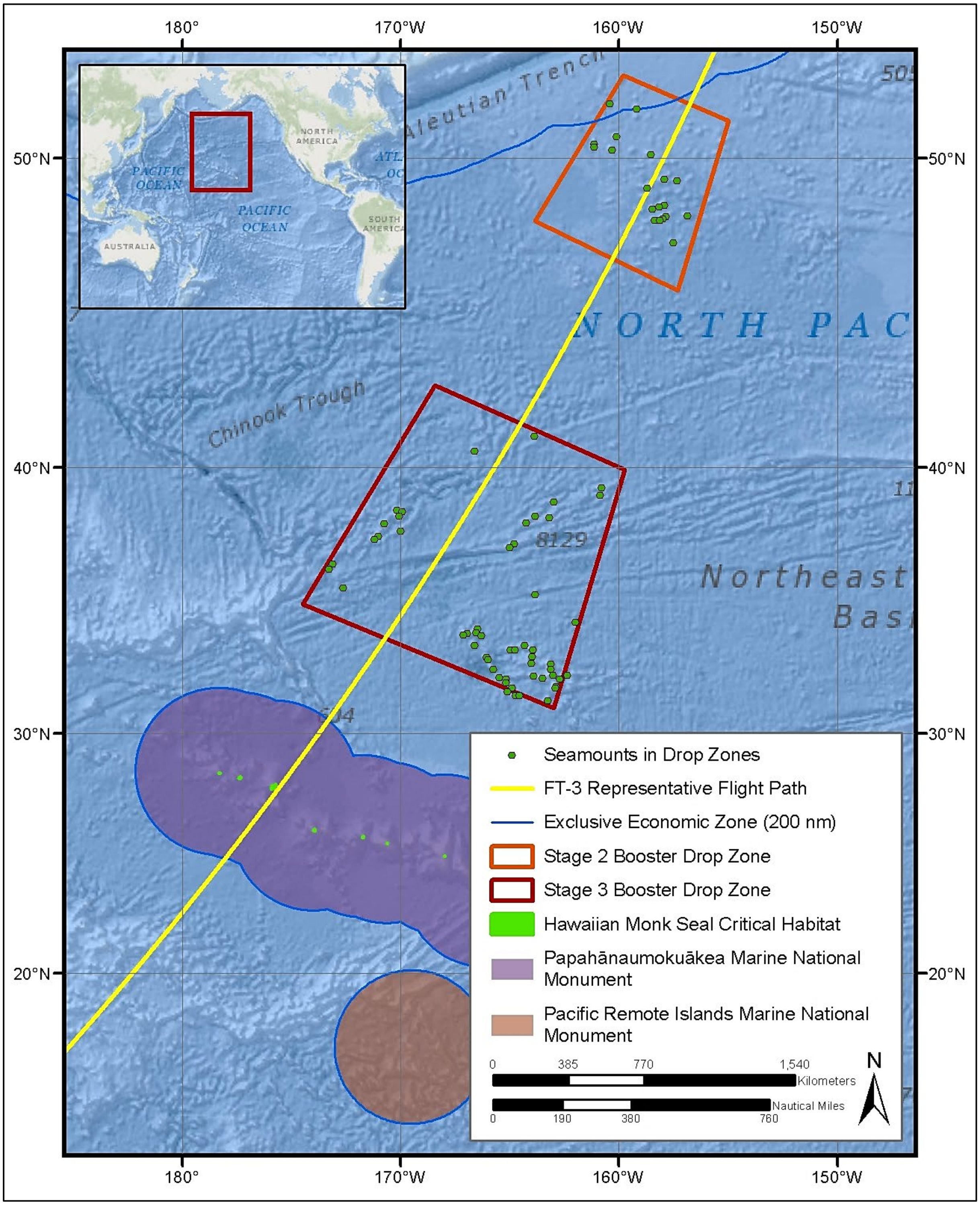
During its flight path, the emissions from the targets and interceptors have the potential to affect air quality in the global upper atmosphere (USASMDC/ARSTRAT 2014).

3.2.2 Biological Resources (Pacific Ocean Flight Corridor)

Biological resources are defined as in **Section 3.1.3**. This section summarizes existing information on biological resources within the affected environment of the Pacific Ocean BOA, specifically those areas subject to FT-3 overflight and splashdown of FT-3 components (**Figure 3-5**), with special emphasis on the presence of any special status species. 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.

3.2.2.1 Regulatory Setting

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). The regulatory requirements under the ESA, MMPA, MBTA, and MSA are described in **Section 3.1.3.1** and apply under the requirements of EO 12114.



Data Sources: Seamounts from Kitchingman and Lai 2004; Basemap Source: Esri World Ocean Base

Figure 3-5. Important Biological Resources in the BOA ROI.

3.2.2.2 Biological Resources in the Pacific Ocean Flight Corridor Region of Influence

The BOA ROI includes the ocean area along the FT-3 flight path that is outside the U.S. EEZ (370 km or 200 nm from the coastline) as well as the stage 2 and 3 booster drop zones. The flight path does include flight over the U.S. EEZ near the Northwest Hawaiian Islands (**Figure 1-1**). However, the Proposed Action would have minimal to no impacts on biological resources in this area and these resources are only briefly described in this EA/OEA. The BOA ROI consists of deep North Pacific Ocean waters with a diversity of pelagic and benthic habitats. Pelagic areas support communities of planktonic (drifting) and nektonic (swimming) marine organisms. Benthic communities vary with depth are made up of marine organisms that live on or near the sea floor such as bottom dwelling fish, mollusks, crustaceans, and echinoderms. The BOA ROI includes a wide range of ocean regions extending from temperate waters of the Gulf of Alaska, through subtropical and tropical waters of the North Central Pacific, to equatorial waters of the RMI. Since minimal to no effects to biological resources are expected for overflight of the FT-3 vehicle in the BOA, this section focuses on biological resources in the stage 2 and 3 booster drop zone (**Figure 3-5**).

The stage 2 and 3 booster drop zone would be in deep oceanic waters of the North Pacific Current, subarctic current, and the subpolar and subtropical gyres. The North Pacific transition zone (between the subtropical and subarctic gyres) varies in location from year to year but is known to be a productive area that provides important habitat and feeding grounds for many pelagic organisms in the North Pacific (Polovina et al. 2017).

3.2.2.2.1 Special Status Marine Wildlife

Given the large extent of the North Pacific covered by the BOA ROI, a large number of special status marine mammal, sea turtle, fish, and seabird species have the potential to occur within this area. **Table 3-6** lists the MMPA and ESA-listed species that are likely to occur in the stage 2 and 3 spent booster drop zone. Other special status species known to occur in the spent booster drop zones such as those listed under the MBTA are discussed in the subsections below. Several special status species may occur in the flight corridor; however, FT-3 vehicle overflight is not expected to affect these species and most are not discussed in this section. It is important to note that special status species are not equally likely to occur in all portions of the BOA ROI and some only occur within the ROI seasonally. Due to the limited potential for the Proposed Action to affect special status marine species in the BOA ROI, detailed species descriptions are not included in this EA/OEA. Detailed descriptions of special status species in the North Pacific can be found in the FT-3 Biological Assessment (U.S. Army 2020) as well as in several other recent documents including the Gulf of Alaska Navy Training Activities Environmental Impact Statement / Overseas Environmental Impact Statement (U.S. Navy 2016), Hawai`i-Southern California Training and Testing EIS (U.S. Navy 2018), and FE-2 Biological Assessment (U.S. Navy 2019a) and are included here by reference.

Table 3-6. MMPA and ESA Listed Species with the Potential to Occur within the Stage 2 and 3 Booster Drop Zones in the BOA

Common Name	Scientific Name	Federal Listing Status	Occurrence in Stage 2 and 3 Drop Zone
Fishes			
Oceanic giant manta ray	*Manta birostris*	T	Potential
Sea Turtles			
Loggerhead turtle – North Pacific Ocean DPS	*Caretta caretta*	E	Likely
Green turtle – North Pacific DPS	*Chelonia mydas*	T	Potential
Leatherback turtle	*Dermochelys coriacea*	E	Likely
Hawksbill turtle	*Enetmochelys imbricata*	E	Potential
Olive ridley turtle	*Lepidochelys olivacea*	T[1]	Potential
Birds			
Hawaiian petrel	*Pterodroma sandwichensis*	E, MBTA	Likely
Short-tailed albatross	*Phoebastria albatrus*	E, MBTA	Likely
Cetaceans			
Minke whale	*Balaenoptera acutorostrata*	MMPA	Likely
Sei whale	*B. borealis*	E, MMPA-Depleted	Likely
Bryde's whale	*B. edeni*	MMPA	Potential
Blue whale	*B. musculus*	E, MMPA-Depleted	Likely
Fin whale	*B. physalus*	E, MMPA-Depleted	Likely
Baird's beaked whale	*Berardius bairdii*	MMPA	Likely
Short-beaked common dolphin	*Delphinus delphis*	MMPA	Potential
Gray whale	*Eschrichtius robustus*		
Eastern Pacific DPS		MMPA	Potential
Western North Pacific DPS		E, MMPA-Depleted	Potential
North Pacific right whale	*Eubalaena japonica*	E, MMPA-Depleted	Potential
Pygmy killer whale	*Feresa attenuata*	MMPA	Potential
Short-finned pilot whale	*Globicephala macrorhynchus*	MMPA	Likely
Risso's dolphin	*Grampus griseus*	MMPA	Potential
Pygmy sperm whale	*Kogia breviceps*	MMPA	Potential
Dwarf sperm whale	*K. sima*	MMPA	Potential
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*	MMPA	Likely
Northern right whale dolphin	*Lissodelphis borealis*	MMPA	Likely
Humpback whale[2]	*Megaptera novaeangliae*		
Hawai`i DPS[2]		MMPA	Likely
Mexico DPS[2]		T, MMPA-Depleted	Potential
Western North Pacific DPS[2]		E, MMPA-Depleted	Potential
Hubbs' beaked whale	*Mesoplodon carlhubbsi*	MMPA	Potential
Blainville's beaked whale	*M. densirostris*	MMPA	Potential
Ginkgo-toothed beaked whale	*M. ginkgodens*	MMPA	Potential

Common Name	Scientific Name	Federal Listing Status	Occurrence in Stage 2 and 3 Drop Zone
Stejneger's beaked whale	*M. stejnegeri*	MMPA	Potential
Killer whale	*Orcinus orca*	MMPA-Depleted	Likely
Dall's porpoise	*Phocoenoides dalli*	MMPA	Likely
Sperm whale	*Physeter macrocephalus*	E, MMPA-Depleted	Likely
False killer whale	*Pseudorca crassidens*	MMPA-Depleted[2]	Potential
Striped dolphin	*Stenella coeruleoalba*	MMPA	Potential
Rough-toothed dolphin	*Steno bredanensis*	MMPA	Potential
Bottlenose dolphin	*Tursiops truncatus*	MMPA-Depleted	Potential
Cuvier's beaked whale	*Ziphius cavirostris*	MMPA	Likely
Pinnipeds			
Northern fur seal	*Callorhinus ursinus*	MMPA-Depleted	Likely
Northern elephant seal	*Mirounga angustirostris*	MMPA	Likely

Notes:

[1] The olive ridley turtle is listed as threatened throughout its range except for the Mexican Pacific Coast nesting population which is listed as endangered. Olive ridley turtles in the ROI likely do not belong to the endangered east Pacific Coast nesting population (NMFS and USFWS 2014).

[2] Humpback whales in the ROI may include whales from three DPSs (Barlow et al. 2011, Bettridge et al. 2015, Calambokidis et al. 2001). Humpback whales feeding in the Gulf of Alaska may being from the Hawai`i DPS (89%), the Mexico DPS (10.5%), and the Western North Pacific DPS (0.5%; Wade et al. 2016) and it is assumed the same DPSs may be represented in the ROI.

Abbreviations: DPS = Distinct Population Segment, ESA = Endangered Species Act; MMPA = Marine Mammal Protection Act; MBTA = Migratory Bird Treaty Act; E = ESA endangered; T = ESA threatened

Invertebrates. There are a diversity of pelagic and benthic habitats for invertebrates in the BOA ROI. Waters beyond the EEZs are usually beyond the continental shelves and are mostly very deep waters (1,000–6,000 m [3,300–19,700 ft] 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 deep-water benthic and pelagic invertebrates are likely to occur in the Pacific Ocean BOA, the density and distribution of these organisms are largely unknown.

Fish. Due to the large size of the BOA, 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. Areas of the central North Pacific such as the North Pacific Transition Zone and seamounts are known to be biological hotspots, due to dynamic ocean conditions and currents. Periodic disturbances in these areas create locally elevated areas of primary production, which attract large numbers of fish and apex predators such as sharks and rays. However, the magnitude and frequency of these disturbances varies significantly interannually (Palacios et al. 2006). The major fisheries in the central North Pacific include several tuna species, marlin, swordfish, sharks, dolphinfish, and wahoo (*Acanthocybium solandri*; Lawseth 2007). The ESA-listed oceanic giant manta ray has the potential to occur in the stage 3 booster drop zone. A detailed description of this ESA-listed species is included in the FT-3 Biological Assessment (U.S. Army 2020) and is incorporated here by reference.

Sea Turtles. Sea turtles spend most of their lives in the open ocean (NOAA 2020b). Five species of sea turtle occur in the Pacific Ocean, and all are listed as endangered or threatened under the ESA (NOAA 2020b) and have the potential to occur in the ocean under the vehicle flight path. Two of these species are likely to occur in the stage 2 and 3 booster drop zones of the BOA: loggerhead turtle and leatherback turtle (**Table 3-6**). Detailed descriptions of these ESA-listed species are included in the FT-3 Biological Assessment (U.S. Army 2020) and are incorporated here by reference.

Birds. There are approximately 160 species of pelagic seabirds found in the North Pacific Ocean (Drew and Piatt 2015). Some seabirds known to occur in the temperate North Pacific and the BOA include trans-Pacific species such as short-tailed albatross (*Phoebastria albatrus*), black-footed albatross (*P. nigripes*), Laysan albatross (*P. immutabilis*), Leach’s storm-petrel (*Oceanodroma leucorhoa*), and Pomarine jaeger (*Sterocorarius pomarinus*); and birds of the central and southern transition zones such as Stejneger’s petrel (*Pterodroma longirostris*), Pycroft’s petrel (*P. pycrofti*), Bulwer’s petrel (*Bulweria bulwerii*), Bonin petrel (*P. hypoleuca*), sooty tern (*Onychoprion fuscatus*), wedge-tailed shearwater (*Ardenna pacifica*), Leach’s storm petrel (*Oceanodroma leucorhoa*), red-tailed tropicbird (*Phaethon rubricauda*), and Northern fulmar (*Fulmarus glacialis*) (Drew and Piatt 2015, Gould 1974, King 1974, Crossin 1974, Sanger 1974, Robbins and Rice 1974, Springer et al. 1999, Thorne et al. 2015). All of these seabirds are migratory birds protected under the MBTA. At-sea distributions of seabirds are largely unknown, however, their occurrences in the open ocean are highest during the nonbreeding season, which varies among species, and is also affected by ocean conditions and prey availability (Drew and Piatt 2015). Two ESA-listed birds have the potential to occur in the stage 2 and 3 booster drop zones (**Table 3-6**): short-tailed albatross and Hawaiian petrel (*Pterodroma sandwichensis*). The ESA-listed band-rumped storm-petrel (*Oceanodroma castro*) and Newell’s shearwater (*Puffinus auricularis newelli*) may also occur under the vehicle flight path; however, vehicle overflight would not impact these species and they are not discussed further. Detailed descriptions of these ESA-listed species and their distributions are included in the FT-3 Biological Assessment (U.S. Army 2020) and are incorporated here by reference.

Marine Mammals. Several species of cetaceans and pinnipeds have been documented in the Northcentral North Pacific where the spent stage 2 and 3 boosters would splash down. While this area of the North Pacific has a relatively low marine mammal species diversity in general (Kaschner et al. 2011), it also provides very important and productive habitat for several special status marine mammal species. There are 13 cetacean species and two pinniped species that are likely to occur in the stage 2 and 3 booster drop zone (**Table 3-6**). Fourteen other cetacean species are considered to have the potential to occur in the drop zone as they have limited range overlap with this area and if present likely have very low densities for most of the year. All marine mammal species in the ROI are protected under MMPA, and five species with the potential to occur in the drop zone are listed under the ESA (**Table 3-6**). Detailed descriptions of the ESA-listed species and their distributions are included in the FT-3 Biological Assessment (U.S. Army 2020) and are incorporated here by reference.

Three pinnipeds have the potential to occur in the BOA: northern fur seal, northern elephant seal, and Hawaiian monk seal (*Neomonachus schauinslandi*). Northern fur seals and elephant seals are both species that forage at sea and are likely to occur in the stage 2 and 3 booster drop zones seasonally (**Table 3-6**). Northern elephant seals are known to frequent the North Pacific Transition Zone, especially during the summer and autumn (Robinson et al. 2012). Northern fur seals also spend the majority of the year at-sea where they may concentrate around oceanographic features with high prey availability (NOAA 2020b). 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 are known to forage in offshore areas up to 700 km (378 nm) from the Hawaiian Islands but spend the majority of their time close to shore in waters less than 90 m (300 ft) deep (NMFS 2011) and are very unlikely to occur in the spent booster drop zones.

3.2.2.2.2 Environmentally Sensitive Habitats

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). Designated critical habitats and protected areas in the vicinity of the PSCA ROI are discussed in this section as well as EFH in the ROI.

Critical Habitats. No designated critical habitat or other environmentally sensitive habitat occurs within the booster drop zones. The flight path crosses over designated critical habitat for the Hawaiian monk seal. Critical habitat for the Hawaiian monk seal includes terrestrial areas used for pupping, nursing, and haul-out as well as marine habitat within 10 m (33 ft) of the seafloor out to the 200 m (656 ft) depth contour (80 FR 50925 [August 21, 2015]). This critical habitat includes areas around the main Hawaiian Islands and the Northwestern Hawaiian Islands. While the FT-3 vehicle flight path would cross the Northwestern Hawaiian Islands, no part of the Proposed Action would impact Hawaiian monk seal critical habitat and it is not discussed further in this EA/OEA.

Marine Protected Areas. The flight path would cross over the Papahānaumokuākea Marine National Monument (**Figure 3-5**). 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 2019c). No part of the Proposed Action would impact this Marine National Monument and it is not discussed further in this EA/OEA.

Seamounts. A number of seamounts are located within the stage 2 and 3 booster drop zones (**Figure 3-5**). Seamounts are underwater bathymetric features comparable to terrestrial mountains. Seamounts are known to be areas which create biological hotspots by altering the flow of water above them which creates upwelling of cold, nutrient-rich waters and by providing sessile fauna with hard substrates for attachment (Morgan et al. 2015, Nishizawa et al. 2015). Studies of the Emperor Seamount chain, which spans from the Aleutian Trench to the northwestern Hawaiian Islands, indicate that seamounts in the North Pacific Ocean are ecologically and commercially important areas (Morgan et al. 2015, Nishizawa et al. 2015, Miyamoto and Kiyota 2017, McClain et al. 2010). Seamounts in the North Pacific Ocean support commercial fisheries that target bottomfish such as North Pacific armorhead (*Pseudopentaceros wheeleri*) and splendid alfonsino (*Beryx splendens*) (Miyamoto and Kiyota 2017). The productive waters associated with these seamounts also help support populations of seabirds like the Laysan albatross and black-footed albatross, which tend to forage and aggregate around seamounts due to higher prey density (Nishizawa et al. 2015).

3.2.3 Water Resources (Pacific Ocean Flight Corridor)

The general composition of the ocean includes water, sodium chloride, dissolved gases, minerals, and nutrients (USASMDC/ARSTRAT 2014). These characteristics determine and direct the interactions between the seawater and its inhabitants. The most important physical and chemical properties are salinity, density, temperature, pH, and dissolved gases (USASMDC/ARSTRAT 2014). For oceanic waters, the salinity is approximately 35 parts of salt per 1,000 parts of seawater (USFWS 2019). Most organisms have a distinct range of temperatures in which they may thrive. A greater number of species live within the moderate temperature zones, with fewer species tolerant of extremes in temperature.

Surface seawater often has a pH between 8.1 and 8.3 (slightly basic), but generally is very stable with a neutral pH (USASMDC/ARSTRAT 2014). The amount of oxygen present in seawater varies with the rate of production by plants, consumption by animals and plants, bacterial decomposition, and surface interactions with the atmosphere (USASMDC/ARSTRAT 2014). Most organisms require oxygen for their life processes. Carbon dioxide is 60 times more concentrated in seawater than it is in the atmosphere.

Ocean Zones

Classification of the Pacific Ocean zones is based on depth and proximity to land. Using this methodology, there are four major divisions or zones in the ocean: the littoral zone, the coastal zone, the offshore zone, and the pelagic zone. Spanning across all zones is the benthic environment, or sea floor. This section discusses the pelagic zone and the benthic environment.

The pelagic zone is commonly referred to as the open ocean. The organisms that inhabit the open ocean typically do not come near land, continental shelves, or the seabed. Approximately 2 percent of marine species live in the open ocean.

The bottom of the sea floor is known as the benthic area. It comprises 98 percent of the species of animals and plants in the ocean (USASMDC/ARSTRAT 2014). Less than 1 percent of benthic species live in the deep ocean below 2000 m (6,562 ft) (USASMDC/ARSTRAT 2014).

3.3 U.S. Army Garrison–Kwajalein Atoll

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, Greenhouse Gases, and Climate Change: Because of the relatively small numbers and types of local air-pollution sources, the dispersion caused by trade winds, and the lack of topographic features that inhibit dispersion, air quality at USAG-KA is considered good. The primary activities at USAG-KA contributing to air pollution are combustion sources that produce particulates, nitrous oxide, sulfur dioxide, carbon monoxide, and hydrocarbon emissions (UES§1-5.3, 2016). Most of these sources are located on Kwajalein Islet and are regulated under the current version Air Emissions from Major, Synthetic Minor, and Industrial Boiler Stationary Sources Document of Environmental Protection 2013 (Air DEP-11-001.0. 2013). There are no ongoing, regulated primary air emission activities at Illeginni Islet or in the BOA proposed impact locations, and there would be no change to air emissions on Kwajalein from the Proposed Action.

The developmental payload would not emit HAPs during flight or impact in USAG-KA, and no major stationary emission sources would be involved or affected. Fugitive dust from a land impact would be temporary and quickly dispersed by trade winds. Prior to debris recovery at Illeginni Islet, the area would be wetted with freshwater to minimize fugitive dust. Although global sea level is documented to be rising based on climate change and the islands within USAG-KA are of low elevations, the subtle effects of rising sea level and climate change would not affect the single flight test within a year after signing of the FONSI/FONSH, if approved, nor would the FT-3 flight test affect climate change. No impacts to air quality, GHGs, or climate change would be expected from the FT-3 flight test.

Water Resources: Illeginni Islet has no surface water; groundwater is very limited in quantity and is saline and non-potable. Freshwater used to minimize fugitive dust following impact would not be allowed to flow to the lagoon or ocean and would evaporate in place. In the unlikely event of an accidental release of a hazardous material or petroleum product at the impact site, emergency response personnel would comply with the UES KEEP. An FE-2 post-test survey and sampling report described pre-test and post-test groundwater results for uranium, beryllium, and tungsten at seven wells (RGNext 2020). The pre-and post-test sampling showed little variation in values, with beryllium remaining undetected, tungsten exceeding residential tap water screening levels, and uranium well below the USEPA maximum contaminant level for drinking water. **Table 2-2** includes tungsten in the payload structure for this flight test. The FT-3 vehicle would contain about 10 percent as much tungsten as analyzed for FE-2. Groundwater at Illeginni is currently considered non-potable and no impacts to water resources would be expected.

Cultural: For a land impact, the FT-3 flight test is proposed to occur on the west end of Illeginni Islet. Archaeological surveys have not found indigenous cultural materials or evidence of subsurface deposits on the Islet. The Cold War-era properties potentially eligible for listing on the RMI National Register of Historic Places are located in the central and eastern portions of the

Islet. Because a land impact would not occur in proximity to known or potential cultural resources on Illeginni Islet, implementation of the Proposed Action would not result in impacts to cultural resources.

Geological Resources: There would be no mining or quarrying and little, if any, surface disturbance during the placement of equipment prior to the flight test. While a temporary crater would be created at impact on Illeginni Islet, the crater would be refilled with ejecta and the site topography restored. For a deep-water impact, there would be no marine sediment disturbance beyond the settling of the payload as it comes to rest on the sea floor after splashing into the ocean at impact and sinking thousands of feet. For an Illeginni Islet impact, some ejecta may be thrown into shallow waters. No impact would occur to geological resources from the FT-3 flight test.

Land Use: No changes to land use would occur from the FT-3 flight test. Illeginni Islet has served as the flight termination site for numerous missile test flights. The FT-3 flight test activities are consistent with the RTS mission and are well within the limits of current operations of RTS and USAG-KA.

Airspace: Illeginni Islet and the two BOA locations are located under international airspace and, therefore, have no formal airspace restrictions governing them. No new special use airspace would be required, expanded, or altered for the FT-3 flight test. Local airport operations would not be affected. Commercial and private aircraft would be notified through FAA NOTAMs in advance of the launch at the request of RTS as part of their routine operations. Flight operations would be conducted in accordance with Western Range and RTS procedures. There would be no impacts to airspace from the FT-3 flight test.

Infrastructure: There would be no changes and, therefore, no impacts to infrastructure at USAG-KA. The Proposed Action represents activities that are consistent with the mission and well within the limits of current operations of RTS and USAG-KA.

Transportation: Transportation services would be unaffected by the FT-3 flight test at Kwajalein Atoll. Public NOTAMs and NTMs would be issued along the flight path to protect the safety of aircraft and vessels. The payload would impact at Illeginni Islet where there is no resident population to ensure, along with the public notices, that there would be no unauthorized vessels or aircraft in the vicinity. Transport of FT-3 flight test materials, equipment and personnel to and from USAG-KA and the impact site would occur using existing transportation methods. The flight test activities are consistent with the mission and well within the limits of current operations of RTS and USAG-KA. There would be no impacts from the FT-3 flight test to transportation at Kwajalein Atoll.

Socioeconomics: Use of USAG-KA by the U.S. Army is maintained under the Military Use and Operating Rights Agreement and Compact of Free Association, with lease payments made to the Marshallese government. The current lease is valid through 2066 with an additional option through 2086 (U.S. Department of State 2019). Personnel conducting the FT-3 flight test would reside only temporarily at USAG-KA, and the flight test would not employ any Marshallese citizens or contribute to the local Marshallese economy. There currently is no resident population at Illeginni Islet (U.S. Department of Interior 2012). Therefore, there would be no impacts to socioeconomics from the FT-3 flight test.

Environmental Justice: Illeginni Islet does not include any population centers; there currently is no resident population at Illeginni Islet (U.S. Department of Interior 2012). Therefore, there would be no disproportionate impacts from the FT-3 flight test to minority populations and low-income populations as defined under EO 12898.

Visual Resources: There would be no changes to and, therefore, no impacts to the visual aesthetics at USAG-KA from the FT-3 flight test. While a temporary crater would be created at impact on Illeginni Islet, the crater would be refilled with ejecta and the site topography restored.

3.3.1 Biological Resources (USAG-KA)

Biological resources are defined as in **Section 3.1.3**. This section summarizes existing information on biological resources within the affected environment at USAG-KA, specifically those areas subject to pre- and post-flight operations, FT-3 payload overflight, and payload impact. Biological resources are summarized separately for Illeginni Islet (the proposed impact location) and for the deep-water impact locations southwest and northeast of Kwajalein Atoll (alternative impact locations). These sections focus on the presence of any special status species in the ROI, including species considered coordination or consultation species under the UES. Consultation species have been described in detail and the effects of the Proposed Action on these species have been evaluated in the FT-3 Biological Assessment (U.S. Army 2020). 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.

3.3.1.1 Regulatory Setting

The Compact of Free Association between the RMI and the United States (48 USC § 1921) requires all U.S. Government activities at USAG-KA and all DOD and RTS activities in the RMI to conform to specific compliance requirements, coordination procedures, and environmental standards identified in the UES. As specified in Section 2-2 of the UES, these standards also apply to all activities occurring in the territorial waters of the RMI. The proposed FT-3 test, which could affect Illeginni Islet, the deep-water region southwest of Illeginni Islet, or the deep ocean waters northeast of USAG-KA, must comply with the UES (USASMDC/ARSTRAT 2018).

In this section, special status species at USAG-KA are those species protected under the UES, specifically UES Section 3-4. The standards in Section 3-4 of the UES were derived primarily from 50 CFR, Sections (§§) 17, 23, 402, 424, and 450-452, which includes species listed as threatened or endangered under the ESA, species protected under the MMPA, and species protected under the MBTA. The regulatory setting under the ESA, MMPA, and MBTA are described in detail in **Section 3.1.3.1** including relevant definitions under these Acts.

The UES provides protection for the following categories of biological resources occurring within the Marshall Islands, including RMI territorial waters:

- Any threatened or endangered species listed under the U.S. ESA;
- Any species proposed for designation or candidates for designation to the endangered species list in accordance with the U.S. ESA;
- All species designated by the RMI under applicable RMI statutes, such as the RMI Endangered Species Act of 1975, Marine Mammal Protection Act of 1990, Marine Resources (Trochus) Act of 1983, and the Marine Resources Authority Act of 1989;
- Marine mammals designated under the U.S. Marine Mammal Protection Act of 1972;
- Bird species pursuant to the Migratory Bird Treaty Act (MBTA); and
- Species protected by the Convention on International Trade in Endangered Species (CITES), or mutually agreed on by USAG-KA, USFWS, NMFS, and the RMI Government as being designated as protected species.

Under the UES, any action carried out at USAG-KA must be reviewed to determine if the action may affect UES listed species. If consultation is necessary, the USFWS and NMFS are responsible for completing consultations. In compliance with Section 3-4 of the UES, a Biological Assessment has been prepared for the FT-3 Action (U.S. Army 2020). The U.S. Army has transmitted the Biological Assessment to NMFS and USFWS and consulted with NMFS and USFWS under Section 3-4 of the UES (**Appendix A**).

3.3.1.2 Region of Influence Illeginni Islet (Proposed Impact Location)

For the purposes of this EA/OEA, biological resources at Illeginni Islet are those that have the potential to be in the area subject to direct contact, exposure to hazardous chemicals, exposure to elevated noise levels, or exposure to human activity and equipment operation during Proposed Action activities. The ROI includes the proposed payload impact location on Illeginni Islet (**Figure 3-6**) as well as shallow nearshore marine waters around Illeginni Islet. Deeper offshore waters of Kwajalein Atoll which may be subject to vessel traffic and elevated noise levels are discussed in **Section 3.3.1.3**. Biological resources in the Illeginni Islet ROI for the Proposed Action were recently described in the FE-2 EA/OEA (U.S. Navy 2019b). The status of biological resources in the Illeginni Islet ROI as described in the FE-2 EA/OEA (U.S. Navy 2019b) remains the best available information for the ROI and is incorporated here by reference. This section provides a brief summary of biological resources in the ROI, but detailed species descriptions and occurrence information can be found in the FE-2 EA/OEA (U.S. Navy 2019b) and in the FT-3 Biological Assessment (U.S. Army 2020).

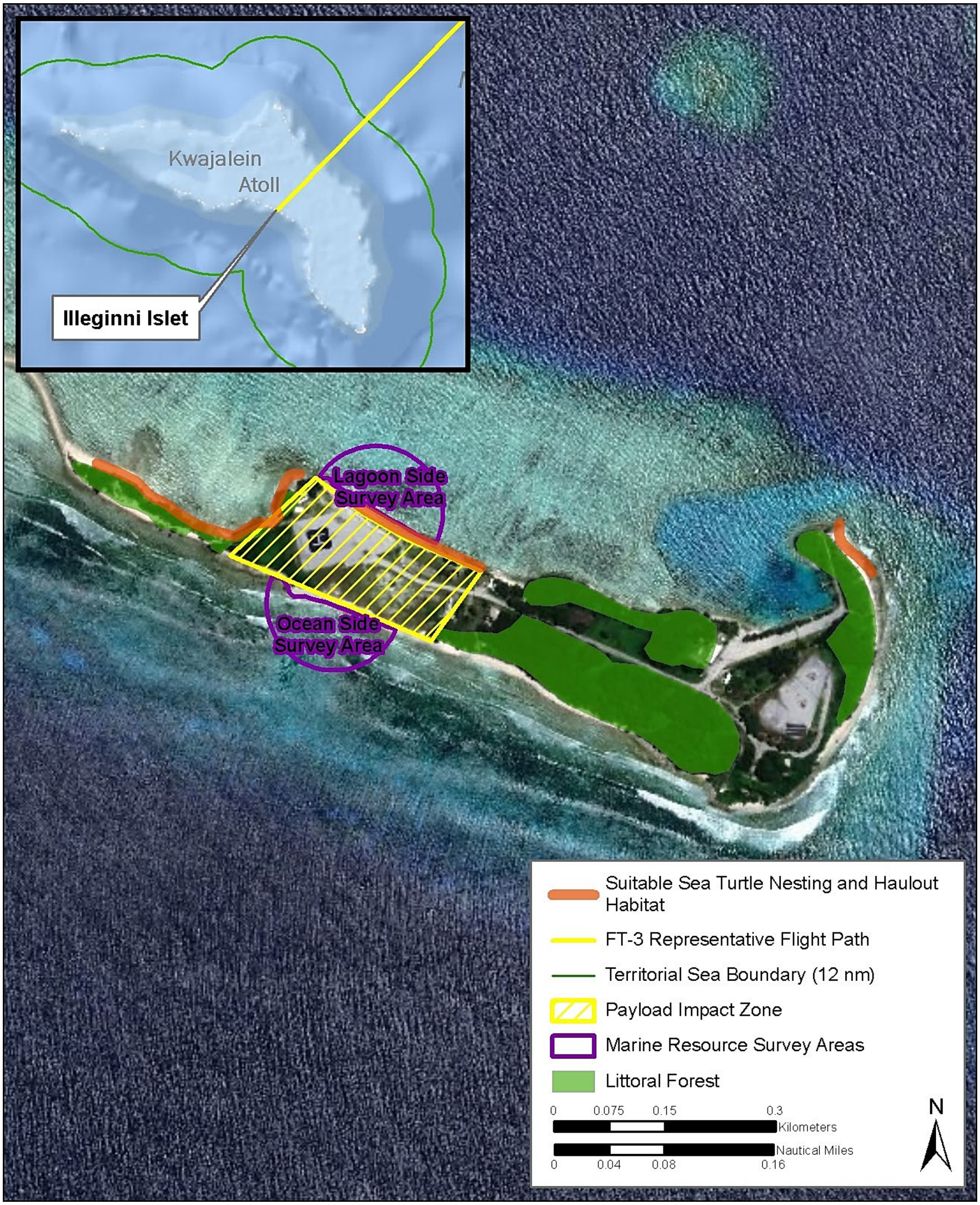


Figure 3-6. Terrestrial Habitats and Marine Survey Areas at Illeginni Islet.

3.3.1.2.1 Terrestrial Vegetation

Vegetation on Illeginni Islet is previously disturbed and managed on much of the western end of the islet, including the payload impact zone (U.S. Navy 2019b). The only native vegetation present on the islet consists of a patch of herbaceous vegetation and three patches of littoral (near shore) forest (U.S. Navy 2019b; **Figure 3-6**). No special status vegetation species occur on Illeginni Islet.

3.3.1.2.2 Terrestrial Wildlife

Sea Turtles. Suitable sea turtle haulout and nesting habitat exists on the northwestern and eastern beaches of Illeginni Islet (U.S. Navy 2019b; **Figure 3-6**). However, no sea turtle nests or nesting activity has been observed on Illeginni Islet in over 20 years (U.S. Navy 2019b). Green and hawksbill turtles are known to use the nearshore waters of Illeginni Islet, but it is unlikely that sea turtles will haul out or nest on Illeginni Islet (U.S. Navy 2019b).

Birds. At least 14 species of protected migratory and resident seabirds and shorebirds have been seen breeding, roosting, or foraging on Illeginni Islet (**Table 3-7**) during biological inventories conducted by the USFWS and NMFS (USFWS and NMFS 2012). A number of shorebirds use the littoral forest, littoral shrub, and managed vegetation throughout the islet's interior, including white terns (*Gygis alba*) and black noddies (*Anous minutus*) (**Figure 3-6**; USFWS and NMFS 2012). Other species such as the great crested tern (*Thalasseus bergii*) and black-naped tern (*Sterna sumatrana*) roost on the shoreline embankment and exposed inner reef (USFWS and NMFS 2012). Black-naped tern are known to nest in the vicinity of the proposed impact area (U.S. Navy 2019b, Fry 2017). All of these migratory and resident birds are protected under the MBTA and are considered coordination species under the UES. There are no known UES-consultation bird species present on Illeginni Islet.

Table 3-7. Birds Known to Occur on Illeginni Islet.

Common Name	Scientific Name	Common Name	Scientific Name
Brown noddy	*Anous stolidus*	Godwit sp.	*Limosa* sp.
Black noddy	*A. minutus*	Whimbrel	*Numenius phaeopus*
Ruddy turnstone	*Arenaria interpres*	Bristle-thighed curlew	*N. tahitiensis*
Pacific reef heron	*Egretta sacra*	Black-naped tern	*Sterna sumatrana*
Great frigatebird	*Fregata minor*	Great crested tern	*Thalasseus bergii*
White tern	*Gygis alba*	Gray-tailed tattler	*Tringa brevipes*
Pacific golden plover	*Pluvialis fulva*	Wandering tattler	*T. incana*

Source: USFWS and NMFS 2012

3.3.1.2.3 Marine Vegetation

Marine habitats around Illeginni Islet include both lagoon-side and ocean-side reef flats, crests, and slopes that provide habitat for a number of macroalgae species (U.S. Navy 2019b, NMFS and USFWS 2017). The only special status algae species known to occur in the ROI is seagrass (*Halophila gaudichaudii*) which is listed as a coordination species under the UES (U.S. Navy

2019b). Seagrass forms dense beds in Illeginni Harbor, as well as down the slopes in and near the harbor entrance (NMFS and USFWS 2017).

3.3.1.2.4 Marine Wildlife

This section focuses on marine wildlife in shallow-water habitats near Illeginni Islet. Wildlife in deeper offshore waters of Kwajalein Atoll which may be subject to elevated sound levels and vessel traffic are discussed in **Section 3.3.1.3.1**. The marine environment surrounding Illeginni Islet supports a diverse community of fishes, corals, and other invertebrates. In general, coral cover and invertebrate diversity is moderate to high on the lagoon-side reef crests and slopes and relatively high on ocean-side reef flats and ridges (U.S. Navy 2019b).

Invertebrates. A diverse invertebrate community exists in the shallow waters near Illeginni Islet that is typical of reef ecosystems in the tropical insular Pacific (U.S. Navy 2019b). Typical benthic invertebrates include sea anemones, sponges, corals, sea stars, sea urchins, worms, bivalves, crabs, and many more (U.S. Navy 2019b). Within the benthic invertebrate community are many coral and mollusk species that are protected as consultation or coordination species under the UES (U.S. Navy 2019b, USASMDC/ARSTRAT 2018). In 2014, NMFS surveyed the reef areas adjacent to the payload impact area at Illeginni Islet (**Figure 3-6**) (NMFS-PIRO 2017a and 2017b, U.S. Navy 2019b). These surveys still represent the best available data on the invertebrate assemblages in these nearshore areas and are described in detail in the FE-2 EA/OEA (U.S. Navy 2019b).

Overall, NMFS recorded 36 UES coordination coral species and 7 UES consultation corals in these nearshore marine survey areas (for a full list of species see Table 3-12 in U.S. Navy 2019b); NMFS-PIRO 2017a and 2017b). Other corals species exist in the reefs surrounding other USAG-KA islets and may occur in other reefs around Illeginni Islet as described in the FE-2 EA/OEA (U.S. Navy 2019b) and the FT-3 Biological Assessment (U.S. Army 2020). However, these are the only species likely to occur offshore of the payload impact area (U.S. Navy 2019b). All of these species are relatively widespread in Kwajalein Atoll, with known occurrence in reefs at the majority of surveyed USAG-KA islets (U.S. Navy 2019b).

During 2014 surveys, NMFS recorded three UES consultation mollusk species (*Tectus niloticus*, *Hippopus hippopus*, and *Tridacna squamosa*) and three UES coordination species (*Tridacna maxima*, *Lambis lambis*, and *L. truncata*) offshore of the proposed payload impact area (NMFS-PIRO 2017a and 2017b). These species are the only species likely to be in the ROI; however, two other consultation species (*Tridacna gigas* and *Pinctada margaritifera*) have been recorded elsewhere at Illeginni Islet reefs and potentially occur in the ROI (U.S. Navy 2019b). All of these special status mollusk species are relatively widespread in Kwajalein Atoll, with known occurrence in reefs at the majority of surveyed USAG-KA islets (see Table 3-13 in U.S. Navy 2019b).

Sponges are ubiquitous on the seafloor in the ROI at all depths but are most common on hard bottom or reef substrates (U.S. Navy 2019b). The sponges that inhabit coral reefs of the RMI are generally found throughout the tropical Indo-Pacific region. All artificially planted or cultivated sponges (phylum Porifera) within the RMI are afforded protection under the RMI Marine Resources Act and are protected under the UES (USASMDC/ARSTRAT 2018, U.S. Navy 2019b). However, no cultivated sponges are known to occur in the shallow waters near Illeginni Islet (U.S. Navy 2019b).

In addition to the adults of these species, larvae and gametes of many of these marine invertebrates may be found in the ROI. Gamete and larval densities would be expected to range from high (during the reproductive season) to very low (out of season). Additional information about coral and mollusk reproduction, as well as threats to these species, is detailed in the FE-2 EA/OEA (U.S. Navy 2019b) and the FT-3 Biological Assessment (U.S. Army 2020) included here by reference.

Fish. A diversity and abundance of reef-associated fishes are found in the shallow waters near Illeginni Islet (U.S. Navy 2019b) and have been recorded during biological inventories of USAG-KA islets. During the 2014 NMFS surveys of the nearshore areas adjacent to the proposed payload impact area (**Figure 3-6**), 45 fish species were recorded in the ocean-side survey area and 40 species in the lagoon-side survey area (NMFS-PIRO 2017a). The most abundant fish included Atherinid sp., *Chrysiptera brownriggii, Stethojoulis bandanensis, Halichoeres trimuculatus, H. margaritaceus,* and *Thalassoma quinquevittatum* (NMFS-PIRO 2017a). No UES consultation species were observed during these surveys. However, reef fish can be highly mobile species and the humphead wrasse (*Cheilinus undulatus*) and a *Manta* sp. may occur in nearshore waters (**Table 3-8**). Additional information about the occurrence and abundance of the humphead wrasse and manta ray species near Illeginni Islet can be found in the FE-2 EA/OEA (U.S. Navy 2019b) and the FT-3 Biological Assessment (U.S. Army 2020) included here by reference.

Sea Turtles. Only the green turtle and hawksbill turtle are known to occur in the waters of the RMI (U.S. Navy 2019b). Green turtles are more common, while hawksbills are considered rare (U.S. Navy 2019b, Maison et al. 2010). Sea turtles have been observed fairly regularly during biological inventories at Illeginni Islet (U.S. Navy 2019b, U.S. Army 2020). Dense seagrass beds in and near Illeginni harbor (NMFS and USFWS 2017) may provide valuable foraging habitat for green turtles. Both of these species are considered likely to occur in both nearshore waters of Illeginni and in deeper offshore waters. Additional information about sea turtle occurrence data and the threats to sea turtles in the ROI can be found in the FE-2 EA/OEA (U.S. Navy 2019b) and the FT-3 Biological Assessment (U.S. Army 2020) included here by reference.

Table 3-8. UES Consultation (Bold) and Coordination Fishes, Sea Turtles, and Marine Mammals Known or with the Potential to Occur in the USAG-KA ROI near Illeginni Islet and in Deeper Offshore Waters.[1]

Common Name	Scientific Name	ESA Listing Status	Likelihood of Occurrence in Nearshore Waters	Likelihood of Occurrence in Deeper Offshore Waters
Fishes				
Bigeye thresher shark	***Alopias superciliosus***		**-**	**P**
Oceanic whitetip shark	***Carcharhinus longimanus***	**T**	**-**	**P**
Humphead wrasse	***Cheilinus undulatus***		**L**	**-**
Reef manta ray	***Manta alfredi***		**L**	**-**
Oceanic giant manta ray	***M. birostris***	**T**	**-**	**L**
Giant coral trout	*Plectropomus laevis*		L	-
Scalloped hammerhead shark	***Sphyrna lewini***	**T**	**-**	**P**
Pacific bluefin tuna	***Thunnus orientalis***		**-**	**P**
Sea Turtles				
Green turtle	***Chelonia mydas***	**T**	**L**	**L**
Hawksbill turtle	***Enetmochelys imbricata***	**E**	**P**	**L**
Marine Mammals				
Minke whale	***Balaenoptera acutorostrata***		**-**	**L**
Sei whale[1]	*B. borealis*	E	-	P
Bryde's whale	***B. edeni***		**-**	**L**
Blue whale	***B. musculus***	**E**	**-**	**L**
Fin whale	***B. physalus***	**E**	**-**	**L**
Short-beaked common dolphin	***Delphinus delphis***		**-**	**L**
Pygmy killer whale	***Feresa attenuata***		**-**	**P**
Short-finned pilot whale	***Globicephala macrorhynchus***		**-**	**L**
Risso's dolphin	***Grampus giseus***		**-**	**P**
Pygmy sperm whale	***Kogia breviceps***		**-**	**P**
Humpback whale	***Megaptera novaeangliae***	**E**	**-**	**L**
Blainville's beaked whale	***Mesoplodon densirostris***		**-**	**P**
Killer whale	***Orcinus orca***		**-**	**L**
Melon-headed whale	***Peponocephala electra***		**-**	**L**
Sperm whale	***Physeter macrocephalus***	**E**	**-**	**L**
Pantropical spotted dolphin	***Stenella attenuata***		**-**	**L**

Common Name	Scientific Name	ESA Listing Status	Likelihood of Occurrence in Nearshore Waters	Likelihood of Occurrence in Deeper Offshore Waters
Striped dolphin	***S. coeruleoalba***		-	L
Spinner dolphin	***S. longirostris***		-	L
Bottlenose dolphin	***Tursiops truncatus***		-	L

Data Source: U.S. Navy 2019b, Miller 2007, USASMDC/ARSTRAT 2018, NMFS and USFWS 2018
Note:
[1] The sei whale is not specifically listed in Section 3-4 of the UES but is listed under the ESA and is therefore included as a special status species.
Abbreviations: E = ESA endangered; T = ESA threatened; L = Likely; P = Potential; "-" = Does not or unlikely to occur in this portion of the ROI.

3.3.1.3 Region of Influence for Offshore Waters of Kwajalein Atoll (Alternative Impact Locations)

For the purposes of this EA/OEA, biological resources in the offshore waters ROI are those that have the potential to be in the area subject to direct contact, exposure to hazardous chemicals, exposure to elevated noise levels, or exposure to human activity and equipment operation during Proposed Action activities. The ROI includes the alternative payload impact locations southwest and northeast of Kwajalein Atoll (**Figure 2-3**) as well as offshore waters of Kwajalein Atoll which may be subject to vessel traffic and elevated noise levels. Biological resources in the Offshore Areas ROI for the Proposed Action were recently described in the FE-2 EA/OEA (U.S. Navy 2019b). The status of biological resources in the Illeginni Islet ROI as described in the 2019 FE-2 EA/OEA (U.S. Navy 2019b) remains the best available information for the ROI and is incorporated here by reference. This section provides a brief summary of biological resources in the ROI but detailed species descriptions and occurrence information can be found in the FE-2 EA/OEA (U.S. Navy 2019b) and in the FT-3 Biological Assessment (U.S. Army 2020).

3.3.1.3.1 Marine Wildlife

This section focuses on marine wildlife in the alternative payload impact locations southwest and northeast of Kwajalein Atoll but also includes wildlife in deeper offshore waters of Kwajalein Atoll which may be subject to elevated sound levels and vessel traffic. Water in the alternative deepwater payload impact locations is approximately 1,800 to 4,400 m (5,900 to 14,400 ft) deep.

Invertebrates. Little is known about invertebrate species assemblages in the deep offshore waters of Kwajalein Atoll; however, these areas may support a variety of pelagic and deep-water benthic invertebrates (U.S. Navy 2019b). Deep water benthic communities have been documented around other islands in the central Pacific including the Hawaiian Archipelago, Wake Island, and Johnston Atoll (Parrish and Baco 2007, Kelley et al. 2017, Kelley et al. 2018), and include a diversity of deep-water coral and sponge species. The potential composition of benthic invertebrate communities in the ROI is unknown; however, if coral species do occur in the deepwater impact areas within RMI waters, those species would likely be UES coordination species (U.S. Navy 2019b, USASMDC/ARSTRAT 2018).

As discussed for Illeginni Islet above, coral and other invertebrate gametes and larvae may occur in deep offshore waters at certain times of the year (U.S. Navy 2019b). These may include larvae and gametes of special status species found on the reefs of Kwajalein Atoll (U.S. Navy 2019b). However, given the distance between the alternative impact areas to the nearest larval sources, the average time to larval settlement, and the seasonality of reproduction (see U.S. Army 2020), larval densities in the deep ocean waters near USAG-KA are likely to be very low.

Fish. Five special status fish species have the potential to occur in the deep offshore waters of Kwajalein Atoll (**Table 3-8**). The two most likely special status fish species in the deep waters of the ROI are the scalloped hammerhead shark and the oceanic giant manta ray (U.S. Navy 2019b). While the bigeye thresher shark, oceanic whitetip shark, and Pacific bluefin tuna are known to occur in the Marshall Islands and have been documented as being caught in local fisheries, little is known about their abundance, distribution, or seasonality in this area (U.S. Navy 2019b). The reef manta ray is not likely to occur in deep offshore waters; however, individuals have been known to migrate further offshore (U.S. Navy 2019b).

Sea Turtles. As discussed for Illeginni Islet, only the green turtle and hawksbill turtle are known to occur in Kwajalein Atoll offshore waters (**Table 3-8**). Green turtles are more common and hawksbills are considered rare (U.S. Navy 2019b, Maison et al. 2010). Sea turtles are highly migratory and may utilize different marine habitats during various life stages (see **Section 3.2.2**). Adult green and hawksbill turtles are known to use nearshore seagrass beds and coral reefs; however, hatchling and juvenile turtles may be found more often in the open ocean (U.S. Navy 2019b).

Marine Mammals. A number of cetacean species are likely or have the potential to occur in deeper offshore waters of Kwajalein Atoll (**Table 3-8**; U.S. Navy 2019b). Except for the sei whale, all of the marine mammals listed in **Table 3-8** are UES consultation species listed in Section 3-4 of the UES (USASMDC/ARSTRAT 2018). All of these marine mammals are protected under the MMPA and five species are listed under the U.S. ESA. The density of most marine mammal species are expected to be very low in the deep waters near Illeginni Islet, although sperm whales have been observed in the vicinity of Illeginni Islet on many occasions (U.S. Navy 2019b).

3.3.2 Noise (USAG-KA Illeginni Islet)

Natural sources of noise on these remote atolls include the constant wave action along shorelines and the occasional thunderstorm. The sound of thunder, one of the loudest sounds expected here, can register up to 120 dB. Within the atoll communities, other sources of noise include a limited number of motor vehicles, motorized equipment, and the occasional fixed-wing aircraft. Typical daytime noise levels within the local communities are expected to range between 55 and 65 dBA. Ambient noise levels at the installation are slightly greater because of higher levels of equipment, vehicle, and aircraft operations. On Kwajalein Island, for example, there are several aircraft flights per week, including military and commercial jet aircraft.

Flight test vehicles can generate sonic booms during flight. The sound of a sonic boom resembles rolling thunder and is produced by a shock wave that forms at the nose and at the exhaust plume of a missile when it travels faster than the speed of sound. These shock waves produce an audible sonic boom when they reach the ground.

3.3.2.1 Regulatory Setting

The UES incorporate provisions and policies for noise management and specify conformance with the U.S. Army's Environmental Noise Management Program and noise monitoring provisions as specified in Army Regulation 200-1 (*Environmental Protection and Enhancement*). As an Army installation, USAG-KA also implements the Army's Hearing Conservation Program as described in Department of the Army Pamphlet 40-501 (*Hearing Conservation Program*). Army standards require hearing protection whenever a person is exposed to steady-state noise greater than 85 dBA, or impulse noise greater than 140 dB, regardless of duration. Army regulations also require personal hearing protection when using noise-hazardous machinery or entering hazardous noise areas.

3.3.2.2 Region of Influence – Illeginni Islet (Proposed Impact Location)

The ROI for noise is focused primarily on those RMI atolls and islands closest to a proposed flight path. For the Illeginni Islet land impact scenario, Kwajalein, Likiep, Ailuk, Taka, and Utirik Atolls, as well as Jemo Island, might be affected. Census records from 2011 indicate 401 residents on Likiep Atoll, 339 on Ailuk Atoll, and 435 on Utirik Atoll; and none were reported on Taka Atoll or on Jemo Island. Kwajalein Atoll has the highest population within the ROI with a total population of approximately 11,408, including U.S. personnel and Marshallese residents (Secretariat of the Pacific Community 2011).

Offshore Waters – Southwest and Northeast (Alternative Impact Locations)

During terminal flight and impact at RTS, the developmental payload has the potential to affect open ocean areas with sonic booms. Thus, the ROI for noise for a BOA impact is focused primarily on those RMI atolls and islands closest to the proposed flight path. For a BOA impact scenario, Bikar, Taka, and Utirik Atolls might be affected. Census records from 2011 indicate 435 residents on Utirik Atoll and none were reported on Bikar or Taka Atolls or on Jemo Island.

3.3.3 Public Health and Safety (USAG-KA Illeginni Islet)

RTS range safety ensures protection to Installation personnel, inhabitants of the Marshall Islands, and ships and aircraft operating in the downrange areas potentially affected by flight tests. Commercial, private, and military air and sea traffic in caution areas designated for specific flight tests or missions, and inhabitants near a flight path, are notified of potentially hazardous operations. An NTM and a NOTAM are transmitted to appropriate authorities to clear traffic from caution areas and to inform the public of impending missions. The warning messages describe the time, the area affected, and safe alternate routes. The GRMI also is informed in advance of rocket launches and missile payload impact missions.

3.3.3.1 Regulatory Setting

All program operations must first receive approval from the Safety Office at RTS. All safety analyses, SOPs, and other safety documentation applicable to operations affecting the RTS must be provided, along with an overview of mission objectives, support requirements, and schedule. The flight safety plans evaluate risks to inhabitants and property near the flight path, calculate trajectory and debris areas, and specify range clearance and notification procedures. Criteria used at RTS to determine debris hazard risks are in accordance with RCC Standard 321-17, *Common Risk Criteria Standards for National Test Ranges* (Range Commanders Council 2017).

3.3.3.2 Region of Influence – Illeginni Islet (Proposed Impact Location)

The areas of Illeginni Islet where FT-3 flight test activities would occur are the ROI for a land impact scenario. Illeginni is and has been the target impact location for several missile programs, including the MMIII ICBM flights. As part of USAG-KA, Illeginni Islet is not open to the public. A limited number of FT-3 flight test personnel would access Illeginni Islet before the flight test to place equipment and after the test to recover the equipment and restore the impact site. There would be no personnel on-island during the impact; project personnel would be located offshore on ships or at other islands at the time of impact.

Offshore Waters – Southwest and Northeast (Alternative Impact Locations)

The deep offshore waters to the southwest or northeast of Kwajalein Atoll are the ROI for an FT-3 flight test water impact. These have been previously identified as potential impact locations for several missile programs. Radar and/or visual sweeps of hazard areas are accomplished immediately prior to operations to assist in the clearance of non-mission ships and aircraft.

3.3.4 Hazardous Materials and Wastes (USAG-KA Illeginni Islet)

Pollution prevention, recycling, and waste minimization activities are performed in accordance with the UES and established contractor procedures in place at the installation. USAG-KA has removed all remaining hazardous materials and wastes (e.g., asbestos, polychlorinated biphenyls in old light ballasts, and cans of paint) from buildings and facilities on Illeginni Islet (USAF 2004). Range personnel would also ensure that any unexploded ordnance or material is consumed with each burn operation. Due to the intermittent nature of flight testing and consequent occupancy of Illeginni Islet, only small quantities of hazardous wastes are generated and managed at Illeginni Islet. Hazardous handling and disposal activities are closely monitored by the USAG-KA Environmental Office in accordance with the UES. Waste treatment or disposal is not allowed at the Installation under the UES. Hazardous materials to be used by organizations on the RTS test range and its facilities are under the direct control of the user organization, which is responsible for ensuring that these materials are stored and used in accordance with UES requirements. The use of all hazardous materials is subject to ongoing inspection by USAG-KA environmental compliance and safety offices to ensure the safe use of all materials. The majority of these materials are stored in satellite supply facilities, are distributed through the base supply system, and are consumed in operational processes.

Because of previous reentry vehicle tests on Illeginni Islet, residual concentrations of beryllium and depleted uranium remain in the soil near the helipad on the west side of the Islet. In 2005, LLNL analyzed over 100 soil samples collected around the helipad to determine concentrations of beryllium and depleted uranium in the soil. Soil samples were collected again following subsequent flight tests and results were reported in 2010 and 2013 (Robison et al. 2013). The observed soil concentrations of beryllium and uranium (as a surrogate for depleted uranium) on Illeginni Islet are within compliance with USEPA Region 9 Preliminary Remediation Goals as outlined in the UES. Results from the soil sampling conducted in September 2018 indicated possible beryllium and uranium above the screening levels. Beryllium was not detected in any of the 20 parent soil samples collected from the Illeginni Islet borings; however, it was detected in one of the duplicate samples with a concentration of 1.9 mg/kg, which exceeded the 1.1 mg/kg screening level for beryllium (U.S. Navy 2019b). This sample was a field duplicate of a sample in which beryllium was not detected above 0.089 mg/kg (U.S. Navy 2019b). This large discrepancy may be due to the heterogeneous nature of the soil matrix (described as gravelly sand). An FE-2 post-test survey and sampling report described pre-test and post-test soil sampling results for uranium, beryllium, and tungsten at 34 sites (RGNext 2020). The pre-and post-test sampling revealed beryllium and tungsten were undetected, and uranium detected, but well below the USEPA composite worker regional screening level (ingestion and inhalation) (RGNext, 2020; USEPA 2020). Residual concentrations of tungsten remaining in the soil following the FE-1 and FE-2 flight test were below the EPA Regional Screening Level (RSL) for residential areas (63 mg/kg) and commercial areas (930 mg/kg).

In September 2018, groundwater samples collected from the groundwater monitoring wells were analyzed for tungsten, beryllium, and uranium. Beryllium was not detected in any of the nine groundwater samples. Uranium was detected in three of the groundwater samples, but concentrations did not exceed the 30 ug/L USEPA MCL screening level. Tungsten was detected in seven of the nine groundwater samples collected from the Illeginni Islet wells (U.S. Navy 2019b). Detected concentrations ranged from 0.055 milligrams per liter (mg/L) to 1.2 mg/L and all detected concentrations exceeded the USEPA residential tap water screening level (0.016 mg/L) (U.S. Navy 2019b). However, because the groundwater at Illeginni Islet is currently deemed to be too saline and not available year-round, it is not considered a viable source of potable water and the USEPA residential screening level would not apply. Groundwater samples collected from monitoring wells following the FE-1 flight test were analyzed for tungsten, beryllium, and uranium. Water samples collected in the impact crater shortly after the FE-1 test had tungsten concentrations of 0.65 mg/L (range of 0.64 to 0.67 mg/L) (U.S. Navy 2019b).

An FE-2 post-test survey and sampling report described pre-test and post-test groundwater results for uranium, beryllium, and tungsten at seven wells (RGNext 2020). The pre-and post-test sampling showed little variation in values, with beryllium remaining undetected, tungsten exceeding residential tap water screening levels, and uranium well below the USEPA maximum contaminant level for drinking water. The sampling report following the FE-2 flight test showed lower levels of tungsten than the 2018 sample results—with detected concentrations ranging from 0.0023 mg/L to 0.99 mg/L (RGNext 2020) compared to previously detected concentrations ranging from 0.055 mg/L to 1.2 mg/L (U.S. Navy 2019b). Tungsten was detected in eight of the 12 groundwater samples collected from the Illeginni wells. The 2020 sampling report described that monitoring wells MW-03, MW-04, and MW-05 were located within the FE-2 impact zone and could not be sampled. The DEP for FE-2 explains (Section 4.3, page 12-13) that the wells on Illeginni were to be sampled every 3-6 months for metals, including tungsten.

Hazardous Waste Management

Hazardous wastes are accumulated for up to 90 days. Any sampling and waste characterization is performed during that time prior to off-island shipment for disposal. All hazardous and regulated wastes are shipped off-island for disposal in the continental United States. The barge departs Kwajalein approximately every 2 weeks.

In accordance with the UES, USAG-KA has prepared a KEEP for responding to releases of oil, hazardous materials, pollutants, and contaminants to the environment. The KEEP is a contingency plan similar to a spill prevention, control, and countermeasure plan, but it incorporates response provisions of a National Contingency Plan. The hazardous materials management plan is incorporated into the KEEP.

3.3.4.1 Regulatory Setting

The objective of the standards for material and waste management is to identify, classify, and manage in an environmentally responsible way all materials imported or introduced for use at USAG-KA/RTS. The UES classify all materials as either general-use, hazardous, petroleum products, or prohibited. UES for material and waste management (UES §3-6) are derived from a composite of U.S. statutes and regulations addressing the use and management of hazardous material and solid waste and the RMIEPA regulations (UES §1-5.8). Hazardous wastes must be shipped off the island. Also prohibited are all new uses of polychlorinated biphenyls (PCBs), introduction of new PCBs, and introduction of PCB articles or PCB items.

USAG-KA has a contingency plan (the KEEP; UES § 3-6.4.1) for responding to releases of oil, hazardous material, pollutants, and contaminants to the environment. The UES also include a process for evaluating and, when called for, remediating sites contaminated from releases.

3.3.4.2 Region of Influence – Illeginni Islet (Proposed Impact Location)

The ROI for the Proposed Action includes locations where mission-related hazardous materials and wastes are stored, handled, and disposed (i.e., Kwajalein and Illeginni).

Offshore Waters – Southwest and Northeast (Alternative Impact Locations)

The ROI for a deepwater impact is visually depicted in **Figure 2-3**. The two alternative impact locations are deep water areas with depths between 1,500 and 4,800 m (5,000 and 15,700 ft).

This page intentionally left blank.

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 **4.3** 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 4.4** 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. The resources evaluated in this chapter are the same as those evaluated in the FT-2 EA (USASMDC/ARSTRAT 2014).

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 4.1.6** and **4.3.3**.

4.1 Pacific Spaceport Complex–Alaska

4.1.1 Air Quality (PSCA)

Effects on air quality are based on estimated direct and indirect emissions associated with the action alternatives. The ROI for assessing air quality impacts is the air basin surrounding PSCA. 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. FT-3 launch emissions at PSCA would come from the first stage of the FT-3 launch vehicle, which is a C-4 booster.

4.1.1.1 PSCA – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to baseline air quality. Therefore, no impacts to air quality or air resources would occur with implementation of the No Action Alternative.

4.1.1.2 PSCA – Proposed Action

The Proposed Action would launch a single developmental payload on a booster missile with impact of the payload on or near Illeginni Islet at RTS, USAG-KA. Launches of the STARS booster, the Trident I (C4) Target, and the LV-2 and 3 have been analyzed in various environmental documents (FAA 1996; MDA 2003, 2007a; USASMDC 2001, 2014) and have been determined to not have a significant impact on air quality. This is mostly attributed to the scarcity of the tests, the high rates of atmospheric dispersion at Narrow Cape, and the lack of industrial operations contributing to air quality pollutants in Kodiak. It is anticipated that the FT-3 flight test, using the same first stage as the Trident I, LV-2 and LV-3, would have a similar impact on air quality to that described for previous missile launches.

Data on the previously launched STARS booster, Trident I (C4) Stage 1 booster, the LV-2 and LV-3 C-4 First Stage will be utilized for this air quality analysis. The STARS first-stage booster releases emissions at a rate of about 217 kilograms per second (478.4 pounds per second). The emission rates of the major components of the STARS first-stage booster and the 8-hour average concentrations of these materials at 3,000 m (9,842 ft) from the launch pad indicate that they are less than the applicable standards (**Table 4-1**).

Table 4-1. STARS Emission Rates and Concentrations

		8-Hour Average Concentration at 3,000 meters | mg/m^3			
	Emission Rate kg/sec (lb/sec)	**Winds at 5.5 km/hr (3.4 mi/hr)**	**Winds at 24 km/hr (15 mi/hr)**	**Winds at 48 km/hr (30 mi/hr)**	**Standard 8-Hour TLV[(a)] mg/m^3**
Hydrogen Chloride	32.2 (70.9)	1.3	0.08	0.03	2 ppm
Aluminum Oxide	60.3 (132.9)	0.22	0.14	0.08	1
Nitrogen Dioxide	42.5 (93.7)	1.6	0.10	0.05	0.2 ppm
Carbon Dioxide	6 (13.2)	N/A	N/A	N/A	5,000 ppm
Carbon Monoxide	77 (169.9)	N/A	N/A	N/A	9 ppm (NAAQS 8-hour standard)

From FE-2 EA/OEA (U.S. Navy 2019b); USEPA 2011
(a) TLV = threshold limit value published by American Conference of Governmental Industrial Hygienist's (ACGIH)
Abbreviations: kg/sec = kilograms per second, lb/sec = pounds per second, mg/m^3 = milligrams per cubic meter, km/hr = kilometers per hour, mi/hr = miles per hour, N/A = not applicable, NAAQS = National Ambient Air Quality Standards, ppm = parts per million

Table 4-2 lists major exhaust components from a typical STARS missile launch, Trident I (C4) Target launch, and LV-2 Missile launch. LV-2 and LV-3 have the same rocket motors, except LV-2 is a two-stage rocket and LV-3 is a three-stage rocket. Emissions data for LV-3 were not published in the Flexible Target Family EA, so LV-2 data which were assessed in the Ground-Based Midcourse Defense Extended Test Range Final EIS (MDA 2003) are used in place of LV-3. As discussed in **Section 3.1.1**, of the chemical species that form during solid rocket launches, the most environmentally significant are hydrochloric acid, aluminum oxide, nitrogen oxides, and carbon dioxide.

PSCA does not have a water deluge system and has never used one for previous launches (USASMDC/ARSTRAT 2014). The lack of a water deluge system is beneficial to the environment because it reduces the amount of hydrogen chloride that would contact the ground surface during launch (USASMDC/ARSTRAT 2014). Hydrogen chloride vapor concentrations would be less than OSHA exposure limits of 5 parts per million locally and will be negligible to members of the general public because of the inaccessibility of PSCA during launches (USASMDC/ARSTRAT 2014). On-site personnel may safely return to the launch pad after a short duration once the site safety officials have visually cleared the pad (approximately 10 minutes) (USASMDC/ARSTRAT 2014).

Table 4-2. Estimated Emissions from a Typical STARS Missile Launch, Trident I (C4) Target Missile Launch, and LV-2 (Minuteman II) Missile Launch

	Aluminum Oxide[1]	Carbon Monoxide	Carbon Dioxide[2]	Hydrogen	Water	Hydrochloric Acid[1]	Nitrogen Oxides[2]	Lead	Others
Missile	**tons**	**tons**	**tons**	**tons**	**tons**	**tons**	**tons**	**tons**	**tons**
STARS	5.628	4.185	0.431	0.318	0.959	1.943	1.855	0.000	0.027
Trident I (C4) Target	7.40	6.04	0.39	NA	0.79	0.43	4.48	NA	<0.010
LV-2 (Minuteman II)	6.93	5.51	0.85	0.48	2.18	4.93	2.02	NA	0.030

From FT-2 EA (USASMDC/ARSTRAT 2014), and Ground-Based Midcourse Defense Extended Test Range Final EIS (MDA 2003)
Notes:
[1] Ozone-depleting substances
[2] Greenhouse gas

Past data from the STARS booster and Trident I (C4) Target showed that combustion products generated by the three-stage burn were relatively minor amounts that naturally dispersed within a short time after liftoff. The combustion products resulted in very minor short-term impacts to air quality. The Flexible Target Family EA determined that the LV-3, with a total propellant mass of 43,258 kilograms (kg; 95,367 pounds [lb]), would cause insignificant air quality impacts at PSCA because it would be within NAAQS, Alaska AAQS, and Air Force Standards (MDA 2007b). The BMDS PEIS (MDA 2007a) also analyzed general pre-launch, launch, and post launch impacts of solid propellant, and concluded that minimal, temporary impacts to air quality would be expected.

Due to the release of relatively small amounts of combustion products to the atmosphere, the FT-3 flight test would incrementally contribute to global emissions of GHGs; however, no significant impacts are anticipated from this launch as emissions are expected to be temporary (USASMDC/ARSTRAT 2014; MDA 2007b; MDA 2007a). Comparable rocket launches done at PSCA observed a return to ambient conditions within minutes of booster ignition and flight, and environmental studies done at PSCA have shown that chemical exhaust products do not accumulate in surface water or affect the local environment. There would be no significant air quality effects anticipated as a result of the FT-3 flight test (USASMDC/ARSTRAT 2014; FAA 1996; R&M 2007a, 2007b, 2008, 2009, 2011; MDA 2003, 2007a, 2007b).

4.1.2 Water Resources (PSCA)

Effects on water quality are based on estimated direct and indirect impacts associated with the action alternatives. Impacts are considered based upon several factors including:

- Violation of applicable state or federal water quality standards, including the CWA and SDWA; and
- Whether major changes in existing drainage and runoff patterns are proposed; and
- Whether there is the potential to exceed the capacity of existing storm water drainage systems; or if there is the potential for the degradation of water quality at PSCA as a direct result of the Proposed Action.

The ROI for assessing water resources impacts is the groundwater, surface water, and wetlands at PSCA.

4.1.2.1 Water Resources at PSCA – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to baseline water resources. Therefore, no significant impacts to water resources would occur with implementation of the No Action Alternative.

4.1.2.2 Water Resources at PSCA – Proposed Action

The deposition of harmful exhaust chemicals into the PSCA water resources is the main concern of this analysis, in particular, whether the Proposed Action would result in deposition of acids such as hydrogen chloride and combustion products such as aluminum oxide. Spill hazards are addressed in public safety sections. The acids have the potential to affect the pH of streams and lakes and the buildup of combustion products would negatively impact local water quality. According to the KLC EA (FAA 1996), certain environmental conditions and specific pH ranges would be necessary to accumulate aluminum oxide and cause water quality problems. Based on levels previously observed during STARS booster launches and Trident I (C4) Target launches, this Proposed Action is not anticipated to release levels of aluminum oxide that would cause impacts to water quality. Additionally, because the Proposed Action is for a single launch, levels of aluminum oxide would not be anticipated to accumulate and cause water quality issues.

Under normal launch conditions rocket motor emissions would be expected to rapidly disperse to non-toxic levels, based on dilution and buffering from the ocean waters (USASMDC/ARSTRAT 2014; MDA 2003). As required by AAC, a qualified accident response team would be stationed at the launch pad to mitigate any environmental effects in the unlikely event of a launch failure (FAA 2016).

The launches of the STARS booster have been analyzed in various environmental documents (USASDC 1992, U.S. Navy 2008) and have been determined to not have a significant impact on water resources. The launch of the Trident I (C4) Target was analyzed in the Ground-Based

Midcourse Defense Extended Test Range Final EIS (MDA 2003), and it concluded that there would be no significant impacts to PSCA water resources. The FT-3 is likely similar to the STARS booster and Trident I (C4) Target Stage 1 booster. Therefore, with proper BMPs and SOPs, it can be reasonably concluded that implementation of the Proposed Action would not result in significant impacts to water resources.

4.1.3 Biological Resources (PSCA)

The potential environmental consequences of the Proposed Action on biological resources are evaluated in the context of the regulatory setting discussed in **Section 3.1.3.1**. 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. 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 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 ESA-listed species would be considered significant if a disturbance resulted in reductions in the population size or distribution of a species. Impacts to critical habitats or environmentally sensitive habitats would be considered significant if these habitats were destroyed or substantially modified over large areas.

4.1.3.1 Biological Resources at PSCA – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to affected environment for biological resources. Therefore, no impacts to biological resources would occur with implementation of the No Action Alternative.

4.1.3.2 Biological Resources at PSCA – Proposed Action

Under the Proposed Action, the FT-3 vehicle would launch from PSCA and the stage 1 booster would splash down offshore of PSCA in the Stage 1 Booster Drop Zone depicted in **Figure 3-2**. Overall, the Proposed Action would have less than significant impacts on biological resources in the PSCA ROI.

The impacts of ongoing launch activities at PSCA, including pre-launch operations and vehicle overflight, have recently been evaluated by the FAA (FAA 2016). Based on the characteristics of the proposed FT-3 launch vehicle, launch activities under the Proposed Action would be within those evaluated for programmatic launch activities at PSCA and there would be no new impacts to biological resources. The U.S. Army evaluated the environmental consequences of a launch of a vehicle with a C4 stage 1 booster (the same as the FT-3 vehicle stage 1) from PSCA in 2014 (USASMDC/ARSTRAT 2014). The consequences of launch activities at PSCA are detailed in the KLC Launch Pad 3 EA (FAA 2016) and the FT-2 EA (USASMDC/ARSTRAT 2014) which are incorporated here by reference and the conclusions of which are summarized below. The FAA and AAC have consulted with the USFWS and NMFS on the potential effects of launch activities at PSCA on ESA-listed species and critical habitats as detailed in the KLC Launch Pad 3 EA (FAA 2016) and incorporated here by reference; therefore, no additional consultation was required for launch activities under the Proposed Action.

The consequences of splash down of the spent stage 1 booster into U.S. territorial waters near Kodiak Island (**Figure 3-2**) have not been evaluated in previous documents and are discussed in more detail in this section. The U.S. Army has evaluated the effects of the Proposed Action, including splash down of the stage 1 booster, on ESA-listed species and critical habitats in a Biological Assessment for FT-3 (U.S. Army 2020). The U.S. Army has concluded that the Proposed Action *may affect but is not likely to adversely affect* ESA-listed species in the ROI, would not adversely affect designated critical habitat, and initiated consultation with NMFS and USFWS in September 2020 (**Appendix A**). The U.S. Army received concurrence with these determinations from both NMFS and USFWS (**Appendix A** and **Appendix C**).

Site Preparation and Launch Activities

Pre-launch activities would include human activity and equipment operation at PSCA which would be centered around the launch pad and launch support facilities. Launch activities have the potential to impact biological resources through heat and emissions from launch, and elevated noise levels from launch and vehicle flight. The FAA and AAC have evaluated the effects of a range of launch vehicles, from small-lift to space launch vehicles, on biological resources at and near PSCA (FAA 2016). For STARS launches from PSCA, recorded sound pressure levels at Ugak Island have ranged from 90.2 to 91.4 dBA (USASMDC/ARSTRAT 2014). The launch vehicle would fly at velocities sufficient to generate sonic booms from some distance downrange of the launch and extending downrange along the flight path. No FT-3 specific sonic boom footprints are available but for launches of other vehicles with a wide range of sizes, it has been estimated that sonic booms would reach the ocean surface downrange from PSCA beyond the edge of the outer continental shelf (FAA 2016).

Terrestrial Vegetation. Plants near the launch pads may be temporarily affected by heat and emissions from vehicle launch. However, based on studies of vegetation conducted after launches from PSCA, no long-term effects on vegetation would be expected (FAA 2016). Vegetation would be expected to return to normal within a year of the launch and there would be no adverse impacts to sensitive, rare, or otherwise important vegetation.

Terrestrial Wildlife. Elevated noise levels and human activity may temporarily disturb some common bird and terrestrial mammal species near the proposed launch pad and launch support locations. Increased human activity and equipment operation pre-launch may cause wildlife species to temporarily leave the area. Elevated noise levels due to launch would be very short duration (less than 90 seconds) but may cause short-term disturbance reactions in some wildlife (USASMDC/ARSTRAT 2014).

As evaluated in the KLC Launch Pad 3 EA (FAA 2016) any launch-related effects to birds and terrestrial mammals in the ROI would be minor and temporary. Terrestrial birds and seabirds may flush in response to launch noise but previous monitoring during launches has shown little startle response and no long-term effects or next abandonment (FAA 2016). Launch activities have occurred at PSCA since 1998 and bald eagles have continued to successfully use nest sites on and near PSCA (FAA 2016). Bald eagle nests have been monitored during launches from PSCA in the past; however, based on the results of this monitoring, the USFWS concluded that launch operations were not likely to affect the bald eagles and ended the monitoring requirement (FAA 2016).

The potential exists for launch noise to cause behavioral disturbance of pinnipeds hauled out in terrestrial habitats; however, based on expected noise levels and previous monitoring during launches, impacts would be minimal. Because all pinnipeds are protected under the MMPA, AAC applied for a 5-year programmatic permit for small takes of marine mammals incidental to launching of space launch vehicles and missiles at PSCA (AAC 2016). AAC currently holds a Letter of Authorization for take by Level B Harassment of a small number of harbor seals incidental to launches from PSCA. When NMFS issued regulations (valid May 2017 through April 2022) allowing for the issuance of Letters of Authorization for the incidental take of harbor seals during launch operations at PSCA (82 FR 14996 [24 March 2017]), NMFS determined that the expected level of take would have a negligible impact on the species. In addition, NMFS has determined that PSCA launch activities would not reach the level of take for any cetaceans (whales and dolphins) and that any noise that could reach these species would be discountable (76 FR 16311 [23 March 2011]). The launch under the Proposed Action is not expected to result in take of any MMPA listed species (including harbor seals) and would have negligible to no impact on these species.

Marine Resources. Marine wildlife might be exposed to elevated noise levels from sonic booms caused by vehicle overflight. The FAA has evaluated the effects of ongoing launch activities, including sonic booms, on marine wildlife offshore of PSCA. Sonic booms are unlikely to affect marine wildlife given the low density of sensitive marine wildlife 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. As concluded for in previous analyses of sonic booms and other flight associated noises for launches from PSCA (FAA 2016, DOD 2017), noise impacts from sonic booms would be insignificant for biological resources including ESA-listed species.

Threatened and Endangered Species. Proposed launch activities have the potential to impact threatened and endangered species including hauled out pinnipeds and birds through elevated noise levels. AAC and FAA have consulted with NMFS and the USFWS on the effects of PSCA programmatic launch activities on ESA-listed species as summarized in this section. All launch activities under the Proposed Action would take place in accordance with the avoidance, minimization, and mitigation measures as required by PSCA operations procedures and programmatic consultations. Overall, Proposed Action launch activities would not significantly impact threatened and endangered species.

In 2011, NMFS issued a programmatic Biological Opinion for space vehicle and missile launch operations at PSCA for the 5-year period from 2011-2016 (NMFS 2011). In this Biological Opinion, NMFS concluded that launch operations at PSCA were not likely to adversely affect ESA-listed whales in the ROI (i.e., fin whale, humpback whale, and North Pacific right whale) (NMFS 2011). NMFS also concluded that launch operations would not destroy or adversely modify Steller sea lion critical habitat (NMFS 2011). NMFS concluded that launch noise from the loudest launch vehicles may affect and would likely adversely affect Steller sea lions through non-lethal incidental take. The Biological Opinion concluded that this take was not likely to jeopardize the continued existence of the species and required monitoring of pinnipeds quarterly and during launches.

In 2017, AAC applied for a new 5-year programmatic permit for small takes of marine mammals incidental to launching of space launch vehicles and missiles from PSCA (AAC 2016). In their application, AAC concluded that ongoing space and missile launch activities at PSCA would not affect ESA-listed marine species in the action area (i.e., Stellar sea lions, gray whales, and humpback whales) (AAC 2016). When NMFS issued regulations (valid May 2017 through April 2022) allowing for the issuance of Letters of Authorization for the incidental take of harbor seals during launch operations at PSCA (82 FR 14996 [24 March 2017]), NMFS determined that proposed activities would not affect Steller sea lions (or any other ESA-listed species) and that no consultation with NMFS was required under the ESA.

In 2012, the FAA consulted with the USFWS on the effects of PSCA programmatic launch activities on ESA-listed species and critical habitats under USFWS jurisdiction. On 14 December 2012, the USFWS determined that programmatic launch activities were not likely to adversely affect northern sea otters or Steller's eiders, would have no effect on short-tailed albatross, and would have no effect on designated critical habitat for northern sea otters (FAA 2016). In 2016, the FAA evaluated the effects of launch activities for small-lift and medium-lift rockets at PSCA and determined that these conclusions remained valid for these modifications to launch activities.

The U.S. Army has determined that the above effect determinations and consultations remain valid for Proposed Action launch activities and that no further consultation under Section 7 of the ESA is necessary for proposed launch-related activities at PSCA.

Environmentally Sensitive Habitats. No environmentally sensitive habitats occur at PSCA and proposed launch activities at PSCA would not impact any environmentally sensitive habitats described in **Section 3.1.3.2**.

Stage 1 Booster Drop Activities

During the proposed flight test, the stage 1 booster would separate from the rest of the FT-3 vehicle not long after launch and splash down into the stage 1 drop zone near Kodiak Island (**Figure 3-2**). Splashdown of the stage 1 booster has the potential to injure marine wildlife through direct contact or to impact sensitive habitats and would generate elevated sound pressure levels at splashdown.

Marine Wildlife. Marine wildlife, including ESA-listed species, have the potential to be injured or otherwise affected by elevated noise levels, direct contact from the falling booster, and exposure to hazardous chemicals. Booster splashdown would not have a discernible or measurable impact on common marine wildlife or smaller benthic or planktonic organisms, because of their abundance, their wide distribution, and the relatively small area of the ocean which would be impacted by splashdown. The potential exists for impacts to larger vertebrates, particularly those that rest on the surface or must come to the surface to breathe (e.g., marine mammals, seabirds, and sea turtles). The potential for the stage 1 booster drop to result in injury or disturbance of ESA-listed species was evaluated in the FT-3 Biological Assessment (U.S. Army 2020) and summarized below.

Marine wildlife near the surface might be exposed to elevated noise levels from splashdown of vehicle components. Detailed information about the characteristics of sound, the potential effects of sound on marine wildlife, and methodology for estimation of impacts is available in the FE-2 EA/OEA (U.S. Navy 2019b) and the FT-3 Biological Assessment (U.S. Army 2020) and is incorporated by reference. Sound creates vibrations that travel through the air or water and have the potential to affect marine wildlife through temporary or permanent physical injury or by behavioral disturbance.

No model estimates of splashdown noise levels are available for the FT-3 boosters; therefore, the peak noise levels have been estimated based on the size characteristics of the FT-3 boosters compared to the size of boosters for other test vehicles for which estimates are available. Comparing the contact area of the FT-3 stage 1 booster with that of the FE-2 vehicle components (U.S. Navy 2019b), the peak sound pressures for stage 1 booster splashdown are expected to be less than 218 dB referenced to 1 micropascal (re 1 μPa). Based on the standard sound effect thresholds for effects to marine wildlife (presented in U.S. Navy 2019b and U.S. Army 2020) and the best available estimates of species densities in the booster drop zone, the number of expected exposures to elevated noise levels was calculated. For all species with available density data, the estimated number of exposures to noise loud enough to cause any type of auditory injury is substantially less than one (**Table 4-3**). The estimated chances of a marine mammal being exposed to sound loud enough to cause temporary (temporary threshold shift) or permanent (permanent threshold shift) auditory injury are extremely low and considered discountable. While unlikely, any realized effects of splashdown noise on marine wildlife would likely be limited to short-term behavioral response and individuals would be expected to return to normal behaviors within minutes of splashdown. Noise generated by splashdown of the stage 1 booster would have minimal to no impacts on marine wildlife, including ESA-listed species.

Table 4-3. Estimated Number of Marine Mammal Exposures to Acoustic Impacts and Direct Contact from FT-3 Stage 1 Booster Splashdown.

Species	Maximum Average Density (/km^2)	Number of Exposures to Elevated SPLs			Estimated Number of Exposures to Direct Contact
		PTS	TTS	Behavioral Disturbance	
Cetaceans					
Minke whale[a]	0.0006	-	5.96E-09	0.0012	2.30E-07
Sei whale[a]	0.0001	-	9.93E-10	0.0002	6.03E-08
Blue whale[b]	0.0001	-	9.93E-10	0.0002	1.08E-07
Fin whale[b]	0.0680	-	6.76E-07	0.1348	5.76E-05
Baird's beaked whale[a]	0.0005	-	-	0.0010	2.05E-07
Gray whale[a, c]	0.0487	-	4.84E-07	0.0965	2.52E-05
North Pacific right whale[a]	0.00001	-	9.93E-11	1.98E-05	5.18E-09
Pacific white-sided dolphin[a]	0.0208	-	-	0.0412	4.15E-06
Humpback whale[b, d]	0.0930	-	9.24E-07	0.1843	5.61E-05
Stejneger's beaked whale[a]	0.0014	-	-	0.0028	3.88E-07
Killer whale[b]	0.0050	-	-	0.0099	1.92E-06
Harbor porpoise[a]	0.4547	5.69E-05	2.26E-04	0.9013	8.36E-05
Dall's porpoise[b]	0.2180	2.73E-05	1.09E-04	0.4321	4.30E-05
Sperm whale[b]	0.0020	-	-	0.0040	1.09E-06
Cuvier's beaked whale[a]	0.0022	-	-	0.0044	6.79E-07
Pinnipeds					
Northern fur seal[b]	0.0150	-	-	0.0297	2.76E-06
Steller sea lion[ae]	0.0098	-	-	0.0194	2.16E-06

Notes:

[a] Density estimates for the Gulf of Alaska from the U.S. Navy's Pacific Marine Species Density Database Technical Report (Hanser et al. 2014)

[b] Density estimates from Rone et al. 2017.

[c] Density estimate for gray whales include whales from all DPSs in the Gulf of Alaska and are not specific to ESA listed populations. Gray whales in the Gulf of Alaska are likely from unlisted Eastern Populations. It is possible that a small (but unknown) number of these whales are from the Western DPS.

[d] Density estimate for North Pacific right whales based on the density of whales assuming that the total population of 31 individuals was located within the designated critical habitat located near Kodiak Island.

[e] Density estimate for humpback whales and Steller sea lions may include animals from all DPSs in the Gulf of Alaska and are not specific to ESA listed populations.

Abbreviations: DPS = Distinct Population Segment, PTS = Permanent Threshold Shift, SPL = Sound Pressure Level, TTS = Temporary Threshold Shift

The stage 1 booster has the potential to physically injure marine wildlife through direct contact when it splashes down into the ocean. While some common marine wildlife such as planktonic invertebrates and fishes might be physically injured by the falling booster, loss of a few individuals from these populations would not change the regional population density or distribution; therefore, impacts to these species would be minimal. For some larger and rarer species that spend more time at the surface, injury or death of individuals due to direct contact would be of greater consequence. Based on the size of the stage 1 booster (6.1 m [20 ft] long by 2.4 m [7.9 ft] diameter), the best available information on species densities in the stage 1 booster drop zone, and the methodology used in the FE-2 EA/OEA (U.S. Navy 2019b) and FT-3 Biological Assessment (U.S. Army 2020), the number of marine mammals which might be struck by the stage 1 booster were calculated (**Table 4-3**).

Direct contact from splashdown of the stage 1 booster is not expected to impact sensitive or rare marine wildlife. For all species with available density estimates, the estimated number of animals which might be exposed to direct contact is substantially less than one (**Table 4-3**). The chances of a marine mammal being injured are so low as to be discountable and while density estimates are not available for other taxa such as seabirds and sea turtles, the chances of individuals being struck is likely very low as well. Direct contact from splashdown of the stage 1 booster would have less than significant impacts on marine wildlife, including ESA-listed species.

Hazardous material release upon splashdown of the stage 1 booster is not likely to adversely impact marine wildlife. The propellants would be consumed before booster 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, where most sensitive or rare marine wildlife are not likely to occur. Due to the low density and patchy distribution of special status marine wildlife in the ROI, the likelihood of an animal coming into contact with hazardous materials from the stage 1 booster is extremely low. The impacts of hazardous material exposure on marine wildlife would be less than significant.

Pursuant to the ESA, the U.S. Army has concluded that splashdown of the stage 1 booster and related activities under the Proposed Action would have *no effect* on short tailed albatross, Steller's eiders, or northern sea otters; and *may affect, but is not likely to adversely affect* ESA-listed species of cetaceans, pinnipeds, or fish in the ROI (**Table 3-2**).

Environmentally Sensitive Habitats. The Proposed Action would not significantly impact designated critical habitats, Biologically Important Areas, or EFH in the ROI. The Proposed Action would only involve one test with a single booster splashing down into the waters offshore of Kodiak Island. Any residual chemicals introduced to the water would be quickly diluted and dispersed and components would sink to the ocean bottom. Introduction of these limited quantities of debris and chemicals would not destroy any designated critical habitat and would not be expected to alter any of the primary constituent elements of these critical habitats. Specifically, the Proposed Action would not alter prey densities for Steller sea lions. Similarly, the Proposed Action would not alter the suitability of these areas as Biologically Important Areas for marine mammals or seabirds and would not significantly reduce the quality and/or quantity of EFH or HAPCs in the ROI.

4.1.4 Airspace (PSCA)

Airspace resources would be deemed impacted if the following were to occur:

- The Proposed Action would permanently alter airspace use in the ROI.
- The Proposed Action would create an unmanageable human-health hazard in the airspace ROI.

4.1.4.1 Airspace at PSCA – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to airspace. Therefore, no significant impacts to airspace would occur with implementation of the No Action Alternative.

4.1.4.2 Airspace at PSCA – Proposed Action

Site Preparation Activities

Proposed site preparation activities (airlift delivery of FT-3 booster stages, the payload, and related hardware), would involve flights in and out of the Kodiak Airport. The Proposed Action would not restrict access to, nor affect the use of, existing airfields and airports in the ROI. Access to the Kodiak Airport would not be affected. All arriving and departing aircraft and all participating military aircraft are under the control of the Kodiak Airport Operations and Anchorage Center (USASMDC/ARSTRAT 2014); thus, there would be no airport conflicts during site preparations for the Proposed Action.

Prior to the launch event and closure of the hazard area, the PSCA launch safety officials will coordinate to ensure that the area is clear of aircraft. NOTAMs would be issued by the FAA to identify areas to remain clear of and the times that avoidance of the area is advised.

Launch Activities

Range Control would communicate with the operations conductors and all participants entering and leaving the range areas as well as with other agencies such as the FAA Anchorage ARTCC in Anchorage, and the Kodiak airfield control tower (USASMDC/ ARSTRAT 2014). The acceptable level of risk to aircraft and the persons on board would continue to follow the RCC Standard 321-17 (RCC 2017).

For the launch, PSCA would coordinate with the Anchorage ARTCC military operations specialist assigned to handle such matters using Altitude Reservation (ALTRV) request procedures (USASMDC/ARSTRAT 2014). After receiving the proper information on each test flight, a hazard pattern would be constructed. When approval of the request of the airspace is received, PSCA would submit an ALTRV request to Central Altitude Reservation Function, which publishes the ALTRV 72 hours prior to the flight test (USASMDC/ARSTRAT 2014). The USCG would also be in close coordination with PSCA regarding the FT-3 flight test to verify that no air traffic would be in the vicinity. With these procedures in place, the proposed activities would not conflict with any airspace use plans, policies, and controls during FT-3 launch activities.

Controlled and Uncontrolled Airspace. No new airspace proposal or any modification to the existing controlled airspace has been identified to accommodate proposed testing. The relatively sparse use of the area by commercial aircraft and the advance coordination with the FAA regarding ALTRV requirements (Page 4-5 of USASMDC/ARSTRAT 2014) should result in minimal impacts on controlled and uncontrolled airspace from FT-3 launch test activities.

En Route Airway Jet Routes. DOD Instruction 4540.01 specifies procedures for conducting missile and projectile firing, which ensures that potential impacts on civilian aircraft are avoided. The FAA has also instituted procedures whereby aircraft can fly direct from one location to another using internal navigation. This complicates planning for launches from PSCA somewhat but providing launch notices to the FAA would prevent air users from flying direct routes through impacted airspace.

Before conducting the launch, NOTAMs would be sent by the FAA. In addition, to satisfy airspace safety requirements, the responsible commander would obtain approval from the FAA through the appropriate USASMDC airspace representative. Provisions would be made for surveillance of the affected airspace either by radar or patrol aircraft. Safety regulations dictate that hazardous activities would be suspended when it becomes known that any non-participating aircraft has entered the danger zone until the non-participating aircraft has left the area or a thorough check of the suspected area has been performed.

Airports and Airfields. The FT-3 launch would not restrict access to or affect arriving and departing flights at existing area airfields and airports in the ROI. Commercial and private aircraft would be notified in advance of launch activities through NOTAMs by the FAA. If medical evacuation or other emergency flights are requested prior to the FT-3 launch, the mission would pause until the medical emergency requiring the flight is over.

Post-launch Activities

Any flights required as part of a post-flight cleanup would not restrict access to, nor affect the use of, existing airfields in the ROI. Operations at the Kodiak Airport would not be obstructed. Existing airfield or airport arrival and departure traffic flows would not be affected, and access to the airfield would not be curtailed. All arriving and departing aircraft and all participating military aircraft are under the control of the Anchorage ARTCC or Kodiak Airport Control Tower; thus, there would be no airfield conflicts in the ROI.

Conclusion

Under the Proposed Action, there would be no permanent alterations to airspace resources. NOTAMs would be temporary, and any potentially affected flight plans would either be re-directed or resume after the FT-3 flight test officials and the FAA give permission. PSCA has tested several similar vehicles and is practiced in working with local, state, and federal air safety entities to prevent risks to human health and safety. By following the prescribed safety measures, there would be no unmanageable human-health hazards in the airspace ROI from the Proposed Action.

4.1.5 Noise (PSCA)

Analysis of potential noise impacts includes estimating likely noise levels from the Proposed Action and determining potential effects to sensitive receptor sites. The potential for launch-associated noise to impact biological resources is discussed in **Section 4.1.3.2**.

The Proposed Action would be deemed to significantly impact noise receptors if the following were to occur:

- The Proposed Action would result in a new, long-term source of noise.
- The Proposed Action would negatively impact noise sensitive receptors above regulatory limits.

4.1.5.1 Noise at PSCA – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to the noise environment. Therefore, no significant impacts due to the noise receptors would occur with implementation of the No Action Alternative.

4.1.5.2 Noise at PSCA – Proposed Action

Site Preparation Activities

Noise from site preparation activities would include transportation noises of the vehicle to the launch pad. The noise levels would increase temporarily and would not result in a new, long-term source of noise. The temporary noise from site preparation activities would not be expected reach the levels of regulatory limits, including OSHA and DOT noise limits.

Launch Activities

The Proposed Action would include the launch of a FT-3 booster with the developmental payload from PSCA. Noise levels would be the same as previous launches. The nearest seasonal residents are located about 4 km (2.5 mi) from PSCA, and the nearest year-round housing is located over 6.4 km (4 mi) away (USASMDC/ARSTRAT 2014). Based on previous measurements of noise for STARS launches and single Target launches at PSCA, the noise level at the on-base housing would be less than the 97 dB level measured at 2 mi, and the personnel at the Launch Control Center (2 mi from the launch pad) would be less than the OSHA standard of 118 dBA over 9.6 minutes. The KLC Launch Pad 3 EA presented a noise study (Appendix A, FAA 2016) which concluded that medium-lift rockets launched at PSCA would not result in significant changes in the overall noise environment to receptors because the noise generated from medium-lift rockets was similar to small-lift rockets. The study states that noise levels at sensitive receptor properties would remain below the 65 dBA DNL requirement (FAA 2016).

Sonic booms are not anticipated to occur over land, such as Kodiak Island or Ugak Island. The KLC EA (FAA 1996) estimated that a sonic boom generated by a launch event would likely result in impacts at the ocean surface 33 to 56 km (21 to 35 mi) downrange from PSCA, beyond the edge of the Outer Continental Shelf (FAA 1996, 2016).

Post-launch Activities

Temporary noise would increase due to removal of any equipment that was used for the FT-3 launch; however, this would be a routine operation for PSCA and would not result in any new, long-term noise effects. Noise levels would be expected to be the same as site-preparation activities and not exceed regulatory limits.

Conclusion

All public and non-essential personnel would be outside of the established GHA and exposed to noise below the 115 dBA limit for short-term exposure. Noise analysis from FAA 1996, FAA 2016, MDA 2003, and DOD 2017 all concluded that no impacts to the noise environment would occur from launch activities under those proposed actions, which includes up to nine launches per year. This EA/OEA only analyzes a single launch of a similarly sized vehicle, and because no changes have occurred to PSCA's noise receptor environment since the PSCA EA (DOD 2017), it can be determined that the Proposed Action would not result in impacts to the noise receptors.

4.1.6 Public Health and Safety (PSCA)

Public health and safety would be deemed impacted if the following were to occur:

- The Proposed Action would introduce materials or operations in the ROI that would cause a potential public or occupational health hazard.
- The Proposed Action would create an unmanageable human-health and/or safety hazard in the ROI.

4.1.6.1 Public Health and Safety at PSCA – 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.

4.1.6.2 Public Health and Safety at PSCA – Proposed Action

The Proposed Action would be conducted under strict adherence to all safety policies and procedures, and would cover ground safety, flight safety, range clearance and surveillance, sea-surface area clearance and surveillance, and commercial air traffic control (USASMDC/ARSTRAT 2014). PSCA will coordinate with the USCG and the FAA. PSCA range safety and mission management personnel will work jointly to establish potential hazard areas over ground and water to assure that the Proposed Action will not endanger life or property (USASMDC/ARSTRAT 2014).

Site Preparation Activities

FT-3 site preparation activity would include transport and storage of all materials that would be used during launch. The primary hazard to public health and safety is the potential for explosion/fire of components. State and federal regulations, as well as the PSCA SOPs and safety plans would be followed in transporting and handling potentially hazardous materials. The shipping containers are protective and designed to prevent an accidental explosion during transport. In the unlikely event of a transport-related accident, the vehicle propellant would likely burn, rather than explode, causing the release of hydrogen chloride locally, an eye and skin irritant. The PSCA established safety procedures would reduce the likelihood of a transport-related accident during site preparations.

Upon arrival at PSCA, the FT-3 components would be stored securely until assembly and launch. Explosive Safety Quantity Distances would be adhered to, and access is restricted to authorized personnel only.

Launch Activities

PSCA has multiple procedures in place to mitigate the potential hazards of both a nominal rocket launch and launch accident. A GHA would be established in PSCA and in the vicinity of the launch arc on Narrow Cape. The GHA would be cleared by safety officers and would ensure that no unauthorized marine vessels or aircraft are in the vicinity. Public road access to the beach recreation area near PSCA will be barricaded for the launch.

As a routine operation, PSCA would have fire suppression, hazmat response, and emergency medical teams in place before launch of the FT-3 and distribute the appropriate NOTAMs and NTMs.

The FT-3 will also be fitted with an FTS to prevent unacceptable risk scenarios. The FTS includes highly reliable in-flight tracking and has a failsafe built in. The LHA would be cleared before launch activities, including watercraft exclusion zones and ALTRVs for airspace.

The access road to PSCA and nearby beaches would be closed; however, an observation area at Pasagshak Point approximately 6.4 km (4 mi) west of the LP is generally available to the general public. If the safety zone pre-determined for the launch is compromised in any way, the launch would be delayed until this area is confirmed to be clear.

Post-launch Activities

Post-launch, routine removal of FT-3 launch equipment would occur per PSCA's SOP and would not present any hazards to health and safety.

Launch debris may impact the ground or the Gulf of Alaska from either a planned jettison, or unplanned flight termination action. Launch debris may consist of metal, propellant, batteries, and electronics. If necessary, hazardous debris would be recovered from the ground or the ocean and be properly disposed of per applicable rules and regulations.

Conclusion

PSCA has abundant procedures and policies in place to prevent any threats to public health and safety and can mitigate any potential hazards from a nominal or off-nominal FT-3 launch. The Proposed Action would not introduce materials or operations in the ROI that would cause a potential public or occupational health hazard, nor would the Proposed Action create an unmanageable human health and/or safety hazard in the ROI.

4.1.7 Hazardous Materials and Wastes (PSCA)

Impacts on hazardous materials and wastes at PSCA would be considered environmentally significant if the following were to occur:

- If an increase of hazardous materials and wastes as a result of the Proposed Action exceeded PSCA's capacity to manage, store, or dispose of them in accordance with federal, state, or local laws.
- If the hazardous materials and wastes as a result of the Proposed Action increased the risk of soil or groundwater contamination; or created new human and environmental health risks.

4.1.7.1 Hazardous Materials and Wastes at PSCA – Proposed Action

Site Preparation Activities

Hazardous materials expected to be used during site preparations for FT-3 include diesel fuel, anti-freeze, hydraulic fluid, and lubricating oils (USASMDC/ARSTRAT 2014). Only trained and qualified personnel would be allowed to manage hazardous materials and wastes. Site preparations would use small quantities of these hazardous materials and could result in the generation of hazardous waste.

The type and quantity of hazardous materials would be incorporated into FT-3-specific emergency plans. All emergency planning would be reviewed and updated by PSCA as information is obtained. The primary hazard related to FT-3 site preparations is injury due to potential for explosion or fire from the storage of rocket components, propellant, and any Class 1.1, 1.2, and 1.4 explosives (USASMDC/ARSTRAT 2014).

PSCA has well-documented procedures for managing hazardous substances. PSCA stays current on permits for transporting, storing, tracking, receiving, and disposing of hazardous substances. Any hazardous or non-hazardous wastes produced during FT-3 site preparations would be properly containerized and disposed of according to state and federal regulations. PSCA is permitted to generate and dispose of waste, and the FT-3 launch site preparations would not be expected to exceed those permitted levels.

Launch Activities

The FT-3 launch activities would follow standardized hazardous material and waste management practices and would not be anticipated to result in any procedure changes. Although unlikely, should a launch accident occur, potentially hazardous debris and propellant may fall within PSCA's pre-established LHA. Any hazardous materials and wastes would be recovered and cleaned up to regulated standards and PSCA's emergency response plans.

Post-launch Activities

Post-launch activities include routine removal of all FT-3-related equipment. Any hazardous and non-hazardous materials and wastes remaining post-launch would be recycled or disposed of according to PSCA's waste management plans. A dedicated sensor would track the first stage of the launch vehicle to assist cleared aircraft with identifying potential debris. Should restoration or debris recovery be required, PSCA would coordinate with the USCG to do so.

Conclusion

All applicable state and federal regulations, range operating procedures, and FT-3-specific safety plans would be followed to prevent accidents that could release hazardous materials or wastes into the local environment. Although unlikely, should a release of hazardous materials or wastes occur on or off the launch pad, PSCA is capable of mitigating personnel and environmental health risks by following SOPs and utilizing on-site emergency response teams (See **Sections 3.1.6** and **3.1.7** for specific mitigative measures). The Proposed Action would not be expected to exceed PSCA's ability to manage, store, and dispose of hazardous materials and waste.

4.2 Pacific Ocean Flight Corridor

4.2.1 Air Quality (Pacific Ocean Flight Corridor)

Effects on air quality are based on estimated direct and indirect emissions associated with the Proposed Action. The ROI for the BOA flight corridor is the global upper atmosphere along the flight-path from the launch area at PSCA to the impact area at RTS. During the FT-3 flight, emissions within the over-ocean flight corridor would have the potential to affect air quality in the global upper atmosphere. Estimated emissions from the FT-3 would be deemed environmentally significant if:

- The Proposed Action would cause exceedances of NAAQS under the Clean Air Act.

As described in **Section 4.1.1.2**, the FT-3 flight vehicle uses the same first stage as the Trident I (C4) and LV-3 target vehicle, has a similar overall propellant weight as the LV-3 target vehicle, and is also similar to the STARS launch vehicle. Previous analysis for these launch vehicles will be used as the basis for this air quality analysis.

The CEQ draft guidance published on June 26, 2019 states that federal agencies should consider GHG emissions and climate change when the carbon dioxide emissions are estimated to meet an annual threshold of 27,563 metric tons (60,766,013 lb) (CEQ 2019). Past data shows that the STARS booster, the Trident I (C4) Target, and the LV-3 target would not meet that threshold; therefore, the Proposed Action in this EA/OEA will not be analyzed in depth for GHG emissions.

4.2.1.1 Air Quality in the Over-Ocean Flight Corridor – No Action Alternative

Under the No Action Alternative, the FT-3 flight test 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.

4.2.1.2 Air Quality in the Over-Ocean Flight Corridor – Proposed Action

Site Preparation Activities

Airborne military or commercial aircraft are not planned as part of the FT-3 flight test. No site preparation activity would occur in the BOA that would impact air quality.

Launch Activities

FT-3 would launch from PSCA to RTS and generate rocket emissions as propellant is burned from the rocket motor boosters across the upper atmosphere of the BOA. The active flight time of the vehicle would be measured in minutes. **Table 3-6** shows the relatively small amount of emissions that each STARS booster stage would release over a period of minutes. **Table 4-2** also shows the emissions for a Trident I (C4) Target and a LV-2 C-4 First Stage Booster. All three of these launches were deemed to be insignificant with respect to their air quality analysis.

Exhaust emissions would contain both chlorine compounds and free chlorine, produced primarily as hydrogen chloride at the nozzle (USASMDC/ARSTRAT 2014). Chlorine and hydrogen chloride would have a tropospheric lifetime long enough to eventually mix with the stratosphere (USASMDC/ARSTRAT 2014).

The aluminum oxide is emitted as solid particles and can activate chlorine in the atmosphere (USASMDC/ARSTRAT 2014). However, following the FT-3 flight test, the majority of aluminum oxide would be expected to be removed from the stratosphere through dry deposition and precipitation (USASMDC/ARSTRAT 2014).

Both aluminum oxide and nitrogen oxides are of concern with respect to stratospheric ozone depletion. N_2 is a relatively inert gas that makes up 80 percent of the air that humans breathe but nitrogen as a single molecule is reactive and can form nitrogen oxides (USEPA 1999). Nitrogen oxides contribute to ozone depletion, which protects the Earth from harmful ultraviolet rays. The production of various nitrogen oxide species from solid rocket motors is dominated by high-temperature “afterburning” reactions in the exhaust plume (USASMDC/ARSTRAT 2014). As the temperature of the exhaust decreases with increasing altitude, less nitrogen oxide is formed (USASMDC/ARSTRAT 2014). The FT-2 EA determined that the quantity of emissions of nitrogen oxides from a single launch would represent a very small fraction of nitrogen species generated worldwide (USASMDC/ARSTRAT 2014). Additionally, diffusion and trade winds would naturally disperse nitrogen oxide species.

Post-launch Activities

Airborne military or commercial aircraft are not planned as part of the FT-3 flight test. No post-launch activity would occur in the BOA that would impact air quality.

Conclusion

Because the emissions of carbon dioxide, hydrogen chloride, aluminum oxide, and nitrogen oxide from a launch of a comparable STARS booster or Trident I (C4) Target would be relatively small compared to global emissions from industry; the large air volume over which these emissions would be spread; rapid dispersion of the emissions by stratospheric winds; and no apparent EPA NAAQS violations; a single launch of the FT-3 would not have a significant impact on air quality in the Pacific Ocean Flight Corridor.

4.2.2 Biological Resources (Pacific Ocean Flight Corridor)

The potential environmental consequences of the Proposed Action on biological resources are evaluated in the context of the regulatory setting discussed in **Section 3.2.2.1** and based on the evaluation criteria in **Section 4.1.3**.

4.2.2.1 Biological Resources in the Pacific Ocean Flight Corridor – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to affected environment for biological resources. Therefore, no impacts to biological resources would occur with implementation of the No Action Alternative.

4.2.2.2 Biological Resources in the Pacific Ocean Flight Corridor – Proposed Action

Under the Proposed Action, the FT-3 vehicle would fly over the Pacific Ocean and the spent stage 2 booster, spent stage 3 booster, and shroud would splash down the booster drop zones of the BOA (**Figure 1-1**, **Figure 3-5**). The Proposed Action has the potential to impact marine biological resources through elevated noise levels, direct physical contact from vehicle components, and exposure to hazardous chemicals. The Proposed Action may also involve use of sea-based sensors. While these sensors involve vessel traffic in the BOA, operation of these vessels is part of existing programs and use of these vessels for the Proposed Action would not meaningfully increase vessel traffic in the BOA. Vessel traffic as a result of the Proposed Action would have minimal to no impacts on marine biological resources. Overall, the Proposed Action would not have significant impacts on biological resources in the Pacific Ocean Flight Corridor ROI. 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. Detailed information about the methodology for estimation of impacts is available in the FE-2 EA/OEA (U.S. Navy 2019b) and the FT-3 Biological Assessment (U.S. Army 2020) and is incorporated by reference.

Marine Wildlife. The U.S. Army has evaluated the effects of the Proposed Action, including splash down of the vehicle components, on ESA-listed species and critical habitats in the FT-3 Biological Assessment (U.S. Army 2020). The U.S. Army concluded that the Proposed Action *may affect but is not likely to adversely affect* ESA-listed species in the ROI and would not adversely affect designated critical habitat (**Appendix A**), and requested concurrence with these determinations from NMFS and USFWS in September 2020 (**Appendix A**).

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. As discussed in **Section 4.1.3.2**, no model estimates of noise levels are available for splashdown of FT-3 components; therefore, the peak noise levels have been estimated based on the size characteristics of the FT-3 vehicle components compared to the component sizes for other test vehicles for which estimates are available. Using peak sound pressure estimates for the largest FE-2 stage and nose fairing (shroud) (U.S. Navy 2019b), the peak sound pressures are expected to be less than 218 dB re 1 μPa for spent FT-3 boosters and 196 dB re 1 μPa for the shroud. Based on the standard sound effect thresholds for effects to marine wildlife (presented in U.S. Navy 2019b and U.S. Army 2020) and the best available estimates of species densities in the booster drop zones (**Table 4-4**), the number of expected exposures to elevated noise levels was calculated. For all species with available density data, the estimated number of exposures to noise loud enough to cause any type of auditory injury is substantially less than one (**Table 4-4**). These calculations were performed with conservative assumptions, including the assumption that animals were at the surface at all times, which likely resulted in overestimation of effects. The estimated chances of a marine mammal being exposed to sound loud enough to cause temporary or permanent auditory injury are extremely low and considered discountable. While unlikely (**Table 4-4),** any realized effects of splashdown noise on marine wildlife would likely be limited to short-term behavioral response and individuals would be expected to return to normal behaviors within minutes of splashdown. Noise generated by splashdown of the FT-3 vehicle components would have minimal to no impacts on marine wildlife, including ESA-listed species.

Sonic booms are unlikely to affect marine wildlife given the low density of sensitive marine wildlife in the Pacific Ocean Flight Corridor where sonic booms might occur, the short duration of elevated sound pressures (milliseconds), and the attenuation of sounds that occurs at the air-water interface. As concluded for in previous analyses of sonic booms generated from test flights over the Pacific Ocean (U.S. Navy 2019b, U.S. Navy 2017, FAA 2016, DOD 2017, MDA 2007b), noise levels generated by sonic booms in the ROI would not exceed injury thresholds for sensitive marine wildlife. Any realized impacts would be limited to short duration startle reactions in wildlife at or very near the surface and marine wildlife would be expected to return to normal behaviors within minutes. The impacts from sonic booms would be less than significant for marine wildlife, including special status species.

The Proposed Action would result in the spent stage 2 and 3 boosters as well as the protective shroud splashing down in the booster drop zones (**Figure 1-1**, **Figure 3-5**). These falling components would enter marine habitats and have the potential to impact marine organisms. Based on the dimensions of the FT-3 vehicle components (U.S. Army 2020) and the best available information on species density in the booster drop zones (**Table 4-4**) 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 in for other test programs (U.S. Navy 2019b, 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-1 EA/OEA (U.S. Navy 2017) and the FT-3 Biological Assessment (U.S. Army 2020) and is incorporated by reference. For all species with available density data, the estimated number of exposures to direct contact is substantially less than one (maximum is 0.00004; **Table 4-4**). Even when summed across species, the estimated number of animal exposures is only 0.00015. The estimated chances of a marine mammal being exposed to direct contact are extremely low and the impacts of direct contact on these species would be minimal to non-existent.

Table 4-4. Estimated Number of Marine Mammal Exposures to Acoustic Impacts and Direct Contact from FT-3 Vehicle Component Splashdown in the BOA.

Species	Maximum Density (/km²)		Number of Exposures to Elevated SPLs			Estimated Number of Exposures to Direct Contact
	Stage 2 Drop Zone[a]	Stage 3 Drop Zone[b]	PTS	TTS	Behavioral Disturbance	
Cetaceans						
Minke whale	0.0006	0.0009	-	1.49E-08	0.0030	7.31E-07
Sei whale	0.0001	0.0001	-	1.99E-09	0.0004	1.71E-07
Blue whale	0.0014	0.0001	-	1.49E-08	0.0030	3.39E-06
Fin whale	0.0040	0.0235	-	2.73E-07	0.0546	1.92E-05
Baird's beaked whale	0.0005	-	-	-	0.0010	4.87E-07
Gray whale[c]	0.0001	-	-	9.93E-10	0.0002	1.20E-07
North Pacific right whale	0.00001	-	-	9.93E-11	0.00002	1.20E-08
Pygmy killer whale	-	0.0008			0.0016	7.71E-08
Short-finned pilot whale	-	0.0029			0.0057	3.89E-07
Risso's dolphin	-	0.0219			0.0434	2.22E-06
Longman's beaked whale	-	0.0069			0.0137	1.27E-06
Pygmy sperm whale	-	0.0029			0.0057	3.13E-07
Dwarf sperm whale	-	0.0071			0.0141	6.93E-07
Fraser's dolphin	-	0.0013			0.0026	1.27E-07
Pacific white-sided dolphin	0.0208	-	-	-	0.0405	1.11E-05
Humpback whale[c]	0.0010	0.0001	-	1.09E-08	0.0022	1.41E-06
Blainville's beaked whale	-	0.0009			0.0018	1.27E-07
Stejneger's beaked whale	0.0014	-	-	-	0.0028	9.72E-07
Killer whale	0.0090	0.0132	-	-	0.0441	1.09E-05
Melon-headed whale	-	0.0015			0.0030	1.46E-07
Dall's porpoise	0.0730	-	9.13E-06	3.66E-05	0.1456	3.84E-05
Sperm whale	0.0030	0.0014	-	-	0.0088	4.19E-06
False killer whale	-	0.0002			0.0004	2.82E-08
Pantropical spotted dolphin	-	0.0021			0.0042	1.87E-07
Striped dolphin	-	0.0052			0.0103	5.08E-07
Spinner dolphin	-	0.0018			.0036	1.60E-07
Rough-toothed dolphin	-	0.0008			0.0016	7.71E-08
Bottlenose dolphin	-	0.0003			0.0006	3.43E-08
Cuvier's beaked whale	0.0022	0.0062	-	-	0.0167	2.63E-06
Pinnipeds						
Northern fur seal	0.0170	0.0170[a]	-	-	0.0676	9.92E-06
Steller sea lion[c]	0.0098	-	-	-	0.0195	5.63E-06
Northern elephant seal	0.0024	0.0024[a]	1.51E-08	6.00E-08	0.0095	1.72E-06

Notes:
[a] Density estimates for the stage 2 booster drop zone from the U.S. Navy's Pacific Marine Species Density Database Technical Report (Hanser et al. 2014) and Rone et al. 2017.
[b] Density estimates for the stage 3 booster drop zone from the U.S. Navy's Marine Species Density Database Phase III Technical Report (Hanser et al. 2017) and associated spatial data except where indicated.
[c] Density estimate for gray whales, humpback whales, and Steller sea lions may include whales from all DPSs in the ROI and are not specific to ESA listed populations.

Abbreviations: DPS = Distinct Population Segment, PTS = Permanent Threshold Shift, SPL = Sound Pressure Level, TTS = Temporary Threshold Shift

Density estimates are not available for more common species or for special status fish, sea turtle, or seabird species in the spent motor drop zones. Some more common species may have individuals which would be exposed to direct contact; however, direct contact would not change the regional population size or distribution of these common species. As with marine mammals, it is very unlikely that special status fish, sea turtles, or seabirds would be exposed to direct contact and direct contact would have minimal to no impact on marine wildlife in the ROI.

Marine wildlife have the potential to be exposed to hazardous materials as the FT-3 vehicle components splash down into the booster drop zones. Any substances of which the spent boosters or shroud are constructed of or that are contained in the stages and not consumed during flight or jettison (**Table 2-1**) would fall into marine habitats. The propellants would be consumed before booster 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, where most sensitive or rare marine wildlife are not likely to occur. Due to the low density and patchy distribution of sensitive or special status marine wildlife in the ROI, the likelihood of an animal coming into contact with hazardous materials from vehicle components is extremely low. The impacts of hazardous material exposure on marine wildlife would be less than significant.

Pursuant to the ESA, the U.S. Army has concluded that Proposed Action activities in the BOA would have *no effect* on Hawaiian monk seals and *may affect, but is not likely to adversely affect* ESA-listed species of cetaceans, pinnipeds, birds, and fish in the stage 1 and 2 drop zones (**Table 3-6**).

Environmentally Sensitive Habitats. No part of the Proposed Action would impact designated critical habitat or marine protected areas in the Pacific Ocean Flight Corridor ROI. Elevated noise levels would not impact these areas and no protected areas occur within the booster drop zones. Several seamounts occur within the stage 2 and 3 booster drop zones. These habitats have the potential to be impacted by debris and hazardous chemicals when vehicle components splash down subsequently sink to the bottom. Given that there would be only one flight test under the Proposed Action with a limited amount of debris, the Proposed Action would not alter the suitability or productivity of seamounts in the ROI. The Proposed Action would have minimal to no impacts on environmentally sensitive habitats.

4.2.3 Water Resources (Pacific Ocean Flight Corridor)

See **Section 4.2.2** for a discussion on marine biological resources respective environmental consequences as a result of the Proposed Action. This section analyzes the potential for hazardous materials and waste to enter the Pacific Ocean Flight Corridor, also known as the BOA. Environmental impacts on water resources in the BOA are analyzed for significance based on:

- If the Proposed Action would cause exposure to hazardous chemicals or materials that would adversely affect the BOA

4.2.3.1 Water Resources in the BOA – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no significant impacts to water resources.

4.2.3.2 Water Resources in the BOA – Proposed Action

Site Preparation Activities

Military or commercial watercraft are not planned as part of the FT-3 flight test. No site preparation activity would occur in the BOA that would impact water quality.

Launch Activities

The primary concern for water resources in the BOA is pollution from water soluble remnants from rocket propellants. The plastics and rubbers would generally be considered nontoxic and would decompose and disperse at a slower rate than a liquid waste would (USASMDC/ARSTRAT 2014). *De minimis* amounts of potentially toxic combustion or battery material would rapidly disperse in the seawater column as the vehicle components sink in the ocean. The components would break up prior to or upon impact with the water and recovery would not be attempted. All parts would be expected to sink to the sea floor.

Post-launch Activities

Aside from that described in **Section 2.5.5**, additional airborne and waterborne sensors on military or commercial aircraft are not planned as part of the FT-3 flight test. Although unlikely, if there were any floating debris it would be recovered and brought onboard a vessel for appropriate handling and disposal.

Conclusion

Considering the small quantities of hazardous materials contained in the batteries; the likelihood of the solid rocket propellant to be burnt up before vehicle component impact in the BOA; the relatively large expanse between component drop stages; the single test; the lack of anticipated floating debris; and the dilution and mixing capabilities of the ocean waters, the potential for hazardous materials released during component impact to adversely affect the water resources of the BOA should be deemed insignificant.

4.3 U.S. Army Garrison–Kwajalein Atoll

4.3.1 Biological Resources (USAG-KA)

The potential environmental consequences of the Proposed Action on biological resources are evaluated in the context of the regulatory setting discussed in **Section 3.2.2.1** and based on the evaluation criteria in **Section 4.1.3**.

4.3.1.1 Biological Resources at Kwajalein Atoll – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to affected environment for biological resources. Therefore, no impacts to biological resources would occur with implementation of the No Action Alternative.

4.3.1.2 Biological Resources at Illeginni Islet – Proposed Action

Under the Proposed Action, potential impacts on biological resources at Illeginni Islet may include exposure to elevated noise levels, direct contact from payload components or impact debris, disturbance from human activity and equipment operation, and exposure to hazardous chemicals. The potential impacts from the FT-3 test are expected to be similar in types and magnitude as for other recent flight tests with payload impact at Illeginni Islet (U.S. Navy 2019b, U.S. Navy 2017, USASMDC/ARSTRAT 2014). Compared to the recent FE-2 flight test (U.S. Navy 2019b), the characteristics of payload trajectory and impact at Illeginni Islet are expected to be the same except that the FT-3 payload would only carry a fraction of the tungsten (approximately 10 percent of the tungsten contained in FE-2 payload) and modeling indicates the payload would result in less debris dispersion at impact. Due to the potential for the FT-3 Action to affect species listed as consultation species under the UES, the U.S. Army has prepared a Biological Assessment to evaluate the effects of the Proposed Action on these species (U.S. Army 2020). Except for the evaluation of debris dispersion upon payload impact, the potential impacts from the FT-3 Proposed Action at Illeginni Islet are essentially the same in scope and intensity as the FE-2 action and the affected environment is the same as evaluated in the FE-2 EA/OEA (U.S. Navy 2019b). Therefore, the environmental consequences of those parts of the FT-3 Proposed Action would be the same as for the FE-2 action and the evaluation of environmental consequences of FE-2 activities at Kwajalein Atoll in the FE-2 EA/OEA (U.S. Navy 2019b) are incorporated here by reference. A brief summary of the potential impacts and conclusions about the significance of impacts on biological resources at Illeginni Islet is included in this section but additional details about analyses and conclusions can be found in the FT-3 Biological Assessment (U.S. Army 2020) and the FE-2 EA/OEA (U.S. Navy 2019b). A full list of avoidance and minimization measures which will be implemented as part of the Proposed Action can be found in **Table 4-7**.

The Proposed Action has the potential to result in elevated noise levels both in-air and underwater near Illeginni Islet due to sonic booms from payload approach and due to impact of the payload. The sonic boom generated by the approaching payload is expected to be less than 175 dB_{peak} in the waters near Illeginni Islet and would not exceed 149 dB re 20 μPa in air. Impact of the payload would also result in elevated in-air and/or underwater sound levels. Estimates for noise levels due to the FE-2 payload impact were 140 dB re 20 μPa in-air at 18 m (59 ft; U.S. Navy 2019b). While the FT-3 payload impact noise is expected to be less than FE-2, the FE-2 peak noise level estimate was used as a bounding case for the current Proposed Action.

Payload impact on Illeginni Islet would likely form a crater with substrate from the crater being ejected out from the crater. The designated impact zone under the Proposed Action is on the northwest end of Illeginni Islet (**Figure 3-6**). Since specific cratering estimates are not available for the FT-3 payload impact, estimates of cratering and ejecta from FE-2 (U.S. Navy 2019b) payload impact were used as a bounding case for potential impacts. Based on payload impacts from previous tests, the resulting crater would be 6 to 9 m (20 to 30 ft) in diameter and 2 to 3 m (7 to 10 ft) deep (U.S. Navy 2019b). The ejecta field from crater formation at impact would be expected to extend no more than 91 m (300 ft) from the impact, and the density of ejecta would decrease with distance from the point of impact (U.S. Navy 2019b, USAFGSC and USASMDC/ARSTRAT 2015). Based on modeling, the U.S. Army estimates that over 99 percent of all debris generated from FT-3 payload impact would fall on land. The less than one percent of debris that might reach water's edge would be relatively small fragments of natural debris (i.e., coral rubble from crater formation), generally less than 2.3 kg (5 lb).

Pre-test activities would include vessel traffic to and from Illeginni Islet for equipment transport, personnel transport, sensor raft deployment, post-test recovery operations, and sensor raft retrieval. There would be several pre-test and post-test vessel round-trips to and from Illeginni Islet as well as raft-borne sensor deployment. Vessel traffic to and from Illeginni Islet would be increased for a period of 10 weeks.

Elevated levels of human activity are expected for approximately 10 weeks at Illeginni Islet. During this period, helicopters and vessels would be used to transport equipment and personnel to Illeginni Islet and the Proposed Action would involve as many as two dozen personnel on Illeginni Islet during the 10-week period. Post-test, heavy equipment such as a backhoe would be used to excavate the crater, screen out debris, and to backfill the crater with substrate that had been ejected from the crater. Noise levels associated with post-test operations would be consistent with any other land or sea activity that uses mechanized equipment, and the greatest intensity would be centered on the payload impact location.

Following the impact of the payload, any of the residual onboard hazardous materials such as battery acids and heavy metals (**Table 2-2**) would enter habitats around the impact point. The batteries carried onboard the payload would be discharged by the time the vehicle impacts on land at Illeginni Islet; however, a small quantity of electrolyte material (on the order of a couple ounces) may still enter the terrestrial environment. The payload structure would contain heavy metals including tungsten, aluminum, titanium, magnesium, chromium, and nickel. Post-test, any visible man-made test debris, including batteries, would be removed during recovery and cleanup. While every attempt would be made to clean up all visible metal and other fragments, it is possible and likely that some fragments would be too small to be recovered and a small amount of these heavy metals or other substances may remain in the terrestrial or marine environments at Illeginni Islet. Only trace amounts of hazardous materials are expected to remain in terrestrial areas.

For recent flight tests, there has been concern about environmental effects due to the deposition and dissolution of tungsten from test activities at Illeginni Islet. However, the effects of tungsten in the soil and water remain largely unknown (U.S. Navy 2019b), and the amount of tungsten on the FT-3 payload would be approximately 10 percent of that contained on the recent FE-2 test. There is some evidence that tungsten may be deposited in coral skeletons and may damage coral structure or health (Colín-García et al. 2016); however, the tungsten concentration at which any damaging effects might occur is unknown at this time. A description of the expected amount of tungsten as well as descriptions of groundwater and soil monitoring at Illeginni Islet can be found in **Section 3.3.4** and **Section 4.3.4**. For the FE-2 test, no adverse impact due to tungsten or other potentially hazardous materials was expected. Considering that the FT-3 payload would contain a fraction of the tungsten and for the same reasons, no significant impacts are expected. While it is possible that terrestrial plants and wildlife may be exposed to residual tungsten, the exposure durations and concentrations that might harm plants and animals are unknown at this time. Even though there is the potential for remnant tungsten to harm wildlife, remnant tungsten is not expected to change the distribution or abundance of vegetation or wildlife populations on Illeginni Islet or in Kwajalein Atoll. If any hazardous chemicals enter the marine environment, they are expected to dilute and be dispersed quickly by currents and wave action. While the potential exists for special-status species to be exposed to potentially hazardous materials such as tungsten and there is the potential that some animals might be harmed, it is not expected that hazardous materials would cause changes in the population distribution or abundance of these species at Kwajalein Atoll and impacts would be less than significant.

Post-flight cleanup activities may include the use of heavy equipment such as a backhoe or grader on Illeginni Islet. This equipment has the potential to introduce fuels, hydraulic fluids, and battery acids into terrestrial habitats. Equipment operation would not involve any intentional discharges of fuel, toxic wastes, or plastics and other solid wastes that could harm terrestrial or marine life. Any accidental spills from support equipment operations would be contained and cleaned up.

Several avoidance, minimization, and mitigation measures will be implemented as part of the Proposed Action to reduce the potential impacts on biological resources. These measures, detailed in **Table 4-7**, are considered in evaluation of consequences to biological resources summarized below.

Terrestrial Vegetation. Vegetation within the payload impact zone on Illeginni Islet is previously disturbed and managed vegetation(U.S. Navy 2019b). No sensitive or special status plant species occur on Illeginni Islet and the impacts to terrestrial vegetation would be less than significant.

Terrestrial Wildlife. Terrestrial wildlife such as birds have the potential to be disturbed by human activity, equipment operation, elevated noise levels, and direct contact from payload debris or ejecta. Overall, impacts of the Proposed Action on terrestrial wildlife at Illeginni Islet would be less than significant.

Elevated noise levels from sonic booms and payload impact have the potential to cause short-term behavioral response such as temporary startle reactions in birds on Illeginni Islet (U.S. Navy 2019b). Birds roosting, foraging, or nesting in the area near the impact zone may be exposed to noise about the behavioral disturbance threshold for birds (U.S. Navy 2019b). While birds may be more sensitive to elevated sound pressure level disturbance during certain nesting stages (U.S. Navy 2015), previous observations of birds on Illeginni Islet after a payload impact test indicate that even birds close to the impact site (65 to 100 m [213 to 328 ft]) return to normal behaviors soon after a test (Foster and Work 2011, U.S. Navy 2019b). Even during the nesting season, short-duration elevated noise levels at Illeginni Islet are not expected to cause birds to abandon nests (U.S. Navy 2019b). Noise levels have the potential to exceed the physical injury threshold in bird but only over a very small area (18 m or 59 ft from the point of impact) centered on the disturbed habitats of the payload impact area. Mitigation measures will be implemented for the Proposed Action to deter birds from nesting and roosting in the impact area (see **Table 4-7**); therefore, it is unlikely that birds would be injured from elevated noise levels (U.S. Navy 2019b). Elevated noise levels as a result of the Proposed Action are not expected to adversely impact birds at and near Illeginni Islet.

Birds in and near the payload impact zone also have the potential to be impacted by direct contact and human disturbance. The impact zone is composed primarily of previously disturbed habitat, but some black-naped terns have the potential to nest in the impact zone (U.S. Navy 2019b). In the 2019, the USFWS estimated that no more than 12 black-naped terns (4 adults and 8 eggs or chicks) would be expected to be in the impact area during daylight hours (Appendix A of U.S. Navy 2019b). A maximum of 16 black-naped terns could be in the area when both adults are roosting at or near the nests (U.S. Navy 2019b). Several avoidance and minimization measures would be implemented as part of the Proposed Action (see **Table 4-7**) based on recommendations from the USFWS for past tests (U.S. Navy 2019b). Visual deterrents (e.g., scarecrows, Mylar flags, helium-filled balloons, or strobe lights) would be employed to deter bird from nesting and roosting in the impact zone and the area would be searched for nests, including eggs and chicks, prior to pre-flight activities and prior to test fights. If black-naped tern nests are found in the payload impact area, nests would be covered with an A-frame structure to protect eggs, chicks, and adults from debris and to serve as a warning to project personnel to avoid the nest area. With these mitigation measures in place, no adverse effect to black-naped terms are expected. The impacts to black-naped terns and other birds from direct contact and human activity on Illeginni Islet would be less than significant.

Suitable sea turtle haulout and nesting habitat exists on the northwestern and eastern beaches of Illeginni Islet (**Figure 3-6**). However, the last known sea turtle nest pits on Illeginni Islet were recorded in 1996 on the northern tip of the islet (U.S. Navy 2019b). No sea turtle nests or nesting activity have been observed on Illeginni Islet in over 20 years (U.S. Navy 2019b). While green and hawksbill turtles are known to use the nearshore waters of Illeginni Islet, it is considered very unlikely that sea turtles will haul out or nest on Illeginni Islet. While sea turtle are not likely to occur on Illeginni Islet, mitigation measures will be employed to further decrease the chances of there being effects on sea turtles or sea turtle nests including pre-test surveys for sea turtles, sea turtle nesting activity, and sea turtle nests (see **Table 4-7**). Because sea turtles are unlikely to occur in terrestrial habitats on Illeginni Islet and because protective mitigation measures would be in place, sea turtles on land and sea turtle nests would not be impacted by the Proposed Action on Illeginni Islet.

Marine Vegetation. Marine vegetation, including seagrass, is not expected to be impacted by the Proposed Action at Illeginni Islet. Most macroalgae species found at Illeginni Islet are common and likely to be found throughout Kwajalein Atoll (U.S. Navy 2019b). Seagrass beds are known to occur in Illeginni harbor as well as down the slopes in and near the harbor entrance (U.S. Navy 2019b). However, vessel traffic as a result of the Proposed Action is not expected to alter benthic habitats or impact seagrass beds.

Marine Wildlife. Marine wildlife in nearshore habitats have the potential to be impacted by direct contact from debris and ejecta, ground-borne shock waves, elevated noise levels, vessel strike, and exposure to hazardous materials.

Marine mammals, sea turtles, and fish in offshore waters might be exposed to elevated noise levels resulting from sonic booms and payload impact. Detailed methods for estimating the effects of elevated noise levels on wildlife at and near Illeginni Islet are included in the FT-3 Biological Assessment (U.S. Army 2020) and the FE-2 EA/OEA (U.S. Navy 2019b). The expected sound pressures would not exceed the permanent or temporary auditory injury thresholds for marine mammals, sea turtles, or fish (U.S. Navy 2019b). Some marine mammals, sea turtles, and fish may be exposed to noise levels loud enough to cause behavioral disturbance; however, animal densities are likely to be low in the ROI and the noise would be a very short duration (less than a second) single event (U.S. Navy 2019b). Any effects on marine mammals, sea turtles, or fish would likely be limited to short-term startle reactions, and animals would be expected to return to normal behaviors within minutes. The impacts of elevated noise levels on marine wildlife would be minimal and less than significant.

A shoreline payload impact is not planned or expected and is considered unlikely. However, there is a chance that marine wildlife in nearshore reef habitats may be impacted by direct contact from natural debris ejected during crater formation (U.S. Navy 2019b). Several reef-associated fish species are known to occur in the nearshore waters of Illeginni Islet (**Section 3.3.1.2**) and have the potential to be injured by ejecta entering reef habitats (U.S. Army 2020, U.S. Navy 2019b). These fish species occur on reefs throughout Kwajalein Atoll, and the number of fish species near Illeginni Islet is likely a small fraction of the populations of these fish in Kwajalein Atoll (U.S. Navy 2019a). One UES consultation fish species, the humphead wrasse, is likely to occur near Illeginni Islet and has the potential to be injured if exposed to direct contact from debris. However, several factors make this highly unlikely. Humphead wrasses are generally not found at the surface (NMFS 2019) where they would be most vulnerable to effects from direct contact (U.S. Army

2020). These fish are most commonly found in waters a few meters to at least 60 m (197 ft) deep (NMFS 2019), and any debris would rapidly lose velocity upon entering the water. In addition, no humphead wrasse were observed in 2014 surveys of the areas offshore of the Illeginni Islet impact area, and NMFS stated that the humphead wrasses observed near Illeginni Islet have been observed beyond the reef crest around 91 m (300 ft) from the shoreline (NMFS 2019). It is highly unlikely that any humphead wrasse would be contacted by ejecta, and effects from debris entering the water would be limited to temporary behavioral responses (U.S. Army 2020). Fish would be expected to return to normal behaviors within moments of exposure. Debris is expected to have insignificant effects on UES-listed fish in the Action Area. Due to the potential for adverse effects to the humphead wrasse, the U.S. Army consulted with NMFS (**Appendix A**) and NMFS issued a Biological Opinion in March 2021 (**Appendix C**). NMFS concluded that the Proposed Action may adversely affect up to 108 humphead wrasse but is not likely to eliminate the species at Illeginni Islet nor reduce the likelihood of their survival and recovery across Kwajalein Atoll (**Appendix C**).

Several coral and mollusk species occur in reefs adjacent to the payload impact zone at Illeginni Islet (Table 3-12 and Table 3-13 in U.S. Navy 2019b). Based on NMFS surveys of habitats with the potential to be subject to direct contact effects (described in **Section 3.3.1.2.4** and U.S. Navy 2019b) and the estimated maximum area that may be affected by direct contact, the numbers of consultation coral colonies and individual mollusks that may exposed were estimated in the FT-3 Biological Assessment (U.S. Army 2020) and are summarized in **Table 4-5**. Colonies of at least two relatively high density UES-consultation coral species are likely to have exposures to direct contact: *Pocillopora meandrina* and *Heliopora coerulea*. Based on the mean density for these species, up to two *Pocillopora meandrina* colonies and one *Heliopora coerulea* colony might be exposed (**Table 4-5**). Not all colonies, individuals, or species would be equally vulnerable to the effects of debris fall and shock wave impacts (U.S. Navy 2019b, NMFS-PIRO 2017c). Not all corals exposed to debris would be damaged but the most likely realized effects from contact would be cracks in the colony or broken branches or plates (U.S. Army 2020). Based on the size and dispersion of the debris, complete pulverization of a colony is not likely. Coral have the potential to regrow after damage, but regrowth and stress could still have a negative impact on growth rate, reproduction, or disease susceptibility (NMFS 2019). As detailed by NMFS (2019), since these corals are colonial organisms with hundreds to thousands of genetically-identical interconnected polyps, affecting some polyps of a colony does not necessarily constitute harm to the individual (defined as a colony) as the colony can continue to exist even if the colony is damaged. Based on surveys of USAG-KA islets, harbors, and the mid-atoll corridor conducted between 2010 and 2016, the seven consultation coral species and three consultation mollusk species with the potential to be affected as adults (**Table 4-5**) have all been observed at multiple Kwajalein Atoll islets (Tables 3-12 and 3-13 in U.S. Navy 2019b). With the exception of *Acropora polystoma* (found at only 8 percent of sites) these consultation species appear to be common throughout Kwajalein Atoll (U.S. Navy 2019b). Density estimates are not available for non-consultation corals or mollusks; however, all of these species are present on islets throughout Kwajalein Atoll as well (Tables 3-12 and 3-13 in U.S. Navy 2019b). The entire reef area with the potential for direct contact effects is small in comparison to the total comparable reef area surrounding and connected to Illeginni Islet and is considered extremely small compared to the comparable reef areas in the USAG-KA area and in Kwajalein Atoll (U.S. Navy 2019b).

Table 4-5. Estimated Numbers of Consultation Coral Colonies and Individual Mollusks Potentially Exposed to Debris Generated by FT-3 Payload Impact.

	Ocean Side				Lagoon Side			
Species	**Mean Colonies or Individuals (per m²)**	**99% UCL (per m²)**	**Potentially Affected Habitat (m²)**	**Number of Colonies or Individuals (mean to UCL)**	**Mean Colonies or Individuals (per m²)**	**99% UCL (per m²)**	**Potentially Affected Habitat (m²)**	**Number of Colonies or Individuals (mean to UCL)**
Corals								
Acropora microclados	0.0004	0.0017	7.3	<0.01 to 0.01				
Acropora polystoma	≤0.0004	0.0017	7.3	<0.01 to 0.01				
Cyphastrea agassizi					0.0003	0.0013	7.8	<0.01 to 0.01
Heliopora coerulea					0.16	0.45	7.8	1.25 to 3.51
Pavona venosa					0.0003	0.0013	7.8	<0.01 to 0.01
Pocillopora meandrina	0.3	0.58	7.3	2.19 to 4.24				
Turbinaria reniformis					≤0.0003	0.0013	7.8	<0.01 to 0.01
Coral Subtotal				**5 to 7**				**5 to 7**
Mollusks								
Hippopus hippopus	0.0003	0.0015	7.3	<0.01 to 0.01	0.002	0.006	7.8	0.02 to 0.05
Tectus niloticus					0.00006	0.0003	7.8	<0.01
Tridacna squamosa					0.0002	0.0011	7.8	<0.01 to 0.01
Mollusk Subtotal				**1**				**3**

Note: The species in this table include those found during a 2014 assessment of the reef areas offshore of the Illeginni Islet Impact Zone (NMFS-PIRO 2017a and 2017b). Coral colony and individual mollusk mean densities and 99% UCL provided by NMFS-PIRO (2017a and 2017b). The estimated number of exposures for each species was rounded up before subtotaling.

Abbreviations: m² = square meter, UCL = upper confidence limit

Based on analysis in the FT-3 Biological Assessment (U.S. Army 2020), the U.S. Army has concluded that the Proposed Action *may affect and is likely to adversely affect* seven UES-consultation coral species and three mollusk species offshore of Illeginni Islet (**Table 4-5**). The U.S. Army had consulted with NMFS for potential effects of the Proposed Action on these species (**Appendix A**). NMFS issued a Biological Opinion in March 2021 (**Appendix C**) and concluded that up to 14 UES-consultation coral colonies and 3 individual mollusks might be killed by the Proposed Action. Overall, NMFS concluded that the Proposed Action would not jeopardize the continued existence or recovery of these species at Illeginni Islet or in Kwajalein Atoll. Therefore, the Proposed Action would not significantly impact UES-consultation or other coral and mollusk species near Illeginni Islet.

Larval corals and mollusks of many species may also be present in the waters near Illeginni Islet as drifting plankton during certain times of the year (U.S. Navy 2019b). However, larval densities in this area are highly variable in space and time and are likely to be very low except during peak spawning (U.S. Army 2020, U.S. Navy 2019b). Since there would only be one flight test with limited activities in the marine environment, the Proposed Action would have minimal to no impact on gamete or larvae concentrations near Illeginni Islet or elsewhere in Kwajalein Atoll. Therefore, the Proposed Action impact on larval coral or mollusks is less than significant.

Vessels would be used to transport equipment and personnel to and from Illeginni Islet. Marine wildlife has the potential to be affected by vessel strike primarily by being at the surface when a vessel travels through an area and being struck by the vessel or its propellers (U.S. Navy 2019b). Marine mammals and sea turtles must surface to breath, are known to bask at the ocean surface, and have the highest risk of vessel strike. Only a small number of vessel trips would be required for the Proposed Action and avoidance an minimization measures (see **Table 4-7**) such as ship-based observers and adjusting vessel speed when possible, would be implemented to reduce the chances of a marine mammal or sea turtles being struck. Based on the likely low density of marine mammals and sea turtles in the ROI, implementation of avoidance measures, and the limited number of vessel trips, marine wildlife is not likely to be impacted by Proposed Action vessel traffic (U.S. Navy 2019b).

Considering the small quantities of hazardous materials contained in the payload and other test equipment, the planned land impact, the planned cleanup of test debris, and the dilution and mixing capabilities of the ocean and lagoon waters, hazardous materials released during payload impact should be of little consequence to any marine wildlife in the area (U.S. Navy 2019b). Exposure to hazardous chemicals would have little to no impact on marine wildlife.

4.3.1.3 Biological Resources in the Offshore Waters of Kwajalein Atoll –Alternative Impact Locations

Under the Proposed Action, potential impacts on biological resources in the offshore waters of Kwajalein Atoll may include exposure to elevated noise levels, direct contact from payload components or impact debris, disturbance from human activity and equipment operation, and exposure to hazardous chemicals. The potential impacts from the FT-3 test are expected to be of the same types and magnitude as for other recent flight tests evaluated for payload impact in offshore waters (U.S. Navy 2019b, U.S. Navy 2017, USASMDC/ARSTRAT 2014). Compared to the FE-2 flight test (U.S. Navy 2019b), the characteristics of payload impact and other Proposed Action activities are expected to be the same except that the FT-3 payload would carry a fraction (approximately 10 percent) of the tungsten. The potential impacts from the FT-3 Proposed Action in offshore waters are essentially the same in scope and intensity as the FE-2 action and the affected environment is the same as evaluated in the FE-2 EA/OEA (U.S. Navy 2019b). Therefore, the environmental consequences of the FT-3 Proposed Action would be the same as for the FE-2 action and the evaluation of environmental consequences of FE-2 payload impact at Illeginni Islet in the FE-2 EA/OEA (U.S. Navy 2019b) are incorporated here by reference. A brief summary of the potential impacts and conclusions about the significance of impacts on biological resources in offshore waters is included in this section but additional details about analyses and conclusions can be found in the FE-2 EA/OEA (U.S. Navy 2019b). A full list of avoidance and minimization measures which will be implemented as part of the Proposed Action can be found in **Table 4-7**.

Marine Wildlife. Marine wildlife in the ROI has the potential to be exposed to elevated noise levels, direct contact from payload components or impact debris, disturbance from human activity and equipment operation, and exposure to hazardous chemicals. While terrestrial habitats do not occur in the offshore payload impact zones, foraging seabirds may occur in these areas (U.S. Navy 2019b) and are included in this section.

The Proposed Action has the potential to result in elevated noise levels both in-air and underwater near the offshore impact location due to sonic booms from payload approach and due to impact of the payload as described for Illeginni Islet in **Section 4.3.1.2**. The maximum sound pressure levels for sonic booms at the terminal end of payload flight and for payload impact do not exceed the permanent or temporary auditory injury thresholds for any marine mammal, sea turtle, or fish species in the ROI (U.S. Navy 2019b). Sounds may exceed the behavioral disturbance threshold for marine wildlife (U.S. Navy 2019b); however, based on the expected noise levels and short-duration of the noise (lasting only seconds), any response is likely to be limited to startle response or short-term avoidance behavior. Animals would be expected to return to their normal behavior within minutes of exposure and the impact of noise on marine wildlife would be minimal.

If one of the alternative offshore impact locations were used, the payload would impact in deep ocean waters southwest of Kwajalein Atoll or northeast of Kwajalein Atoll. As in the FE-2 EA/OEA (U.S. Navy 2019b), a direct contact area of 91 m (300 ft) was used as a conservative approach to account for any fragmentation of the payload upon impact. Direct contact from payload debris is not expected to affect marine wildlife in the deepwater impact zones (U.S. Navy 2019b). For marine mammals and sea turtles with the potential to occur in the deep ocean waters near Kwajalein Atoll the number of exposures to direct contact was calculated based on the best available estimates of species density in the region (U.S. Navy 2019b). The estimated number of exposures was substantially less than one (maximum 0.0005 exposures for spinner dolphins) for all species (Table 4-7 in U.S. Navy 2019b). While density information for special status fish and seabird species is not available for the ROI, most species are expected to have low densities in the deep offshore waters of Kwajalein Atoll and direct contact from payload debris is considered very unlikely (U.S. Navy 2019b). While individuals of some more common species of fish and invertebrates may be contacted by payload fragments, loss of these individuals would not meaningfully change the regional population size or distribution of these species. Direct contact from payload debris is not expected to adversely impact marine wildlife in the ROI.

Pre-test preparation and post-test cleanup and recovery operations would result in increased vessel traffic to and from the offshore alternative impact locations. A station-keeping barge would be used at the offshore impact zones to provide primary scoring and sensor coverage for payload impact. Visual deterrents would be used on the barge (e.g., scarecrows, Mylar flags, helium-filled balloons, and strobe lights) to minimize the chances of birds loafing or resting on the vessel. Prior to the test flight, self-stationing sensor rafts would be deployed near the impact site, some with hydrophones. During post-test cleanup efforts, vessels would be used to transport personnel for manual cleanup of visible debris and instrument recovery. Vessel traffic would likely include several vessel round-trips to and from the offshore impact location. Marine wildlife in the offshore payload impact locations are not expected to be impacted by human activity and vessel traffic (U.S. Navy 2019b). Only a small number of vessel trips would be required in this area to position the self-stationing barge and sensor rafts, and to clean up floating debris post-test. While cetaceans and sea turtles must surface to breathe and are known to bask at the ocean surface, these are highly mobile animals capable of avoiding vessels, and measures will be in place during vessel operation to detect and avoid marine wildlife (see **Table 4-7**). Given the low densities of rare or sensitive marine wildlife in the ROI, the chances of an animal being impacted by human disturbance or being struck by a vessel are considered to be very low (U.S. Navy 2019b). Marine wildlife is not expected to be significantly impacted by human disturbance or vessel operation as a result of the Proposed Action.

Following the impact of the payload, fragmentation of the payload would disperse any of the residual onboard hazardous materials as described in **Section 4.3.1.2**. Only floating, visible debris would be recovered in the deep-water impact sites. Considering the small quantities of hazardous materials contained in the payload, the dilution and mixing capabilities of the deep ocean waters, the fact that most debris would sink to the ocean floor where it would be out of reach of most marine wildlife, and the low densities of rare and sensitive marine wildlife in the ROI, materials released during payload impact are not likely to have an impact on marine wildlife in the ROI (U.S. Navy 2019b).

4.3.2 Noise (USAG-KA)

Analysis of potential noise impacts includes estimating likely noise levels from the Proposed Action and determining potential effects to sensitive receptor sites. The potential for launch-associated noise to impact biological resources is discussed in **Sections 4.3.1.2** and **4.3.1.3**.

The Proposed Action would be deemed to significantly impact noise receptors if the following were to occur:

- The Proposed Action would result in a new, long-term source of noise
- The Proposed Action would negatively impact noise sensitive receptors above regulatory limits.

Because this is a developmental vehicle, and noise data are unavailable at this time, comparisons to the FT-2 STARS booster and the Trident I (C4) Target are conservatively analyzed as a point of reference where actual data is nonexistent (USASMDC/ARSTRAT 2014; MDA 2003)

4.3.2.1 Noise at Kwajalein Atoll – No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to noise levels in the USAG-KA ROI. Therefore, no significant impacts would occur from noise with implementation of the No Action Alternative.

4.3.2.2 Noise at Illeginni Islet – Proposed Action

Site Preparation Activities

Site preparation activities that would cause noise include deployment of radar and heavy equipment to Illeginni Islet or either one of the two deep ocean impact areas to the southwest or northeast of Kwajalein Islet. However, there are no local RMI communities that would be disturbed. No vessel or aircraft site preparation activity for the Proposed Action would impact sensitive noise receptors. RTS would verify that no non-mission water or aircraft would be in the ROI. All support personnel would evacuate to a safe location and wear hearing protection as required by the Army's Hearing Conservation Program (USASMDC/ARSTRAT 2014).

Launch Activities

Terminal flight of the FT-3 over the RMI would create a sonic boom carpet along its flight path. Local communities located on Ennubirr Islet (southeast of Roi-Namur Islet), Ebeye Islet, and Carlos Islet (northwest of Kwajalein Islet) are located outside of the sonic boom footprint. Using the FT-2 EA's STARS booster information (Page 4-23; USASMDC/ARSTRAT 2014), with the vehicle's high altitude (approximately 30,480 m [100,000 ft]), resulting sonic boom overpressures at sea level would range from approximately 0.12 to 0.21 pounds per square foot (psf) (109 to 114 dB [re 20 μPa] in air). As the FT-3 payload nears the intended impact site, a more focused sonic boom would occur. As the payload nears the RTS, the vehicle would travel towards the pre-designated impact site at Illeginni Islet, or in one of the two deep ocean impact zones to the southwest or northeast of Kwajalein Atoll. During vehicle descent, a focused boom would occur over the atoll. Sonic boom overpressures at ocean level would range from about 0.06 psf (103 dB [re 20 μPa] in air) near the outer edge of the footprint, to approximately 26 psf (156 dB [re 20 μPa] in air) near the point of impact. These overpressures are a conservative estimate for FT-3 based on FT-2 data. As FT-3 specific information is shared, it will be added to this EA/OEA.

Post-launch Activities

Post-launch activity would mirror site preparation activity but may generate more noise due to heavy equipment operation at Illeginni Islet for debris cleanup. The noise levels would not be anticipated to be near regulatory limits, and no noise-sensitive receptors would be present.

Conclusion

Noise levels during pre-test and post-flight activities at the predetermined impact site would occur in mostly unpopulated areas without resident receptors.

Depending on meteorological conditions, peak sound pressure levels locally could reach 123 dB based on a sonic boom overpressure of 0.6 psf (USASMDC/ARSTRAT 2014). Although this is considered reasonably loud, this noise would be audible once, last for a fraction of a second, and would be below the Army standard of 140 dB (peak sound pressure level) for impulse noise (USASMDC/ARSTRAT 2014). Because the local communities are outside the sonic boom footprint, these sensitive receptors may not hear the noise at all.

4.3.3 Public Health and Safety (USAG-KA)

Public health and safety would be deemed impacted if the following were to occur:

- The Proposed Action would introduce materials or operations in the ROI that would cause a potential public or occupational health hazard
- The Proposed Action would create an unmanageable human-health and/or safety hazard in the ROI

In accordance with EO 13045, Protection of Children from Environmental Health and Safety Risks, an analysis of environmental health and safety risks that may disproportionately affect children was made. The FT-3 flight test would be conducted on controlled DOD property or in the open ocean. Tests of this nature have been performed at USAG-KA for decades, and no additional protections for health and safety of children have been enacted previously. This EA/OEA has not identified any environmental health and safety risks that may disproportionately affect children.

4.3.3.1 Public Health and Safety at Kwajalein Atoll – No Action Alternative

Under the No Action Alternative, the FT-3 flight test would not occur and there would be no change to public health and safety. Therefore, no significant impacts to public health and safety would occur with implementation of the No Action Alternative.

4.3.3.2 Public Health and Safety at Illeginni Islet – Proposed Action

Site Preparation Activities

Site preparation activities include issuances of NOTAMs and NTMs by RTS in the ROI, as well as radar/visual sweeps of hazard areas to ensure clearance of non-mission vessels. The USAG-KA and RTS Safety Office would ensure that no public health and safety risks are imminent per the Flight Safety Plan, which includes an evaluation of risks to inhabitants and property near the flight path, calculations of vehicle trajectory and debris areas, and specific clearance and notification procedures. GRMI is notified in advance of rocket launches and missile payload impact missions.

Launch Activities

FT-3 would be fitted with an FTS to prevent unacceptable risk scenarios. No inhabited land areas would be subject to unacceptable risks of falling debris.

Post-launch Activities

Post-launch activities include cleanup of any hazardous materials per UES and KEEP requirements. No members of the general public would be susceptible to unmanageable risks from the Proposed Action.

Conclusion

The presence of non-mission vessels and aircraft in proximity to the USAG-KA impact zone represents the greatest risk to public health and safety for the FT-3 flight test. All efforts would be made by USAG-KA and RTS to follow SOPs and ensure clearance of the hazard areas. No unmanageable risks to public health and safety would result from implementation of the Proposed Activity.

4.3.4 Hazardous Materials and Wastes (USAG-KA)

Impacts on hazardous materials and wastes at USAG-KA would be considered environmentally significant if the following were to occur:

- If an increase of hazardous materials and wastes as a result of the Proposed Action exceeded USAG-KA's capacity to manage, store, or dispose of them in accordance with federal, state, or local laws.
- If the hazardous materials and wastes as a result of the Proposed Action increased the risk of soil or groundwater contamination; or created new human and environmental health risks.

4.3.4.1 Hazardous Materials and Wastes within Kwajalein Atoll – No Action Alternative

Under the No Action Alternative, the FT-3 flight test would not occur and there would be no change associated with hazardous materials and wastes at Kwajalein Atoll. Therefore, no significant impacts would occur to hazardous materials and wastes with implementation of the No Action Alternative.

4.3.4.2 Hazardous Materials and Wastes within Kwajalein Atoll – Proposed Action

Site Preparation Activities

Site preparation activities that would have the potential to develop hazardous materials or wastes include deployment of radar and heavy equipment to Illeginni Islet. Any releases of hazardous or non-hazardous waste during site preparation activity at Illeginni Islet would be cleaned up per current UES and KEEP regulations.

Launch Activities

Samples taken in July 2017, before the FE-1 test, show tungsten levels in soils at the FE-1 site averaged 1.3 milligrams per kilogram (mg/kg; range of 0.2 to 8.5 mg/kg) (U.S. Navy 2019b, LLNL 2017). Post-test FE-1 samples were taken in November 2017 and showed an average tungsten level of 3.0 mg/kg (range of 0.7 to 9.0 mg/kg). Additional soil sampling conducted at the site in February 2018 showed an average tungsten level of 2.3 mg/kg (range of 0.2 to 10.4 mg/kg) (U.S. Navy 2019b). An FE-2 post-test survey and sampling report described pre-test and post-test soil sampling results for uranium, beryllium, and tungsten at 34 sites (RGNext 2020). The pre-and post-test sampling revealed beryllium and tungsten were undetected, and uranium detected, but well below the USEPA composite worker regional screening level (ingestion and inhalation) (RGNext 2020, USEPA 2020).

Although the groundwater at Illeginni Islet shows tungsten levels above the RSL, the groundwater is not potable under the UES standards. With the reasonably foreseeable land use at Illeginni Islet as a test range and with the groundwater not being potable, further risk-based analysis is not planned at this time. If the land use would change, the site would be evaluated under the UES Restoration requirements to determine if the new land use required institutional controls or remediation.

Up to 45.36 kg (100 lb) of tungsten may be introduced to Illeginni Islet as a result of the Proposed Action; however, because the FE-2 EA/OEA analyzed up to 454 kg (1,000 lb) of tungsten alloy being introduced to the same impact location and determined that there was no significant risk to human health or the environment (U.S. Navy 2019b, LLNL 2017), then it can be reasonably assumed that no impacts to hazardous materials or waste management would occur from launch activities of FT-3. No UES required remediation would be expected because the Proposed Activity would not be expected to reach the screening criteria.

Post-launch Activities

The FT-3 payload would descend onto Illeginni Islet or into one of the two offshore waters locations. Post-launch activities include any necessary debris recovery and disposal per the UES for land or water impact, and impact crater remediation for a land-impact. Explosive Ordnance Disposal would be tasked with scanning the impact crater for explosive hazards and properly recovering them if found.

Should the vehicle impact one of the two alternative deep water impact zones, then any floating debris would be recovered and disposed of according to federal and UES standards. NASA conducted a thorough study of the seawater quality effects of missile components deposited in ocean waters (U.S. Navy 2017). NASA concluded that the release of hazardous materials from missiles into seawater would not be significant. The materials would be rapidly diluted and, except in the immediate vicinity of the debris, would not be found at concentrations that produce adverse effects. The payload materials are relatively insoluble and the depth of the Pacific Ocean at either of the proposed BOA impact sites is thousands of feet where light does not penetrate, levels of oxygen that might interact with materials at the surface are too low for that to occur, and water temperature differences from the upper water layers hamper any mixing between them. Any area on the ocean bottom affected by the slow dissolution of the payload debris would be relatively small, due to the size of the payload debris pieces as compared relative to the volume of surrounding seawater. Therefore, water quality effects from the payload are expected to be minimal. As potential for toxic concentrations is expected to be small and the effects would be very localized, the potential for cumulative impacts is expected to be nil. There are no plans to monitor deep water impacts in the BOA benthic zones of 2,438 m (8,000 ft) depth or greater, where no mixing with upper layers of water occurs.

Conclusion

Although unlikely, if there were any floating debris it would be recovered and brought onboard a vessel for appropriate handling and disposal from USAG-KA to the United States per the hazardous waste management plan. Considering the small quantities of hazardous materials contained in the batteries; the capacity of the USAG-KA hazardous waste management to accept and properly dispose of potential debris per UES standards; the single test; and the dilution and mixing capabilities of the ocean waters, the potential for hazardous materials released during the FT-3 flight test to adversely affect human health or the environment should be deemed insignificant.

4.4 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 4-6**. Minimization measures for each alternative are presented in **Table 4-7**.

Table 4-6. Potential Impacts Associated with the No Action Alternative and the Proposed Action

Location	Resource Area	No Action Alternative	U.S. Army RCCTO FT-3 Proposed Action
PSCA	Air Quality	There would be no change to baseline air quality and, therefore, no significant impacts to air quality or air resources would occur with implementation of the No Action Alternative.	Within the launch pad area short-term effects of the Proposed Action are anticipated to be high temperature exhaust gases and elevated carbon monoxide concentrations. However, because comparable rocket launches done at PSCA observed a return to ambient conditions within minutes of booster ignition and flight, and environmental studies done at PSCA have shown that chemical exhaust products do not accumulate in surface water or affect the local environment, then it can reasonably be assumed that there would be no significant air quality effects anticipated as a result of the FT-3 flight test.
	Water Resources	There would be no change to baseline water resources, and therefore, no significant impacts to water resources from implementation of the No Action Alternative.	Based on levels previously observed during STARS booster launches, the FT-3 is not anticipated to release levels of aluminum oxide that would cause impacts to water quality. Additionally, because the Proposed Action is for a single launch, levels of aluminum oxide would not be anticipated to accumulate and cause water quality issues. Under normal launch conditions rocket motor emissions would be expected to rapidly disperse to non-toxic levels, based on dilution and buffering from the ocean waters. Similar launches of the STARS booster and Trident I (C4) Target have been analyzed in various environmental documents and have been determined to not have a significant impact on water resources. The implementation of this Proposed Action would not be anticipated to result in significant impacts to water resources.
	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.	Launch Activities: Based on the characteristics of the FT-3 vehicle, proposed launch activities would be within the parameters of ongoing programmatic launch activities at PSCA. The effects of ongoing launch activities on biological resources at and near PSCA have previously been evaluated and there would be no new or additional impacts to biological resources at PSCA as a result of Proposed Action launch activities. As for other launch activities from PSCA potential impacts of proposed launch activities from PSCA include heat and emissions from vehicle launch and elevated noise levels. There would be no significant impacts to terrestrial vegetation, terrestrial wildlife, marine biological resources, threatened and endangered species, or environmentally sensitive habitats as a result of Proposed Action launch activities or vehicle overflight.

Table 4-6. Potential Impacts Associated with the No Action Alternative and the Proposed Action (Continued)

Location	Resource Area	No Action Alternative	U.S. Army RCCTO FT-3 Proposed Action
PSCA	**Biological Resources (Continued)**		Stage 1 Booster Drop Activities: Marine wildlife, including ESA-listed species, have the potential to be injured or otherwise affected by elevated noise levels, direct contact from the falling booster, and exposure to hazardous chemicals. Based on the characteristics of the FT-3 vehicle and vehicle flight and on the expected density of species in the ROI, it is very unlikely that rare or sensitive marine wildlife would struck by the falling booster or exposed to sound loud enough to injure individuals. Overall, stage 1 booster splash down would not significantly impact marine wildlife in the ROI. For ESA-listed species in the ROI, the U.S. Army has concluded that the stage 1 booster drop activities may affect but are not likely to adversely affect ESA-listed cetaceans, pinnipeds, sea turtles, or fish, and would have no effect on ESA-listed seabirds or northern sea otters. The U.S. Army has consulted with NMFS and USFWS and received their concurrence with these determinations (Appendix A). The Proposed Action would not significantly impact designated critical habitats, Biologically Important Areas, or Essential Fish Habitat in the PSCA ROI.
	Airspace	There would be no change to airspace use or control, and therefore, no impacts to airspace from implementation of the No Action Alternative.	Under the Proposed Action, there would be no permanent alterations to airspace resources. NOTAMs would be temporary, and any potentially affected flight plans would either be re-directed or resume after the FT-3 flight test officials and the FAA give permission. PSCA has tested several similar vehicles and is practiced in working with local, state, and federal air safety entities to prevent risks to human health and safety. By following the prescribed safety measures, there would be no unmanageable human-health hazards in the airspace ROI from the Proposed Action.
	Noise	There would be no change to noise sources, and therefore, no impacts from noise resulting from implementation of the No Action Alternative.	Noise analysis from FAA 1996, FAA 2016, and DOD 2017 all concluded that no impacts to the noise environment would occur from launch activities under those Proposed Actions, which included up to nine launches per year. This EA/OEA analyzes a single launch of a similarly sized vehicle, and because no changes have occurred to PSCA's noise receptor environment since the PSCA EA (DOD 2017), it can be determined that the Proposed Action would not result in impacts to the noise receptors.
	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.	PSCA has abundant procedures and policies in place to prevent any threats to public health and safety and can mitigate any potential hazards from a nominal or off-nominal FT-3 launch. The Proposed Action would not introduce materials or operations in the ROI that would cause a potential public or occupational health hazard, nor would the Proposed Action create an unmanageable human health and/or safety hazard in the ROI.

Table 4-6. Potential Impacts Associated with the No Action Alternative and the Proposed Action (Continued)

Location	Resource Area	No Action Alternative	U.S. Army RCCTO FT-3 Proposed Action
PSCA	**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.	All applicable state and federal regulations, range operating procedures, and FT-3-specific safety plans would 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, PSCA is capable of mitigating personnel and environmental health risks by following SOPs and utilizing on-site emergency response teams. The Proposed Action would not be expected to exceed PSCA's ability to manage, store, and dispose of hazardous materials and waste.
Pacific Ocean BOA	**Air Quality**	Under the No Action Alternative, the FT-3 flight test would not occur and there would be no change to baseline air quality in the flight corridor. No significant impacts to air quality or air resources would occur with implementation of the No Action Alternative.	Because the emissions of carbon dioxide, hydrogen chloride, aluminum oxide, and nitrogen oxide from a launch of a comparable STARS booster or Trident I (C4) Target would be relatively small compared to global emissions from industry; the large air volume over which these emissions would be spread; rapid dispersion of the emissions by stratospheric winds; and no apparent EPA NAAQS violations; a single launch of the FT-3 would not have a significant impact on air quality in the Pacific Ocean Flight Corridor.
	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 has the potential to impact marine biological resources in the BOA through elevated noise levels, direct contact from falling vehicle components, and exposure to hazardous chemicals. Marine wildlife and environmentally sensitive habitats would not be impacted by vehicle overflight. Based on available density data for special status marine wildlife in the stage 2 and 3 drop zones, the estimated number of animal exposures to elevated noise levels or direct contact from falling components is so low as to be discountable. Similarly, it is very unlikely that marine wildlife would be impacted by hazardous chemicals. Overall, splashdown of vehicle components in the BOA would not have significant impacts on marine wildlife. The U.S. Army has evaluated the effects of the Proposed Action on ESA-listed species and critical habitats in the FT-3 Biological Assessment (U.S. Army 2020) and has determined that the Proposed Action may affect but is not likely to adversely affect ESA-listed species in the BOA and would have no effect on designated critical habitat. The U.S. Army has consulted with NMFS and USFWS and received their concurrence with these determinations. (Appendix A).
	Water Resources	There would be no change to baseline water resources, and therefore, no significant impacts to water resources from implementation of the No Action Alternative.	Considering the small quantities of hazardous materials contained in the batteries; the likelihood of the solid rocket propellant to be burnt up before vehicle component impact in the BOA; the relatively large expanse between component drop stages; the single test; the lack of anticipated floating debris; and the dilution and mixing capabilities of the ocean waters, the potential for hazardous materials released during component impact to adversely affect the water resources of the BOA should be deemed insignificant.

Table 4-6. Potential Impacts Associated with the No Action Alternative and the Proposed Action (Continued)

Location	Resource Area	No Action Alternative	U.S. Army RCCTO FT-3 Proposed Action
USAG-KA, RMI Illeginni Islet and Offshore Waters Impact Zones	**Biological Resources**	There would be no change to biological resources under the No Action Alternative. Therefore, no impacts would occur to biological resources with implementation of the No Action Alternative.	**Illeginni Islet (Proposed Impact Location):** Potential impacts on biological resources at Illeginni Islet may include exposure to elevated noise levels, direct contact from payload components or impact debris, disturbance from human activity and equipment operation, and exposure to hazardous chemicals. No impacts to terrestrial or marine vegetation are expected. Birds nesting or roosting near the impact zone may be impacted by noise and human activity but with implementation of avoidance measures impacts would be short term and minimal. No sea turtle nests or nesting activity have been observed on Illeginni Islet in over 20 years and it is very unlikely that sea turtles will haul out or nest on Illeginni Islet. With implementation of measures to minimize the potential impacts to sea turtles, sea turtles in terrestrial habitats are not likely to be impacted. Marine mammals, sea turtles, and fish in offshore waters might be exposed to elevated noise levels or vessel traffic; however, any effects would likely be limited to short-term startle reactions and animals would be expected to return to normal behaviors within minutes. The impacts of elevated noise levels on marine wildlife would be minimal and less than significant. In the event of a payload impact on or near the shoreline, marine wildlife in nearshore reef habitats may be impacted by direct contact from debris or ejecta or by human activity during cleanup operations. Several special status coral, mollusk, and reef-associated fish species are known to occur in the nearshore waters of Illeginni Islet and have the potential to be injured by proposed activities. The U.S. Army has concluded that the Proposed Action may affect and is likely to adversely affect seven UES-consultation coral species and three mollusk species in reef habitats offshore of Illeginni Islet (U.S. Army 2020). The U.S. Army has consulted with NMFS and the USFWS on the effects of the Proposed Action on UES-consultation species at Kwajalein Atoll (Appendix C). Several measures would be in place to reduce impacts to these species and the impact to populations of these species would be less than significant. **Offshore Waters (Alternative Impact Location):** Potential impacts on biological resources in the alternative deep water impact zones may include exposure to elevated noise levels, direct contact from payload components or impact debris, disturbance from human activity and vessel operation, and exposure to hazardous chemicals. Based on the expected noise levels and short duration of the noise (lasting only seconds), any effects on marine wildlife or seabirds is likely to be limited to startle response or short-term avoidance behavior. Animals would be expected to

Table 4-6. Potential Impacts Associated with the No Action Alternative and the Proposed Action (Continued)

Location	Resource Area	No Action Alternative	U.S. Army RCCTO FT-3 Proposed Action
USAG-KA, RMI Illeginni Islet and Offshore Waters Impact Zones	**Biological Resources (continued)**		return to their normal behavior within minutes of exposure and the impact of noise on marine wildlife would be minimal. Given the low densities of rare or sensitive marine wildlife in the ROI, the chances of an animal being impacted by human disturbance, being contacted by payload debris, being exposed to hazardous chemicals, or being struck by a vessel are very low. Marine wildlife would not be significantly impacted by Proposed Action activities under the deep water payload impact alternative.
	Noise	There would be no change to noise levels in the ROI. Therefore, no significant impacts would occur from noise with implementation of the No Action Alternative.	Noise levels during pre-test and post-flight activities at the predetermined impact site would occur in mostly unpopulated areas without sensitive resident receptors. Depending on meteorological conditions, peak sound pressure levels locally could reach 123 dB based on a sonic boom overpressure of 0.6 psf (USASMDC/ARSTRAT 2014). Although this is considered reasonably loud, this noise would be audible once, last for a fraction of a second, and would be below the Army standard of 140 dB (peak sound pressure level) for impulse noise (USASMDC/ARSTRAT 2014). During the flight test, RTS would verify that no non-mission vessels would be in the area. Depending on a mission vessel's location, on-board personnel may be required to wear hearing protection in compliance with the Army's Hearing Conservation Program.
	Public Health and Safety	There would be no change to public health and safety under the No Action Alternative.	The presence of non-mission vessels and aircraft in proximity to the USAG-KA impact zone represents the greatest risk to public health and safety for the FT-3 flight test. All efforts would be made by USAG-KA and RTS to follow SOPs and ensure clearance of the hazard areas. No unmanageable risks to public health and safety would result from implementation of the Proposed Activity.
	Hazardous Materials and Wastes	Under the No Action Alternative, there would be no change to hazardous materials and waste at Illeginni Islet.	Although unlikely, if there were any floating debris it would be recovered and brought onboard a vessel for appropriate handling and disposal from USAG-KA to the U.S. per the hazardous waste management plan. Considering the small quantities of hazardous materials contained in the batteries; the capacity of the USAG-KA hazardous waste management to accept and properly dispose of potential debris per UES standards; the single test; and the dilution and mixing capabilities of the ocean waters, the potential for hazardous materials released during the FT-3 flight test to adversely affect human health or the environment should be deemed insignificant.

Table 4-7. Impact Avoidance and Minimization Measures

Location	Measure	Anticipated Benefit	Evaluating Effectiveness	Implementing and Monitoring	Responsibility
PSCA	Transportation, handling, and storage of rocket motors and other ordnance would occur in accordance with AAC, DOD, Army, 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 AAC, DOD, Army, and U.S. DOT policies and regulations	Army RCCTO, USAF
	SMDC would conduct range responsibilities.	Ensure appropriate launch preparation, including explosive safety, support to PSCA launch safety and coordination	Determine the rate of successful compliance and incident prevention	Recordkeeping in accordance with AAC, DOD, Army, and other applicable policies and regulations	PSCA
	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 AAC, DOD, Army, USCG, and FAA policies and regulations	Army RCCTO, PSCA
	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 AAC, DOD, Army, and OSHA policies and regulations	PSCA

Table 4-7. Impact Avoidance and Minimization Measures (Continued)

Location	Measure	Anticipated Benefit	Evaluating Effectiveness	Implementing and Monitoring	Responsibility
Pacific Over-Ocean Flight Corridor	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, RTS and flight safety policies and regulations, USFWS regulations, and the ESA and MMPA	Army RCCTO, PSCA
	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	Army RCCTO, RTS
	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 DOD, Army, RTS, and flight safety policies and regulations	Army RCCTO, PSCA

Table 4-7. Impact Avoidance and Minimization Measures (Continued)

Location	Measure	Anticipated Benefit	Evaluating Effectiveness	Implementing and Monitoring	Responsibility
USAG-KA, RMI Illeginni Islet and Deep Ocean Impact Areas in Kwajalein Atoll	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 UES, DOD, Army, KMISS and RTS range and flight safety policies and regulations	Army RCCTO, RTS
	Pre-flight monitoring by qualified personnel would be conducted on Illeginni Islet for sea turtles or sea turtle nests. On-site personnel would report any observations of sea turtles or sea turtle nests on Illeginni to appropriate test and USAG-KA personnel to provide to USFWS, NMFS, and RMI EPA.	Avoid impacts to sea turtles and sea turtle nests	Determine the rate of successful compliance and incident prevention or occurrence	For at least 8 weeks preceding the FT-3 launch, Illeginni Islet would be surveyed by pre-test personnel for sea turtles, sea turtle nesting activity, and sea turtle nests. The area would be inspected within a day preceding the flight test. If sea turtles or sea turtle nests are observed near the impact area, observations would be reported to appropriate test and USAG-KA personnel for consideration in approval of the launch and to USFWS, NMFS, and RMI EPA. Recordkeeping and reporting in accordance with UES, DOD, Army, and USFWS regulations	RTS/USAG-KA, Army RCCTO

Table 4-7. Impact Avoidance and Minimization Measures (Continued)

Location	Measure	Anticipated Benefit	Evaluating Effectiveness	Implementing and Monitoring	Responsibility
	RTS would conduct range responsibilities.	Ensure appropriate launch preparation, including explosive safety, support to U.S. Army and inter-range coordination	Determine the rate of successful compliance and incident prevention	Recordkeeping in accordance with UES, DOD, Army, and RTS applicable policies and regulations	RTS
	During travel to and from impact zones, including Illeginni Islet, 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 the USAG-KA Environmental Office and USASMDC, who would then inform NMFS and USFWS. USAG-KA 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 and USAG-KA personnel for consideration in launch planning, recordkeeping and reporting in accordance with UES, DOD, Army, and RTS policies and regulations.	Army RCCTO, RTS

Table 4-7. Impact Avoidance and Minimization Measures (Continued)

Location	Measure	Anticipated Benefit	Evaluating Effectiveness	Implementing and Monitoring	Responsibility
	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 materials and waste management systems of USAG-KA. Hazardous material releases would comply with the emergency procedures set out in the KEEP and the UES.	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	Army RCCTO, RTS
	All equipment and packages shipped to USAG-KA would undergo inspection prior to shipment.	Prevent the introduction of alien species of plants and animals to Kwajalein Atoll	Determine the rate of successful prevention, identifying the need for treatment applications, as necessary	Recordkeeping of all inspections and outcomes	Army RCCTO
	Sensor rafts would not be located in waters less than 3 m (10 ft) deep.	To avoid impacts on coral heads off Illeginni Islet	Determine the rate of successful compliance and incident prevention	Recordkeeping of deployments and outcomes	Army RCCTO, LLNL
	FTS on the payload would include a failsafe operation.	Further ensure the safety of the Marshall Islands 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 UES, DOD, Army, and RTS policies and regulations	Army RCCTO, PSCA, RTS

Table 4-7. Impact Avoidance and Minimization Measures (Continued)

Location	Measure	Anticipated Benefit	Evaluating Effectiveness	Implementing and Monitoring	Responsibility
	Payload impact would be in the non-forested area, place scarecrows, Mylar flags, helium-filled balloons, and strobe lights or tarp coverings on or near equipment and in the impact area.	Avoid affecting the bird habitat	Determine the rate of successful compliance and incident prevention or occurrence	Recordkeeping and reporting in accordance with UES, DOD, Army, RTS, USFWS, and RMIEPA policies and regulations	Army RCCTO, RTS
	The impact area would be searched for seabird nests, including eggs and chicks, prior to pre-flight activity. Any discovered seabird nest would be covered with an A-frame structure to protect eggs or chicks and to warn project personnel.	Avoid impacts to seabirds, especially black-naped terns	Post-test monitoring to observe impacts to seabirds, especially black-naped terns, their nests, eggs, or chicks	Results of monitoring would be reported to USAG-KA Environmental and to USFWS	Army RCCTO, RTS
	Debris recovery and site cleanup would be performed for land or shallow water impacts.	To minimize long-term risks to terrestrial and marine life	Comparison of recovered debris to known materials in the payload	All visible project-related debris would be recovered during post-flight operations, including debris in shallow lagoon or shallow ocean waters by range divers. In all cases, recovery and cleanup would be conducted in a manner to minimize further impacts on biological resources. Protected marine species including invertebrates would be avoided or effects to them would be minimized, which may include	RTS, Army RCCTO, NMFS

Table 4-7. Impact Avoidance and Minimization Measures (Continued)

Location	Measure	Anticipated Benefit	Evaluating Effectiveness	Implementing and Monitoring	Responsibility
				movement of these organisms out of the area likely to be affected.	
	Should any missile components or debris impact areas of sensitive biological resources (i.e., sea turtle nesting habitat or coral reef), a USFWS or NMFS biologist would be allowed to provide guidance and/or assistance in recovery operations to minimize impacts on such resources.	Minimize impacts on terrestrial and marine biological resources	Determine whether components or debris impact sensitive resources, determine if a USFWS or NMFS biologist was contacted and allowed to provide guidance	Recordkeeping and reporting in accordance with UES, DOD, Army, RTS, USFWS and NMFS policies and regulations	Army RCCTO
	Should personnel observe endangered, threatened, or other species requiring consultation moving into the area, work would be delayed until such species leave the area or were out of harm's way.	Avoid impacts to terrestrial and marine wildlife	Determine the rate of successful compliance and incident prevention	Recordkeeping and reporting with UES, DOD, Army, RTS, USFWS, and RMIEPA policies and regulations	Army RCCTO
	Evacuation of nonessential personnel and sheltering all other personnel remaining within the Mid-Atoll Corridor; publication and circulation of NOTAMs and NTMs; perform radar and visual sweeps of the hazard area immediately prior to test flights	Provide safety and warning to personnel, including native Marshallese citizens, 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 UES, DOD, Army, and RTS policies and regulations	Army RCCTO, RTS
	Ordnance personnel survey of impact site, removal of residual	Ensure post-test personnel safety, avoid impacts to terrestrial and	Determine the rate of successful compliance and	Recordkeeping in accordance with UES, DOD, Army, and	RTS

Table 4-7. Impact Avoidance and Minimization Measures (Continued)

Location	Measure	Anticipated Benefit	Evaluating Effectiveness	Implementing and Monitoring	Responsibility
	explosive materials, manual cleanup and removal of debris including hazardous materials, backfill impact crater, dive team or remotely operated vehicle survey and debris recovery for deeper water lagoon impact	marine vegetation and wildlife	incident prevention with appropriate disposition of recovered materials	RTS policies and regulations	
	Inspect reef, reef flat, or shallow waters within 24 hours if inadvertently impacted, assess damage, decide on any mitigation measures	Avoid or minimize impacts to marine vegetation and wildlife	Determine the rate of successful compliance and incident prevention	Recordkeeping and reporting in accordance with UES, DOD, Army, RTS and RMIEPA policies and regulations	RTS, Army RCCTO, possibly NMFS/USFWS
	Ensure that all relevant personnel associated with this project are fully briefed on the BMP and the requirement to adhere to them for the duration of this project.	Ensure awareness of and application of BMP for the duration of the FT-3 flight test	Determine the rate of successful compliance and incident prevention	Recordkeeping in accordance with UES, DOD, Army, RTS, USFWS and NMFS policies, regulations, and guidance	Army RCCTO
	In the event the payload land impact affects the reef at Illeginni, personnel shall secure or remove from the water any substrate or coral rubble from the ejecta impact zone that may become mobilized by wave action as soon as possible. Ejecta greater than 6 inches in any dimension shall be removed from the water or positioned such that it would not become mobilized by expected wave action,	Avoid impacts to marine wildlife, determine impacts to reef and disposition of ejecta	Determine the rate of successful compliance and incident prevention	Recordkeeping and reporting in accordance with UES, DOD, Army, RTS, USFWS and NMFS policies, regulations, and guidance	Army RCCTO, USAG-KA

Table 4-7. Impact Avoidance and Minimization Measures (Continued)

Location	Measure	Anticipated Benefit	Evaluating Effectiveness	Implementing and Monitoring	Responsibility
	including replacement in the payload crater. If possible, coral fragments greater than 6 inches in any dimension shall be positioned on the reef such that they would not become mobilized by expected wave action, and in a manner that would enhance its survival; away from fine sediments with the majority of the living tissue (polyps) facing up. UES consultation coral fragments that cannot be secured in-place should be relocated to suitable habitat where it is not likely to become mobilized.				
	In the event the payload land impact affects the reef at Illeginni, USASMDC shall require its personnel to reduce impacts on top shell snails. Rescue and reposition any living top shell snails that are buried or trapped by rubble. Relocate to suitable habitat, any living top shell snails that are in the path of any heavy equipment that must be used in the marine environment.	Avoid impacts to marine wildlife	Post-test monitoring to observe impacts to reef and top shell snails, and determine disposition of ejecta	Recordkeeping and reporting in accordance with UES, DOD, Army, RTS, USFWS and NMFS policies, regulations, and guidance	Army RCCTO, USAG-KA

Table 4-7. Impact Avoidance and Minimization Measures (Continued)

Location	Measure	Anticipated Benefit	Evaluating Effectiveness	Implementing and Monitoring	Responsibility
	In the event the payload land impact affects the reef at Illeginni, personnel shall be required to reduce impacts on UES coordination and consultation clam species. Rescue and reposition any living UES-listed clams that are buried or trapped by rubble. Relocate to suitable habitat, any living UES-listed clams that are in the path of any heavy equipment that must be used in the marine environment.	Avoid impacts to marine wildlife	Post-test monitoring to observe impacts to reef and living clams, and determine disposition of ejecta	Recordkeeping and reporting in accordance with UES, DOD, Army, RTS, USFWS and NMFS policies, regulations, and guidance	Army RCCTO, USAG-KA
	Appropriately qualified personnel shall be assigned to record all suspected incidences of take of any UES-consultation species.	Ensure accuracy of data collection and applicability to incidences of take	Identification or refutation of all suspected incidences of take	Recordkeeping and reporting in accordance with UES, DOD, Army, RTS, USFWS and NMFS policies, regulations, and guidance	Army RCCTO, USAG-KA
	Digital photography shall be utilized to record any UES-consultation species found injured or killed in or near the ocean target areas and/or at Illeginni. As practicable: 1. Photograph all damaged corals and/or other UES-consultation species that may be observed injured or dead;	Ensure accuracy of data collection and applicability to incidences of take	Photo-documentation prepared as per NMFS guidance	Recordkeeping and reporting in accordance with UES, DOD, Army, RTS, USFWS and NMFS policies, regulations, and guidance	Army RCCTO, USAG-KA

Table 4-7. Impact Avoidance and Minimization Measures (Continued)

Location	Measure	Anticipated Benefit	Evaluating Effectiveness	Implementing and Monitoring	Responsibility
	2. Include a scaling device (such as a ruler) in photographs to aid in the determination of size; and 3. Record the location of the photograph.				
	In the event the payload impact affects the reef at Illeginni, personnel shall survey the ejecta field for impacted corals, top shell snails, and clams. Also be mindful for any other UES-consultation species that may have been affected.	Avoid impacts to marine wildlife; ensure accuracy of data collection and applicability to incidences of take	Post-test monitoring to observe impacts to reef and identified organisms, including UES consultation species	Recordkeeping and reporting in accordance with UES, DOD, Army, RTS, USFWS and NMFS policies, regulations, and guidance	Army RCCTO, USAG-KA
	Within 60 days of completing post-test clean-up and restoration, provide photographs and records to the USAG-KA Environmental Office. USAG-KA and NMFS biologists will review the photographs and records to identify the organisms to the lowest taxonomic level accurately possible to assess impacts on consultation species.	Ensure accuracy of data collection and applicability to incidences of take	Submittal of photographs and records within 60 days of completing post-test clean-up and restoration	Recordkeeping and reporting in accordance with UES, DOD, Army, RTS, USFWS and NMFS policies, regulations, and guidance	Army RCCTO, USAG-KA

Table 4-7. Impact Avoidance and Minimization Measures (Continued)

Location	Measure	Anticipated Benefit	Evaluating Effectiveness	Implementing and Monitoring	Responsibility
	Within 6 months of completion of the action, U.S. Army RCCTO shall provide a report to USAG-KA to forward to NMFS. The report shall identify: 1. The flight test and date; 2. The target area; 3. The results of the pre- and post-flight surveys; 4. The identity and quantity of affected resources (include photographs and videos as applicable); and 5. The disposition of any relocation efforts.	Ensure compliance with UES and NMFS Biological Opinion Terms and Conditions	Submittal of report within 6 months of completing the action	Recordkeeping and reporting in accordance with UES, DOD, Army, RTS, USFWS and NMFS policies, regulations, and guidance	Army RCCTO, USAG-KA
	Prepare a project specific NPA and DEP	Ensure UES compliance	Complete the NPA and DEP prior to occurrence of the Proposed Action	Final DEP authorized with UES Appropriate Agencies' signatures prior to occurrence of the Proposed Action	Army RCCTO
	Raft would have running lights and station-keeping; no intentional ocean dumping should the instrumentation raft be inadvertently struck during the conduct of the mission; possible use of scarecrows, Mylar flags, helium-filled balloons, and strobe lights.	Maritime safety; compliance with international policy; visual deterrents to avoid inadvertent impacts to birds that might be on the raft	Determine the rate of successful compliance and incident prevention or occurrence	Recordkeeping and reporting in accordance with UES, DOD, Army, and RTS range and flight safety policies and regulations	Army RCCTO, RTS, LLNL

Table 4-7. Impact Avoidance and Minimization Measures (Continued)

Location	Measure	Anticipated Benefit	Evaluating Effectiveness	Implementing and Monitoring	Responsibility
	Visible debris on the water surface would be recovered and removed	Avoid physical impacts to marine life	Collection of any visible debris on the water surface or documentation of the lack of visible debris	All visible project-related debris on the water surface would be recovered during post-flight operations. In all cases, recovery and cleanup would be conducted in a manner to minimize further impacts on biological resources. Recordkeeping and reporting in accordance with UES, DOD, Army, and RTS, policies and regulations	RTS/USAG-KA, Army RCCTO
	Publication and circulation of a fact sheet describing the project and the environmental controls would be prepared and would be provided at locations on Ebeye and Kwajalein Islet; perform radar and visual sweeps of the hazard area immediately prior to test flights.	Provide safety and warning to personnel, including native Marshallese citizens, 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 UES, DOD, Army, and RTS policies and regulations	Army RCCTO, RTS

5.0 Cumulative Impacts

This chapter (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 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 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 timeframe for cumulative impacts centers on the timing of the Proposed Action, in this case a single launch and flight test.

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 and 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 projects at and near PSCA, the Pacific BOA, and RTS, Kwajalein Atoll. In determining which projects to include in the cumulative impacts analysis, a preliminary determination was made regarding past, present, or reasonably foreseeable actions. Projects 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 FT-3

Location	Action	Level of NEPA Analysis Completed or Expected
Pacific Spaceport Complex Alaska (PSCA)	**Past, Present, and Reasonably Foreseeable Future Actions**	
	Kodiak Launch Complex Launch Pad 3 (2016)	EA/FONSI
	PSCA Ballistic Missile Defense Flight Test Support (2017)	EA/FONSI
	PSCA Ballistic Missile Defense Flight Test Support	SEA (expected)
Pacific Ocean Broad Ocean Area	**Past, Present, and Reasonably Foreseeable Future Actions**	
	Minuteman III (MMIII) Extended Range Flight Testing (2013)	SEA/FONSI
	Advanced Hypersonic Weapon Flight Test-2 (FT-2) (2014)	EA/FONSI
	Terminal High-Altitude Area Defense Permanent Stationing in Guam (2017)	EA/FONSI
	Navy Flight Experiment-2 (FE-2) (2019)	EA/FONSI
	Air-Launched Rapid Response Weapon (ARRW) (2020)	EA/OEA
	Tactical Boost Glide (TBG) Flight Testing (2020)	EA/OEA/FONSI
	Ground Based Strategic Deterrent (GBSD) Test Program	EA/OEA (expected)
	Army and Navy Joint Flight Campaign (JFC)	EA/OEA (expected)
	MMIII Modification and Fuze Modernization	SEA (expected)
USAG-KA, RMI Illeginni Islet Impact	**Past, Present, and Reasonably Foreseeable Future Actions**	
	Advanced Hypersonic Weapon Flight Test-2 (FT-2) (2014)	EA/FONSI
	Navy Flight Experiment-2 (FE-2) (2019)	EA/FONSI
	Air-Launched Rapid Response Weapon (ARRW) (2020)	EA/FONSI
	GBSD Test Program	EA/OEA (expected)
	MMIII Modification EA (2004)	EA/FONSI

5.3.1 Past Actions

Past actions descriptions were documented in the FE-2 EA/OEA (Page 5-4; U.S. Navy 2019b). Past actions have included testing and training for Navy and other Government agencies; research, development, test, and evaluation activities; Major Exercises; and maintenance of the technical and logistical facilities that support these activities and exercises (U.S. Navy 2019b). MMIII ICBM missile tests have routinely impacted at KMISS and Illeginni Islet in the past (U.S. Navy 2019b). Beryllium, depleted uranium, and tungsten remain in the soil at Illeginni Islet from previous tests (RGNext 2020, U.S. Navy 2019b, USASMDC/ARSTRAT 2014, LLNL 2017). There is beryllium and depleted uranium in the soil at Illeginni Islet from past MMIII reentry vehicles impacts. Analytical results indicate the levels are below USEPA residential regulatory limits (Robison et al. 2013). The U.S. Army Public Health Center Fish Study (2014) noted that "unacceptable cancer risk for Marshallese adults at Illeginni [harbor] is attributable to the pesticide, chlordane." Chlordane is a pesticide used to treat wood and wood structures for control of pests, particularly termites, and is not associated with previous missile flight tests impacting at Illeginni. Soils and groundwater at Illeginni Islet were tested for tungsten released during FE-1 and FE-2. **Section 3.3.4** includes a discussion of those results.

MMIII ICBM missile testing between VAFB and RTS has occurred and will continue to occur on an annual basis. Up to four MMIII 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 MMIII missile testing in 2001 and 2004. For past flight tests, the impact crater was screened for debris and all other visible debris from around the impact was manually recovered and disposed of in accordance with the UES.

On September 11, 2020, private small launch vehicle startup Astra launched and terminated Rocket 3.1. Early in the flight the guidance system introduced slight oscillation into the flight, causing the vehicle to drift from its planned trajectory and therefore commanded to shutdown via the FTS during the first stage burn (Krakow 2020). The resulting fire was put out quickly and no workers or members of the public appear to have been hurt (Krakow 2020). Astra stated that the data and experience gathered from the failed Rocket 3.1 launch still made it a success, and that Rocket 3.2 was built and ready to be tested (Krakow 2020). PSCA is permitted by the FAA to host small and medium sized rocket launches and has multiple environmental and public health and safety measures in place to accommodate this and future launch failures. PSCA is required to follow all applicable state and federal regulations, range operating procedures, and test-specific safety plans to prevent and respond to accidents.

5.3.2 Present and Reasonably Foreseeable Actions

MMIII flight tests have been and will continue to be conducted in accordance with biological opinions from NMFS and USFWS, in addition to program specific DEPs and the UES. MMIII ICBM and Ground Based Strategic Deterrent (GBSD) reentry vehicles are planned to impact in the deep water areas at RTS. An SEA is in process for the Modification and Fuze Modernization flight tests through 2030, and the in-process GBSD EA/OEA includes up to three GBSD reentry vehicles impacting on Illeginni.

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 Point Mugu Sea Range and impact at Illeginni Islet.

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 Spaceport Complex Alaska

5.4.1.1 Cumulative Impact Analysis

Within the launch pad area short-term effects of the Proposed Action are anticipated to be high temperature exhaust gases and elevated carbon monoxide concentrations. However, because comparable rocket launches done at PSCA observed a return to ambient conditions within minutes of booster ignition and flight, and environmental studies done at PSCA have shown that chemical exhaust products do not accumulate in surface water or affect the local environment, then it can reasonably be assumed that there would be no significant air quality effects anticipated as a result of the FT-3 flight test.

Based on launch emission levels previously observed during comparably sized launches, the single FT-3 launch, the dilution and buffering from the ocean waters, the required presence of a qualified accident response team, the previous NEPA documenting a history of no significant impacts to water resources from similarly sized nominal launches, and with proper BMPs and SOPs, it can be reasonably concluded that implementation of the Proposed Action would not result in significant impacts to PSCA's water resources.

Overall, Proposed Action activities at and near PSCA would not significantly impact biological resources including threatened and endangered species. AAC and FAA have evaluated the impacts of ongoing PSCA programmatic launch activities on biological resources, and all launch activities under the Proposed Action would take place in accordance with the avoidance, minimization, and mitigation measures as required by PSCA operations procedures and programmatic consultations. The Proposed Action would not significantly impact designated critical habitats, Biologically Important Areas, or EFH in the ROI. No other actions have been identified that either have not been evaluated under PSCA programmatic launch activities or would interact with effects of the Proposed Action to cumulatively impact biological resources.

Under the Proposed Action, there would be no permanent alterations to airspace resources. NOTAMs would be temporary, and any potentially affected flight plans would either be re-directed or resume after the FT-3 flight test officials and the FAA give permission. PSCA has tested several similar vehicles and is practiced in working with local, state, and federal air safety entities to prevent risks to human health and safety. By following the prescribed safety measures there would be no unmanageable human-health hazards in the airspace ROI from the Proposed Action.

All public and non-essential personnel would be outside of the established GHA and exposed to noise below the 115 dBA limit for short-term exposure. Noise analysis from FAA 1996, FAA 2016, MDA 2003, and DOD 2017 all concluded that no impacts to the noise environment would occur from launch activities under those proposed actions, which includes up to nine launches per year. This EA/OEA only analyzes a single launch of a similarly sized vehicle, and because no changes have occurred to PSCA's noise receptor environment since the PSCA EA (DOD 2017), it can be determined that the Proposed Action would not result in impacts to the noise receptors.

PSCA has abundant procedures and policies in place to prevent any threats to public health and safety and can mitigate any potential hazards from a nominal or off-nominal FT-3 launch. The Proposed Action would not introduce materials or operations in the ROI that would cause a potential public or occupational health hazard, nor would the Proposed Action create an unmanageable human health and/or safety hazard in the ROI.

All applicable state and federal regulations, range operating procedures, and FT-3-specific safety plans would be followed to prevent accidents that could release hazardous materials or wastes into the local environment. Although unlikely, should a release of hazardous materials or wastes occur, PSCA is capable of mitigating personnel and environmental health risks by following SOPs and utilizing on-site emergency response teams. The Proposed Action would not be expected to exceed PSCA's ability to manage, store, and dispose of hazardous materials and waste.

5.4.2 Pacific Ocean Flight Corridor

5.4.2.1 Cumulative Impact Analysis

Because the emissions of carbon dioxide, hydrogen chloride, aluminum oxide, and nitrogen oxide from a launch of a comparable STARS booster or Trident I (C4) Target would be relatively small compared to global emissions from industry; the large air volume over which these emissions would be spread; rapid dispersion of the emissions by stratospheric winds; and no apparent EPA NAAQS violations; a single launch of the FT-3 would not have a significant impact on air quality in the Pacific Ocean Flight Corridor.

As with past flight test programs, the impacts to biological resources within the broad area of the Pacific Ocean 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 Pacific Ocean, the size of missile components, and the low densities of marine species across these open ocean areas. None of these actions are expected to interact to produce cumulative effects for biological resources.

Considering the small quantities of hazardous materials contained in the batteries and FTS components (for a nominal flight), the likelihood of the solid rocket propellant to be burnt up before vehicle component impact in the BOA, the relatively large expanse between component drop stages, the single test, the lack of anticipated floating debris, and the dilution and mixing capabilities of the ocean waters, the potential for hazardous materials released during component impact to adversely affect the water resources of the BOA should be deemed insignificant.

5.4.3 U.S. Army Garrison–Kwajalein Atoll

5.4.3.1 Cumulative Impact Analysis

The Proposed Action is not expected to have significant or lasting impacts on terrestrial biological resources at Illeginni Islet, and no interactions are expected which would lead to cumulative impacts to terrestrial biological resources. As with past missile test activities, the Proposed Action has the potential to affect marine biological resources including UES-protected coral, mollusk, and reef-associated fish species. Marine and shoreline habitats would not be targeted. While past, present, and future test programs, including the Proposed Action, have the potential to affect nearshore marine biological resources, there would be no interactive effects that would result in additional impacts to marine resources greater than those analyzed for an individual action. Therefore, the Proposed Action is not expected to contribute to any cumulative biological resource impacts.

Noise levels during pre-test and post-flight activities at the predetermined impact site would occur in mostly unpopulated areas without resident receptors. Depending on meteorological conditions, peak sound pressure levels locally could reach 123 dB based on a sonic boom overpressure of 0.6 psf (USASMDC/ARSTRAT 2014). Although this is considered reasonably loud, this noise would be audible once, last for a fraction of a second, and would be below the Army standard of 140 dB (peak sound pressure level) for impulse noise (USASMDC/ARSTRAT 2014). Because the local communities are outside the sonic boom footprint, these sensitive receptors may not hear the noise at all.

The presence of non-mission vessels and aircraft in proximity to the USAG-KA impact zone represents the greatest risk to public health and safety for the FT-3 flight test. All efforts would be made by USAG-KA and RTS to follow SOPs and ensure clearance of the hazard areas. No unmanageable risks to public health and safety would result from implementation of the Proposed Activity.

Although unlikely, if there were any floating debris it would be recovered and brought onboard a vessel for appropriate handling and disposal from USAG-KA to the United States per the hazardous waste management plan. Soils and groundwater at Illeginni Islet were analyzed for tungsten in 2020. Results of these tests indicated the tungsten level in soils was undetected (RGNext 2020). Tungsten levels in soils following FT-3 are not expected to increase substantially and are expected to remain below the RSLs. The tungsten level in groundwater is above the RSL for potable water. However, the groundwater at Illeginni Islet is not potable. Considering the small quantities of hazardous materials contained in the batteries, the capacity of the USAG-KA hazardous waste management to accept and properly dispose of potential debris per UES standards, the single test, and the dilution and mixing capabilities of the ocean waters, the potential for hazardous materials released during the FT-3 flight test to adversely affect human health or the environment should be deemed insignificant.

This page intentionally left blank.

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. 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 13423, Strengthening Federal Environmental, Energy, and Transportation Management	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 Proposed Action would not have any known impacts to land use, water use, or natural resources. All federal, state, and local laws consistent with the CZMA would be followed. No federal consistency determination is required for the FT-3 flight test.

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 Proposed Action would leave no significant impacts to the environment that would narrow the range of future beneficial uses. The Proposed Action would have no effect on the maintenance and enhancement of the long-term productivity of the affected environments analyzed in this EA/OEA.

This page intentionally left blank.

7.0 References

AAC (Alaska Aerospace Corporation). 2015. Pacific Spaceport Complex–Alaska Range User's Manual. July 2015.

AAC (Alaska Aerospace Corporation). 2016. Application for a Five-Year Programmatic Permit for Small Takes of Marine Mammals Incidental to Launching of Space Launch Vehicles, Long Range Ballistic Target Missiles, and Smaller Missile Systems at Pacific Spaceport Complex Alaska, Kodiak Island, Alaska. Submitted to the National Marine Fisheries Service, Office of Protected Resources.

AAC (Alaska Aerospace Corporation). 2018. Pacific Spaceport Complex Alaska: Government Programs Launch Site Safety Manual, Kodiak Island – Narrow Cape – Alaska. July 6, 2018.

AAC (Alaska Aerospace Corporation). 2019. "About Us". Available online: https://akaerospace.com/about-us. Accessed March 12, 2020.

ADEC (Alaska Department of Environmental Conservation). 2016a. ADEC Spill No. 14249923702, Alaska Aerospace Corp Kodiak Launch Facility. No Further Action (Closure) Letter. June 9, 2016.

ADEC (Alaska Department of Environmental Conservation). 2016b. State of Alaska 2015 Ambient Air Quality Network Assessment. November 2016.

ADEC (Alaska Department of Environmental Conservation). 2020. Annual Air Quality Monitoring Network Plan. June 25, 2020.

ADFG (Alaska Department of Fish and Game). 2015. Alaska Wildlife Action Plan. Juneau, Alaska.

ADFG (Alaska Department of Fish and Game). 2020a. Fishing in Alaska. Commercial, Sport, and Subsistence Fishery Information. Available online: https://www.adfg.alaska.gov/index.cfm?adfg=fishing.main. Accessed January 2020.

ADFG (Alaska Department of Fish and Game). 2020b. Sport Fishing. Kodiak Management Area. Available online: https://www.adfg.alaska.gov/index.cfm?adfg=ByAreaSouthcentralKodiak.fishingInfo#regulations. Accessed October 2020.

Alaska Climate Research Center. 2019. "Kodiak". Available online: http://climate.gi.alaska.edu/history/kodiak. Accessed March 12, 2020.

AlaskaSeafood.org. 2020. The Economic Value of Alaska's Seafood Industry. Available online: https://www.alaskaseafood.org/industry/seafood-market-info/economic-value-reports/. Accessed November 04, 2020.

Azzellino, A., S. Gaspari, S. Airoldi, and B. Nani. 2008. Habitat use and preferences of cetaceans along the continental slope and the adjacent pelagic waters in the western Ligurian Sea. Deep-Sea Research, 55, pp. 296-323.

Bailey, H., S. R. Benson, G. L. Shillinger, S. J. Bograd, P. H. Dutton, S. A. Eckert, S. J. Morraele, F. V. Paladino, T. Eguchi, D. G. Foley, B. A. Block, R. Piedra, C. Hitipeuw, R. F. Tapilatu, J. R. Spotila. 2012. Identification of distinct movement patterns in Pacific leatherback turtle populations influenced by ocean conditions. Ecological Applications 22(3):735-747. doi: 10.1890/11-0633.

Bannister, J. L. 2002. Baleen Whales. In Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig, and J. G. M. Thewissen Eds. pp. 61-72. Academic Press.

Barlow, J., J. Calambokidis, E. A. Falcone, C. S. Baker, A. M. Burdin, P. J. Clapham, J. K. B. Ford, and C. M. Gabriele. 2011. Humpback whale abundance in the North Pacific estimated by photographic capture-recapture with bias correction from simulation studies. Marine Mammal Science 27 (4):793-818.

Benson, S. R., T. Eguchi, D. G. Foley, K. A. Forney, H. Bailey, C. Hitipeuw, B. P. Samber, R. F. Tapilatu, V. Rei, P. Ramohia, J. Pita, and P. H. Dutton. 2011. Large-scale movements and high-use areas of western Pacific leatherback turtles, *Dermochelys coriacea*. Ecosphere 2(7): article 84. doi:10.1890/ES11-00053.1

Bettridge, S., C. S. Baker, J. Barlow, P.J. Clapham, M. Ford, D. Gouveia, D. K. Mattila, R. M. Pace III. P. E. Rosel, G. K. Silber, and P. R. Wade. 2015. Status review of the humpback whale (*Megaptera novaeangliae*) under the endangered species act. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center.

Calambokidis, J., G. H. Steiger, J. M. Straley, L. M. Herman, S. Cerchio, D. R. Salden, et al. 2001. Movements and population structure of humpback whales in the North Pacific. Marine Mammal Science, 17(4), pp. 769-794.

CEQ (Council on Environmental Quality). 2005. CEQ Memorandum from Chairman James L. Connaughton to the Heads of Federal Agencies. ‘Guidance on the Consideration of Past Actions in Cumulative Effects Analysis’. June 24, 2005. Available online: https://www.energy.gov/sites/prod/files/ nepapub/nepa_documents/RedDont/G-CEQ-PastActsCumulEffects.pdf.

CEQ (Council on Environmental Quality). 2019. CEQ Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions, June 26, 2019. Federal Register, Volume 84, No. 123. Page 30097.

Climate-Data.org. 2020. Kodiak Climate: Average Temperature, Weather By Month, Kodiak Water Temperature. Available online: https://en.climate-data.org/north-america/united-states-of-america/alaska/kodiak-15903/. Accessed March 12, 2020.

Colín-García, N. A., J. E. Campos, J. L. Tello Musi, J. E. Arias-González. 2016. Influence of sediments and tungsten traces on the skeletal structure of Pseudodiploria: a reef building scleractinian coral from the Veracruz Reef System National Park, Mexico. Revista de Biología Tropical 64(3):1077-1089.

Corcoran, R. M. 2013. Seabird Colony Report, Kodiak Archipelago, Alaska 1975-2011. U.S. Fish and Wildlife Service Refuge Report 02-13. Kodiak National Wildlife Refuge, Kodiak, Alaska. January 2013.

Crossin, R. S. 1974. The Storm Petrels (Hydrobatidae). In W. B. King, editor Pelagic studies of seabirds in the Central and Eastern Pacific Ocean. Smithsonian Contributions to Zoology. Number 158.

DOD (Department of Defense). 2017. Pacific Spaceport Complex Alaska Ballistic Missile Defense Flight Test Support EA. April 2017.

DOD (Department of Defense). 2020. Preliminary Final Supplement Environment Assessment for the Pacific Spaceport Complex Alaska Missile Defense System Flight Test Support. September 2020.

Drew, G. S. and J. F. Piatt. 2015. North Pacific Pelagic Seabird Database (NPPSD): U.S. Geological Survey data release (ver. 3.0, February 2020). Available online: https://doi.org/10.5066/F7WQ01T3.

Esri World Ocean Base. n.d. Sources: Esri, GEBCO, NOAA, National Geographic, DeLorme, HERE, Geonames.org, and other contributors.

FAA (Federal Aviation Administration). 1996. Environmental Assessment of the Kodiak Launch Complex, Kodiak Island, Alaska. May 1996.

FAA (Federal Aviation Administration). 2016. Final Environmental Assessment, Finding of No Significant Impact/Record of Decision for the Kodiak Launch Complex Launch Pad 3. April 2016.

FAA (Federal Aviation Administration). 2018. Commercial Space Transportation License. License Number: LSO 03-008 (Rev. 3).

Fautin, D., Dalton, P., Incze, L. S., Leong, J. C., Pautzke, C., Rosenberg, A., Sandifer, P., Sedberry, G., Tunnell Jr., J. W., Abbott, I., Brainard, R. E., Brodeur, M., Eldredge, L. G., Feldman, M., Moretzohn, F., Vroom, P. S., Wainstein, M., and Wolff, N. 2010. An Overview of Marine Biodiversity in United States Waters. PLoS ONE, 5(8): e11914. Available online: https://doi.org/10.1371/journal.pone.0011914.

Federal Interagency Committee on Urban Noise. 1980. Guidelines for Considering Noise in Land Use Planning and Control. June 1980.

Federal Interagency Committee on Noise. 1992. Federal Agency Review of Selected Airport Noise Analysis Issues. August 1992.

Ferguson, M. C., C. Curtice, and J. Harrison. 2015. Biologically Important Areas for Cetaceans Within U.S. Waters – Gulf of Alaska Region. Aquatic Mammals 41(1):65-78.

Foster, K. and T. Work. 2011. U.S. Army at Kwajalein Atoll Trip Report for Advanced Hypersonic Weapons Demonstration Test. U.S. Fish and Wildlife Service, Pacific Islands Office and U.S. Geological Survey. November 14-18, 2011.

Fritz, L.; K. Sweeney, R. Towell, and T. Gelatt. 2015. Steller sea lion haulout and rookery locations in the United States for 2016-05-14 (NCEI Accession 0129877). NOAA National Centers for Environmental Information. Dataset. Available online: https://doi.org/10.7289/v58c9t7v. Accessed January 2020.

Fry, M. 2017. Personal communication from Michael Fry, Environmental Contaminant Specialist, U.S. Fish and Wildlife Service, Pacific Islands Fish and Wildlife Office, Honolulu, Hawai`i. 24 April 2017.

Gallant, A. L., E. F. Binnian, J. M. Omernik, and M. B. Shasby. 1995. Ecoregions of Alaska. United States Geological Survey Professional Paper 1567.

Gould, P. J. 1974. Sooty Tern (*Sterna fuscata*). In W. B. King, editor Pelagic studies of seabirds in the Central and Eastern Pacific Ocean. Smithsonian Contributions to Zoology. Number 158.

Hanser, S., E. Becker, L. Wolski, and A. Kumar. 2014. Pacific Navy Marine Species Density Database. Final Gulf of Alaska Technical Report. 15 August 2014.

Hanser, S., E. Becker, P. Thorson, and M. Zickel. 2017. U.S. Navy Marine Species Density Database Phase III for the Hawai`i–Southern California Training and Testing Study Area. Technical Report. U.S. Department of the Navy, Naval Facilities Engineering Command.

ICAO (International Civil Aviation Organization). 2001. Annex 11 to the Convention on International Civil Aviation: Air Traffic Services - Air Traffic Control Service, Flight Information Service, Alerting Service. July 2001.

ICAO (International Civil Aviation Organization). 2005. Annex 2 to the Convention on International Civil Aviation: Rules of the Air. July 2005.

ICAO International Civil Aviation Organization). 2016. DOC 4444: Procedures for Air Navigation Services Air Traffic Management. Sixteenth Edition, 2016.

International Energy Agency. 2019. Available online: https://www.iea.org/statistics/co2emissions/. Accessed March 12, 2020.

Kaschner, K., D. P. Tittensor, J. Ready, T. Gerrodette, and B. Worm. 2011. Current and Future Patterns of Global Marine Mammal Biodiversity. PLoS ONE 6(5):e19653. doi:10.1371/journal.pone.0019653

Kelley, C., J. Konter, and B. R. C. Kennedy. 2017. First Deep Exploration in the Wake Unit of the Pacific Remote Islands Marine National Monument. Pages 68-71 in Bell, K.L.C., J. Flanders, A. Bowman, and N.A. Raineault, eds. 2017. New frontiers in ocean exploration: The E/V Nautilus, NOAA Ship Okeanos Explorer, and R/V Falkor 2016 field season. Oceanography 30(1), supplement. Available online: https://doi.org/10.5670/oceanog.2017.supplement.01.

Kelley, C., C. Mah, M. Malik, and K. Elliott. 2018. Laulima O Ka Moana: Exploring Deep Monument Waters Around Johnston Atoll. Pages 80-81 in Raineault, N. A, J. Flanders, and A. Bowman, eds. New frontiers in ocean exploration: The E/V Nautilus, NOAA Ship Okeanos Explorer, and R/V Falkor 2017 field season. Oceanography 31(1), supplement, 126 pp. Available online: https://doi.org/10.5670/oceanog.2018.supplement.01.

King, W. 1974. Wedge-tailed Shearwater (*Puffinus pacificus*). In W. B. King, editor Pelagic studies of seabirds in the Central and Eastern Pacific Ocean. Smithsonian Contributions to Zoology. Number 158.

Kitchingman, A. and S. Lai. 2004. Inferences on potential seamount locations from mid-resolution bathymetric data. In: Morato T, Pauly D (eds) Seamounts: Biodiversity and Fisheries. Fisheries Centre, University of British Colombia, Vancouver, Canada, pp 7-12 Ramirez-Llodra, E. and M.C. Baker. 2006. Data on the location of hydrothermal vents. Biogeography of Chemosynthetic Ecosystems (ChEss) Project. Geospatial data. Downloaded April 2020.

Krakow, M. 2020. Hunters capture video of rocket's explosion on Kodiak Island. Anchorage Daily News. September 12, 2020. Accessed online at: https://www.adn.com/alaska-news/2020/09/12/hunters-capture-video-of-rockets-explosion-on-kodiak/

Lawseth, D. 2007. Northeast Pacific Ocean. In De Young, C. (ed.) Review of the state of world marine capture fisheries management: Pacific Ocean. FAO Fisheries Technical Paper. No. 488/1. Rome, FAO. 2007. pp. 55-71.

LLNL (Lawrence Livermore National Laboratories). 2017. Leaching Study on Tungsten-Nickel-Iron Alloy in a Coralline Soil Environment. August 2017.

London, J. M., K. M. Yano, E. L. Richmond, D. E. Withrow, S. P. Dahle, J. K. Jansen, H. L. Ziel, G. M. Brady, and P. L. Boveng. 2015: Observed Haul-out Locations for Harbor Seals in Coastal Alaska. Alaska Fisheries Science Center, National Oceanic and Atmospheric Administration. Available at: https://catalog.data.gov/dataset/alaska-harbor-seal-haul-out-locations.

Lumsden, S. E., T. F. Hourigan, A. W. Bruckner, and G. Dorr (eds.) 2007. The State of Deep Coral Ecosystems of the United States. NOAA Technical Memorandum CRCP-3. Silver Spring MD.

Maison, K. A., I. K. Kelly, and K. P. Frutchey. 2010. Green Turtle Nesting Sites and Sea Turtle Legislation throughout Oceania. NOAA Technical Memo NMFS-F/SPO-110. September 2010.

Malyutin, A. N. 2015. Deep-Sea (Cold-Water) Coral Communities of the North Pacific and Problems of Their Conservation. Russian Journal of Marine Biology 41(1): 1-9.

Mate, B. R., V. Y. Ilyashenko, A. L. Bradford, V. V. Vertyankin, G. A. Tsidulko, V. V. Rozhnov, and L. M. Irvine. 2015. Critically endangered western gray whales migrate to the eastern North Pacific. Biology Letters 11:20150071. Available online: http://dx.doi.org/10.1098/rsbl.2015.0071.

McClain, C. R., L. Lundsten, J. Barry, and A. DeVogelaere. 2010. Assemblage structure, but not diversity or density, change with depth on a northeast Pacific seamount. Marine Ecology, 31(1), 14-25.

MDA (Missile Defense Agency). 2003. Ground-Based Midcourse Defense Extended Test Range Final Environmental Impact Statement.

MDA (Missile Defense Agency). 2007a. Ballistic Missile Defense System Programmatic Environmental Impact Statement. January 2007.

MDA (Missile Defense Agency). 2007b. Flexible Target Family Environmental Assessment. October 2007.

MDA (Missile Defense Agency). 2019. Program Requirements Document. Flight Test Other – 43 (FTX-43). Pacific Spaceport Complex – Alaska. November 2019.

Mellinger, D.K., K. M. Stafford, and C.G. Fox. 2004. Seasonal occurrence of sperm whale (*Physeter macrocephalus*) sounds in the Gulf of Alaska. Marine Mammal Science 20:48-62.

Miller. C. E. 2007. Current State of Knowledge of Cetacean Threats, Diversity and Habitats in the Pacific Islands Region. WDCS Australasia, Inc., p. 98.

Miyamoto, M. and M. Kiyota. 2017. Application of association analysis for identifying indicator taxa of vulnerable marine ecosystems in the Emperor Seamounts area, North Pacific Ocean. Ecological Indicators, 78, 301-310.

Moore, S. E., K. M. Wynne, J. C. Kinney, and J. M. Grebmeier. 2007. Gray Whale Occurrence and Forage Southeast of Kodiak Island, Alaska. Marine Mammal Science 23(2):419-428.

Morgan, N. B., S. Cairns, H. Reiswig, and A. R. Baco. 2015. Benthic megafaunal community structure of cobalt-rich manganese crusts on Necker Ridge. Deep-Sea Research I, 104, 92-105.

NASA (National Aeronautics and Space Administration). 2018. New study finds sea level rise accelerating. Published on February 13, 2018. Available online: https://climate.nasa.gov/news/2680/new-study-finds-sea-level-rise-accelerating/. Accessed March 12, 2020.

National Institute for Occupational Health and Safety. 1998. Criteria for a Recommended Standard Occupational Noise Exposure, Revised Criteria 1998. U.S. Department of Health and Human Services. June 1998.

NGA (National Geospatial-Intelligence Agency). 2019. Available online: https://www.nga.mil/ProductsServices/NauticalHydrographicBathymetricProduct/Pages/NoticeToMariners.aspx.

Nishizawa, B., D. Ochi, H. Minami, K. Yokawa, S. Saitoh, and Y. Watanuki. 2015. Habitats of two albatross species during the non-breeding season in the North Pacific Transition Zone. Marine Biology, 162, 743-752.

NMFS (National Marine Fisheries Service). 1991. Endangered Fish and Wildlife; Gray Whale. Proposed Rule to delist the eastern North Pacific stock. 56 FR 58869-58877. November 22, 1991.

NMFS (National Marine Fisheries Service). 1993. Designated Critical Habitat; Steller Sea Lion. 58 FR 45269. 27 August 1993.

NMFS (National Marine Fisheries Service). 2008. Recovery Plan for the Steller Sea Lion Eastern and Western Distinct Population Segments (*Eumetopias jubatus*). March 2008.

NMFS (National Marine Fisheries Service). 2011. Endangered and Threatened Wildlife and Plants: Proposed Rulemaking to Revise Critical Habitat for Hawaiian Monk Seals. 76 FR 32026. June 2, 2011.

NMFS (National Marine Fisheries Service). 2017. North Pacific Right Whale (*Eubalaena japonica*) Five-Year Review: Summary and Evaluation. December 2017.

NMFS (National Marine Fisheries Service). 2018. Final Environmental Assessment for Essential Fish Habitat (EFH) Omnibus Amendments. National Marine Fisheries Service Alaska Region. June 2018.

NMFS (National Marine Fisheries Service). 2019. Endangered, Threatened, and Candidate Species in Alaska. Species under NOAA Fisheries Authority. Last updated October 25, 2019. Available online: https://alaskafisheries.noaa.gov/pr/esa-species-list. Accessed January 2020.

NMFS and USFWS (National Marine Fisheries Service and U.S. Fish and Wildlife Service). 2014. Olive ridley sea turtle (*Lepidochelys olivacea*) 5-year review: summary and evaluation. Silver Springs. Maryland (87 pp).

NMFS and USFWS (National Marine Fisheries Service and United States Fish and Wildlife Service). 2017. 2014 Marine Biological Inventory Report: The Harbors at Ronald Reagan Ballistic Missile Defense Test Site U.S. Army Kwajalein Atoll, Republic of the Marshall Islands. November 29, 2017.

NMFS and USFWS (National Marine Fisheries Service and United States Fish and Wildlife Service). 2018. Draft Data from the 2016 Biological and 2014 Slope Habitat Inventories at Ronald Reagan Ballistic Missile Defense Test Site U.S. Army Kwajalein Atoll, Republic of the Marshall Islands. Draft: August 2018.

NMFS-PIRO (National Marine Fisheries Service – Pacific Islands Regional Office). 2017a. Biological Assessment of Coral Reef Resources at Risk when Targeting Illeginni Islet using Missile Reentry Vehicles, United States Army Kwajalein Atoll, Republic of the Marshall Islands. Final Report. May 26, 2017.

NMFS-PIRO (National Marine Fisheries Service – Pacific Islands Regional Office). 2017b. Biological Assessment of Giant Clam Species at Risk when Targeting Illeginni Islet using Missile Reentry Vehicles, United States Army Kwajalein Atoll, Republic of the Marshall Islands. Final Report. May 26, 2017.

NMFS-PIRO (National Marine Fisheries Service – Pacific Islands Regional Office). 2017c. Formal Consultation under the Environmental Standards for United States Army Kwajalein Atoll Activities in the Republic of the Marshall Islands Biological Opinion and Informal Consultation under Section 7 of the Endangered Species Act for Single Flight Experiment-1 (FE-1).

NOAA (National Oceanic and Atmospheric Administration). 2018. National Centers for Environmental Information. State of the Climate: Global Climate Report for Annual 2018, published online January 2019, retrieved on November 20, 2019 from https://www.ncdc.noaa.gov/sotc/global/201813.

NOAA (National Oceanic and Atmospheric Administration). 2019a. “Assessing the Global Climate in 2018: For the globe, 2018 becomes the fourth warmest year on record”. Published online on February 6, 2019. Accessed online at: https://www.ncei.noaa.gov/news/global-climate-201812 on March 12, 2020.

NOAA (National Oceanic and Atmospheric Administration). 2019b. Available online: https://coast.noaa.gov/czm/landconservation/state/.

NOAA (National Oceanic and Atmospheric Administration). 2019c. Papahānaumokuākea Marine National Monument. Available online: https://www.papahanaumokuakea.gov/about/.

NOAA (National Oceanic and Atmospheric Administration). 2020a. State of the Climate: Global Climate Report for August 2020. Available online: https://www.ncdc.noaa.gov/sotc/global/202008.

NOAA (National Oceanic and Atmospheric Administration). 2020b. Species Directory. Internet website: https://www.fisheries.noaa.gov/species-directory. Accessed 2020

NOAA (National Oceanic and Atmospheric Administration). 2020c. NOAA National Centers for Environmental Information, State of the Climate: Global Climate Report for Annual 2019, published online January 2020, retrieved on February 3, 2021 from https://www.ncdc.noaa.gov/sotc/global/201913.

NOAA Fisheries (National Oceanic and Atmospheric Administration Fisheries). 2018. GIS Data for Habitat Areas of Particular Concern. Alaska. Available online: https://www.habitat.noaa.gov/protection/efh/newInv/index.html. Last data update February 2, 2018. Accessed January 2020.

NOAA Fisheries (National Oceanic and Atmospheric Administration Fisheries). 2019. GIS Data for Essential Fish Habitat. Alaska. Available online: https://www.habitat.noaa.gov/protection/efh/newInv/index.html. Last data update March 13, 2019. Accessed January 2020.

NPFMC (North Pacific Fishery Management Council). 2012. Fishery Management Plan for the Salmon Fisheries in the EEZ off Alaska. June 2012.

NPFMC (North Pacific Fishery Management Council). 2014. Fishery Management Plan for the Scallop Fishery off Alaska. February 2014.

NPFMC (North Pacific Fishery Management Council). 2018. Fishery Management Plan for Groundfish of the Gulf of Alaska. October 2018.

Palacios, D. M., Bograd, S. J., Foley, D. G., and Schwing, F. B. 2006. Oceanographic characteristics of biological hotspots in the North Pacific: A remote sensing perspective. Deep-Sea Research Part II. 53, 250-269.

Parrish, F. A. and A. R. Baco. 2007. State of Deep Coral Ecosystems in the Pacific Islands Region: Hawai`i and the U.S. Pacific Territories. pp. 155-194. In: S. E. Lumsden, T. F. Hourigan, A. W. Bruckner, and G. Dorr (eds.) The State of Deep Coral Ecosystems of the United States. NOAA Technical Memorandum CRCP-3. Silver Spring MD. 365 pp.

Polovina, J. J., E. A. Howell, D. R. Kobayashi, and M. P. Seki. 2017. The Transition Zone Chlorophyll Front Updated: Advances from a Decade of Research. Progress in Oceanography 150:79-85. Available online: https://doi.org/10.1016/j.pocean.2015.01.006.

RGNext. 2020. "Illeginni Environmental & Biological Activity Survey & Sampling Report, FE-2 Pre & Post Test Activity," prepared for United States Air Force, 29 July 2020.

R&M (R&M Consultants, Inc.). 2007a. "Environmental Monitoring Report – FTG-03 Launch, Kodiak Launch Complex, Kodiak, Alaska", prepared for Alaska Aerospace Corporation, 24 July 2007.

R&M (R&M Consultants, Inc.). 2007b. "Environmental Monitoring Report – FTG-03a Launch, Kodiak Launch Complex, Kodiak, Alaska", prepared for Alaska Aerospace Corporation, 27 November 2007.

R&M (R&M Consultants, Inc.). 2008. "Environmental Monitoring Report – FTX-03 Launch, Kodiak Launch Complex, Kodiak, Alaska", prepared for Alaska Aerospace Corporation, 19 September 2008.

R&M (R&M Consultants, Inc.). 2009. "Environmental Monitoring Report – FTG-05 Launch, Kodiak Launch Complex, Kodiak, Alaska", prepared for Alaska Aerospace Corporation, 3 February 2009.

R&M (R&M Consultants, Inc.). 2011. "Spill Prevention, Control, and Countermeasure Plan" prepared for Alaska Aerospace Corporation. Anchorage, AK. March 2011.

RCC (Range Commanders Council). 2017. Common Risk Criteria Standards for National Test Ranges. September 2017.

Reeves, R. R., B. S. Stewart, P. J. Clapham, and J. A. Powell. 2002. National Audubon Society Guide to Marine Mammals of the World. Alfred A. Knopf, Inc.: New York, New York (p. 527).

Rice, D. W. 1989. Sperm whale *Physeter macrocephalus* Linnaeus, 1758. In: S. H. Ridgway and R. Harrison (eds.), Handbook of Marine Mammals (Vol. 4, pp. 177-234). Academic Press: London.

Robbins, C. S. and D. W. Rice. 1974. Recoveries of Banded Laysan Albatrosses (*Diomedea immutabilis*) and Black-footed Albatrosses (*D. nigripes*).In W. B. King, editor Pelagic studies of seabirds in the Central and Eastern Pacific Ocean. Smithsonian Contributions to Zoology. Number 158.

Robinson, P. W., D. P. Costa, D. E. Crocker, J. P. Gallo-Reynoso, C.D. Champagne, et al. 2012. Foraging Behavior and Success of a Mesopelagic Predator in the Northeast Pacific Ocean: Insights from a Data-Rich Species, the Northern Elephant Seal. PLoS ONE 7(5): e36728. doi:10.1371/journal.pone.0036728.

Robison, W. L., S. C. Yakuma, T. R. Lindman, R. E. Martinelli, M. W. Tamblin, T. F. Hamilton, and S. R. Kehl. 2013. The Concentration of Depleted Uranium (DU) and Beryllium (Be) in Soil and Air on Illeginni Island at Kwajalein Atoll after an Advanced Hypersonic Weapon Flight Test. Lawrence Livermore National Laboratory. Report number LLNL-TR-601552-REV-1. March 6.

Rone, B. K., A. B. Douglas, T. M. Yack, A. N. Zerbini, T. N. Norris, E. Ferguson, and J. Calambokidis. 2014. Report for the Gulf of Alaska Line-Transect Survey (GOALS) II: Marine Mammal Occurrence in the Temporary Maritime Activities Area (TMAA). Submitted to Naval Facilities Engineering Command (NAVFAC) Pacific, Honolulu, Hawai`i under Contract No. N62470-10-D-3011, Task Order 0022, issued to HDR Inc., San Diego, California. Prepared by Cascadia Research Collective, Olympia, Washington; Alaska Fisheries Science Center, Seattle, Washington; and Bio-Waves, Inc., Encinitas, California. April 2014.

Rone, B.K., P. J. Clapham, D. W. Weller, J. L. Crance, and A. R. Lang. 2015. North Pacific right whale visual and acoustic survey in the northwestern Gulf of Alaska. Final Report. Submitted to Marine Mammal Commission, Bethesda, Maryland. Prepared by National Marine Mammal Laboratory, Seattle, Washington; and Southwest Fisheries Science Center, La Jolla, California. October 2015.

Rone, B. K., A. N. Zerbini, A. B. Douglas, D. W. Weller, and P. J. Clapham. 2017. Abundance and distribution of cetaceans in the Gulf of Alaska. Marine Biology 164:23.

Rosenberg, D. H., M. J. Petrula, J. L. Schamber, D. Zwiefelhofer, T. E. Hollmen, and D. D. Hill. 2014. Seasonal Movements and Distribution of Steller's Eiders (*Polysticta stelleri*) Wintering at Kodiak Island, Alaska. Arctic 67 (3):347-359.

Sanger, G. A. 1974. Laysan Albatross (*Diomedea immutabilis*). In W. B. King, editor Pelagic studies of seabirds in the Central and Eastern Pacific Ocean. Smithsonian Contributions to Zoology. Number 158.

Seabirds.net. N.D. North Pacific Seabird Data Portal. Available online: http://axiom.seabirds.net/maps/js/seabirds.php?app=north_pacific#z=9&ll=57.67803,-151.94359. Accessed January 2020.

Secretariat of the Pacific Community. 2011. Republic of the Marshall Islands Census Report. Available online: http://prism.spc.int/images/census_reports/Marshall_Islands_Census_2011-Full.pdf.

Smith, M., N. Walker, C. Free, M. Kirchhoff, N. Warnock, A. Weinstein, T. Distler, and I. Stenhouse. 2012. Marine Important Bird Areas in Alaska: Identifying Globally Significant Sites Using Colony and At-sea Survey Data. Audubon Alaska: Anchorage.

Springer, A. M., J. F. Piatt, V. P. Shuntov, G. B. Van Vliet, V. L. Vladimirov, A. E. Kuzin, and A. S. Perlov. 1999. Marine Birds and Mammals of the Pacific Subarctic Gyres. Progress in Oceanography 43:443-487.

Thorne, L. H., E. L. Hazen, S. L. Bograd, D. G. Foley, M. G. Conners, M. A. Kappes, H. M., Kim, D. P. Costa, Y. Tremblay, and S. A. Shaffer. 2015. Foraging behavior links climate variability and reproduction in North Pacific Albatrosses. Movement Ecology 3:27. DOI 10.1186/s40462-015-0050-9.

U.S. Army 2020. Biological Assessment for Hypersonic Flight Test-3 Activities. September 22, 2020.

U.S. Census Bureau. Available online: https://www.census.gov/quickfacts/fact/table/kodiakislandboroughalaska/INC110217?

U.S. Department of Interior. 2012. Available online: https://www.doi.gov/sites/doi.gov/files/migrated/oia/reports/upload/RMI-2011-Census-Summary-Report-on-Population-and-Housing.pdf.

U.S. Department of State. 2019. Available online: https://www.state.gov/u-s-relations-with-marshall-islands/.

U.S. Navy (US Department of the Navy). 2008. Hawaii Range Complex Final Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS). May 2008.

U.S. Navy (US Department of the Navy). 2015. Mariana Islands Training and Testing Activities Final Environmental Impact Statement/Overseas Environmental Impact Statement. May 2015.

U.S. Navy (US Department of the Navy). 2016. Gulf of Alaska Navy Training Activities Supplemental Environmental Impact Statement/Overseas Environmental Impact Statement. Final. July 2016.

U.S. Navy (US Department of the Navy). 2017. Final Environmental Assessment/Overseas Environmental Assessment for Flight Experiment-1 (FE-1). August 2017.

U.S. Navy. 2018. Hawai`i-Southern California Training and Testing Environmental Impact Statement/Overseas Environmental Impact Statement. Activities. Final. October 2018.

U.S. Navy. 2019a. Biological Assessment for Flight Experiment 2 (FE-2). June 13, 2019.

U.S. Navy. 2019b. Final Environmental Assessment/Overseas Environmental Assessment for Flight Experiment 2 (FE-2). December 2019.

UNEP (United Nations Environment Programme). 2006. Ecosystems and Biodiversity in Deep Waters and High Seas. UNEP Regional Seas Reports and Studies No. 178. UNEP/ IUCN, Switzerland 2006. ISBN: 92-807-2734-6.

United States Army Kwajalein Atoll. 2013. Document of Environmental Protection (DEP): Air Emissions from Major, Synthetic Minor, and Industrial Boiler Stationary Sources, DEP-11-001.0. August 2013.

USAFGSC and USASMDC/ARSTRAT (United States Air Force Global Strike Command and United States Army Space and Missile Defense Command/Army Forces Strategic Command). 2015. United States Air Force Minuteman III Modification Biological Assessment. March 2015.

USASDC (United States Army Strategic Defense Command). 1992. Final Environmental Impact Statement for the Strategic Target System, Volume II. May 1992.

USASMDC (United States Army Space and Missile Defense Command). 2001. North Pacific Targets Program EA.

USASMDC/ARSTRAT (United States Army Space and Missile Defense Command/Army Forces Strategic Command). 2014. Advanced Hypersonic Weapon Flight Test 2, Hypersonic Technology Test Environmental Assessment. July 2014.

USASMDC/ARSTRAT (United States Army Space and Missile Defense Command/Army Forces Strategic Command). 2018. Environmental Standards and Procedures for United States Army Kwajalein Atoll Activities in the Republic of the Marshall Islands, 15th Edition, 2018.

USASSDC (United States Army Space and Strategic Defense Command). 1994. Wake Island Environmental Assessment.

USEPA (United States Environmental Protection Agency). 1974. Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety. EPA 550/9-74-004. March 1974.

USEPA (United States Environmental Protection Agency). 1999. EPA Technical Bulletin, Nitrogen Oxides (NOx): Why and How They Are Controlled. Clean Air Technology Center, 1999.

USEPA (United States Environmental Protection Agency). 2011. Review of National Ambient Air Quality Standards for Carbon Monoxide; Final Rule. Federal Register, Vol. 76, No. 169, Part II. August 31, 2011.

USEPA (United States Environmental Protection Agency). 2017. De Minimis Tables. Available online: https://www.epa.gov/general-conformity/de-minimis-tables on March 12, 2020.

USEPA (United States Environmental Protection Agency). 2019a. "Overview of Greenhouse Gases". Available online: https://www.epa.gov/ghgemissions/overview-greenhouse-gases#f-gases. Accessed March 12, 2020.

USEPA (United States Environmental Protection Agency). 2019b. Inventory of U.S. Greenhouse Gas Emissions and Sinks, 1990-2017. Published April 12, 2019.

USEPA (United States Environmental Protection Agency). 2020. Regional Screening Level (RSL) Composite Worker Soil Table (TR=1E-06, HQ=1). May 2020.

USFWS (United States Fish and Wildlife Service). 2000. Endangered and Threatened Wildlife and Plants; Proposed Designation of Critical Habitat for the Steller's Eider. 65 FR 13262. March 13, 2000.

USFWS (United States Fish and Wildlife Service). 2007. Kodiak: Survey Measures Pulse of Bald Eagle Populations. USFWS Region 7. 12 September 2007. Available online: https://www.fws.gov/fieldnotes/print/print_report.cfm?arskey=22327

USFWS (United States Fish and Wildlife Service). 2008. Birds of Conservation Concern 2008. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. 85 pp. Available online: http://www.fws.gov/ migratorybirds/.

USFWS (United States Fish and Wildlife Service). 2009a. Short-tailed Albatross (*Phoebastria albatrus*) 5-Year Review: Summary and Evaluation. Anchorage Fish and Wildlife Field Office.

USFWS (United States Fish and Wildlife Service). 2009b. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Southwest Alaska Distinct Population Segment of the Northern Sea Otter; Final Rule. 74 FR 51988-52012. 8 October 2009.

USFWS (United States Fish and Wildlife Service). 2014. Species Status Assessment Report: Yellow-billed Loon (*Gavia adamsii*). U.S. Fish and Wildlife Service Listing Review Team, Fairbanks, Alaska. 28 August 2014.

USFWS (United States Fish and Wildlife Service). 2019. Status Assessment of the Alaska-breeding Population of Steller's Eiders. USFWS, Fairbanks Fish and Wildlife Field Office. March 2019.

USFWS and NMFS (United States Fish and Wildlife Service and National Marine Fisheries Service). 2012. Final 2010 Inventory Report Endangered Species and Other Wildlife Resources Ronald Reagan Ballistic Missile Defense Test Site U.S. Army Kwajalein Atoll, Republic of the Marshall Islands.

USGS (United States Geological Survey). 1982. Synthesis Report: Environmental Geology of Kodiak Shelf, Alaska. USGS Open-File Report 82-59.

USGS (United States Geological Survey). 1995. Overview of Environmental and Hydrogeologic Conditions near Kodiak, Alaska. Open-File Report 95-406.

Wade, P. R., A. De Robertis, K. R. Hough, R. Booth, A. Kennedy, R. G. LeDuc, L. Munger, J. Napp, K. E. Shelden, S. Rankin, O. Vasquez, and C. Wilson. 2011. Rare detections of North Pacific right whales in the Gulf of Alaska, with observations of their potential prey. Endangered Species Research 13:99-109.

Wade, P. R., T. J. Quinn II, J. Barlow, C. S. Baker, A. M. Burdin, J. Calambokidis, P. J. Clapham, E. Falcone, J. K. B. Ford, C. M. Gabriele, R. Leduc, D. K. Mattila, L. Rojas-Bracho, J. Straley, B. L. Taylor, J. Urbán R., D. Weller, B. H. Witteveen, and M. Yamaguchi. 2016. Estimates of abundance and migratory destination for North Pacific humpback whales in both summer feeding areas and winter mating and calving areas. Paper SC/66b/IA21 submitted to the Scientific Committee of the International Whaling Commission, June 2016, Bled, Slovenia. Available online: www.iwcoffice.org.

Weller, D. W., A. Klimek, A. L. Bradford, J. Calambokidis, A. R. Lang, B. Gisborne, A. M. Burdin, W. Szaniszlo, J. Urban, A. G. Unzueta, S. Swartz, and R. L. Brownell Jr. 2012. Movements of gray whales between the western and eastern North Pacific. Endangered Species Research 18:193-199.

Whitehead, H. 2002. Sperm Whale (*Physeter macrocephalus*). In Encyclopedia of Marine Mammals. W. F. Perrin, B. Wursig, and J. G. M. Thewissen Eds. pp. 1165-1172. Academic Press.

Witteveen, B. H., J. M. Straley, E. Chenoweth, C. S. Baker, J. Barlow, C. Matkin, C. M. Gabriele, J. Neilson, D. Steel, O. von Ziegesar, A. G. Andrews, and A. Hirons. 2011. Using movements, genetics and trophic ecology to differentiate inshore from offshore aggregations of humpback whales in the Gulf of Alaska. Endangered Species Research 14:217-225.

This page intentionally left blank.

8.0 List of Preparers

GOVERNMENT PREPARERS

USASMDC

David Fuller, NEPA Program Manager

Leah Bishop, Environmental Engineer

Army Rapid Capabilities and Critical Technologies Office, Army Hypersonic Project Office

Henry McElreath, Deputy for Test

Test Directorate

Rihana Williams, Assistant Flight Test Director

CONTRACTOR PREPARERS

KFS, LLC

Karen Charley-Barnes, Senior Principal Investigator
Ph.D., 2009, Higher Education Administration-Policy Evaluation and Implementation, George Washington University, Washington, D.C.
M.S., 1998, Environmental Science–Policy and Management, Florida A&M University
B.S., 1989, Natural Science and Mathematics, University of Alabama, Birmingham
Years of Experience: 30

Karen Hoksbergen, Biologist
M.S., 2004, Biology, Northern Michigan University
B.S., 2001, Wildlife and Biology, University of Wisconsin-Stevens Point
Years of Experience: 19

Edd V. Joy, Senior Environmental Program Manager
B.A., 1974, Geography, California State University, Northridge
Years of Experience: 46

Amy McEniry, Technical Editor
B.S., 1988, Biology, University of Alabama in Huntsville
Years of Experience: 32

Wesley S. Norris, Director of Environmental Planning
B.S., 1976, Geology, Northern Arizona University
Years of Experience: 44

Hannah McCarty, Environmental Scientist I
B.S., 2015, Geology, Florida State University
Years of Experience: 5

TMS, LLC

Christopher W. Scott, Biologist
M.S., 2019, Environmental Biology, Regis University, Denver, Colorado
B.A., 2010, Criminology, University of South Florida, Tampa, Florida
Years of Experience: 1

Tutulu, LLC

Fermin Esquibel, Environmental Scientist II / NEPA Specialist
B.S., 1996, Geology, Austin Peay State University, Clarksville, Tennessee
Years of Experience: 24

Vision Centric, Inc.

Lynne Morris
B.S.B.A. Management Information Systems
Years of Experience: 26

9.0 Distribution List

The following were sent a copy of the Draft EA/OEA and the Draft FONSI/FONSH:

Alaska Department of Fish and Game (ADF&G)
Division of Habitat, Central Region Office
Anchorage, AK

Alaska State Historic Preservation Office (SHPO)/Office of History and Archeology
Review and Compliance Coordinator
Anchorage, AK

Alaska Department of Transportation and Public Facilities (DOT&PF)
Statewide Environmental Program Manager
Juneau, AK

U.S. Environmental Protection Agency (USEPA) Region 10
Office of Environmental Review and Assessment
Seattle, WA

Federal Aviation Administration (FAA)
Office of Commercial Space Transportation
Washington, DC

Sun'aq Tribe
Natural Resources Director
Kodiak, AK

Old Harbor Native Corporation
Vice President of Community and External Affairs
Old Harbor, AK and Anchorage, AK

Alaska Aerospace Corporation (AAC)
President and CEO
Anchorage, AK

U.S. Fish and Wildlife Service (USFWS)
Anchorage Fish and Wildlife Field Office
Anchorage, AK

U.S. Fish and Wildlife Service (USFWS)
Pacific Islands Fish and Wildlife Office
Honolulu, HI

National Marine and Fisheries Service (NMFS)
Pacific Islands Regional Office
Honolulu, HI

Republic of the Marshall Islands Environmental Protection Authority (RMIEPA)
General Manager
Majuro, MH

Republic of the Marshall Islands Environmental Protection Authority (RMIEPA)
General Manager
Ebeye, MH

U.S. Army Garrison–Kwajalein Atoll (USAG-KA)
USAG-KA Directorate of Public Works
APO AP

Missile Defense Agency (MDA)
MDA/MSR Environmental
Redstone Arsenal, AL

U.S. Army Corps of Engineers (USACE)
Pacific Ocean Division, Honolulu District
Honolulu, HI

LIBRARIES AND REPOSITORIES

Kodiak Public Library
Kodiak, AK

Chiniak Public Library
Chiniak, AK

Grace Sherwood Library
Kwajalein, MH

Roi-Namur Library
Roi-Namur, MH

Republic of the Marshall Islands Environmental Protection Authority
Office Lobby
Delap, Majuro, MH

Republic of the Marshall Islands Environmental Protection Authority
Office Lobby
Ebeye, MH

10.0 Persons Contacted List

The following agencies/people were contacted during the development of this EA/OEA:

Alaska DF&G – Ron Benkert

Alaska DOT – Doug Kolwaite

Alaska SHPO – Sarah Meitl

Alaska Aerospace Corporation – Mark Lester

EPA Region 9 – John McCarroll

EPA Region 10 – Andrew Baca and Theogene Mbabaliye

FAA – Leslie Grey

MDA – Chris Smith

NMFS – Steven P. Kolinski, PhD

Old Harbor Native Corporation – Cynthia Berns

RMI EPA – Moriana Phillip and Nious Junious

Sun’aq Tribe – Thomas Lance

USACE – Kanalei Shun

USAKA-RTS – Derek Miller

USFWS (Alaska) – Douglass M. Cooper

USFWS (Pacific) – Dan A. Polhemus, PhD

This page intentionally left blank.

A

Agency Correspondence

September 22, 2020

Steve Kolinski, PhD
National Marine Fisheries Service
Pacific Islands Regional Office
1845 Wasp Boulevard, Building 176
Honolulu, HI 96818

Dear Dr. Kolinski,

The United States Army Space and Missile Defense Command (USASMDC) is assisting the U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO), the action proponent, in evaluating the effects of the proposed Hypersonic Flight Test-3 (FT-3) program (Proposed Action). The Proposed Action involves a single developmental flight test from the Pacific Spaceport Complex Alaska (PSCA) to Kwajalein Atoll, Republic of the Marshall Islands (RMI).

The U.S. Army has prepared a Biological Assessment (BA) to evaluate the effects of the Proposed Action on species listed as endangered or threatened under the Endangered Species Act (ESA), on species listed as consultation species under Section 3-4 of the U.S. Army Kwajalein Atoll Environmental Standards (UES), and on designated critical habitat. Since the Proposed Action activities at Kwajalein Atoll are very similar to the recent Flight Experiment-2 (FE-2) test, the BA prepared for FE-2 activities is also used to support evaluations for the Proposed FT-3 Action and is enclosed.

As described in the enclosed FT-3 BA, a number of UES and ESA protected species occur or have the potential to occur in the Action Area. Based on analyses of all of the potential stressors resulting from the Proposed Action, the U.S. Army has determined that the Proposed Action would have no effect on 15 coral species and two mollusk species, olive ridley turtles (*Lepidochelys olivacea*), or the North Pacific DPS of green turtles (*Chelonia mydas*). The U.S. Army has determined that the Proposed Action may affect but is not likely to adversely affect 19 cetacean species, four sea turtle species, 12 fish species, seven coral species, and three mollusk species listed under the ESA or listed as consultation species under the UES. Furthermore, the U.S. Army has determined that the Proposed Action would have no effect on North Pacific right whale (*Eubalaena japonica*) or Hawaiian monk seal (*Neomonachus schauinslandi*) critical habitat and is not likely to adversely affect Steller sea lion (*Eumetopias jubatus*) critical habitat. The U.S. Army requests initiation of informal consultation under Section 7 of the ESA and under the UES and requests your written concurrence if you agree with our determinations.

I am also providing copies of this letter and the BA to Ms. Moriana Phillip, Republic of the Marshall Islands Environmental Protection Authority – Majuro; Kanalei Shun, U.S. Army Corps of Engineers; Mr. John McCarroll, U.S. Environmental Protection Agency; Dr. Dan Polhemus, Pacific Islands Fish and Wildlife Office; and Mr. Douglass Cooper, Anchorage Fish and Wildlife Field Office.

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: 2020.09.23 10:38:40 -05'00'

Weldon H. Hill, Jr.
Deputy Chief of Staff for Engineering
U.S. Army Space and Missile Defense Command

Enclosures (2)

DEPARTMENT OF THE ARMY
ARMY RAPID CAPABILITIES AND CRITICAL TECHNOLOGIES OFFICE
3307 WELLS ROAD
REDSTONE ARSENAL, AL 35898

SAAL-RCC

24 August 2020

MEMORANDUM FOR Missile Defense Agency, (Attn: Mr. Todd Watts, Director of Real Property Investments and Deployments)

SUBJECT: COOPERATING AGENCY FOR HYPERSONIC FLIGHT TEST-3 ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT

1. U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) and U.S. Army Space and Missile Defense Command (USASMDC) are preparing an Environmental Assessment (EA)/Overseas Environmental Assessment (OEA) to evaluate potential environmental impacts from the proposed testing of the Hypersonic Flight Test-3 (FT-3). Per 40 CFR Part 1501 and Council on Environmental Quality Cooperating Agency guidance, RCCTO and USASMDC requests the Missile Defense Agency (MDA) to participate as a Cooperating Agency for the development of the FT-3 EA/OEA.

2. The Proposed Action consists of one flight test launched from the Pacific Spaceport Complex Alaska (PSCA) to Kwajalein Atoll, Republic of the Marshall Islands (RMI) during FY 2021. The purpose of the Proposed Action is to test a long-range hypersonic weapon system and demonstrate a reduction of risk for longer-range payload systems.

3. No direct writing or analysis by MDA will be required. RCCTO and USASMDC will take the following actions to support interagency cooperation with MDA:

a. Request MDA 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. When appropriate, invite MDA to FT-3 environmental planning meetings and confer with your staff on regulatory agency consultations, including consultations that directly affect MDA.

c. Include information within environmental documents that MDA may need to meet its environmental responsibilities such as mitigation, permits and consultations for MDA facilities and properties that would support the FT-3 flight test.

4. As a Cooperating Agency, RCCTO and USASMDC request MDA support to RCCTO and USASMDC in the following areas:

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 requirements.

b. As appropriate, participate in meetings to discuss EA/OEA related issues.

c. Respond to RCCTO and USASMDC requests for information.

d. Assist RCCTO and USASMDC 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 RCCTO and USASMDC. Enclosure 1 provides the current FT-3 Milestone Schedule.

5. Provide formal, written response to this request, agreeing to the requested support listed in subparagraphs 4.a through 4.e.

6. The U.S. Army views its relationship with MDA as important to the successful completion of the NEPA process for the FT-3 EA/OEA. It is the Army's goal to complete the NEPA process as expeditiously as possible, and I firmly believe that establishing a formal Cooperating Agency relationship with MDA will help attain this goal. Should MDA elect not to participate as a Cooperating Agency, the Army welcomes MDA's informal participation in the environmental planning process.

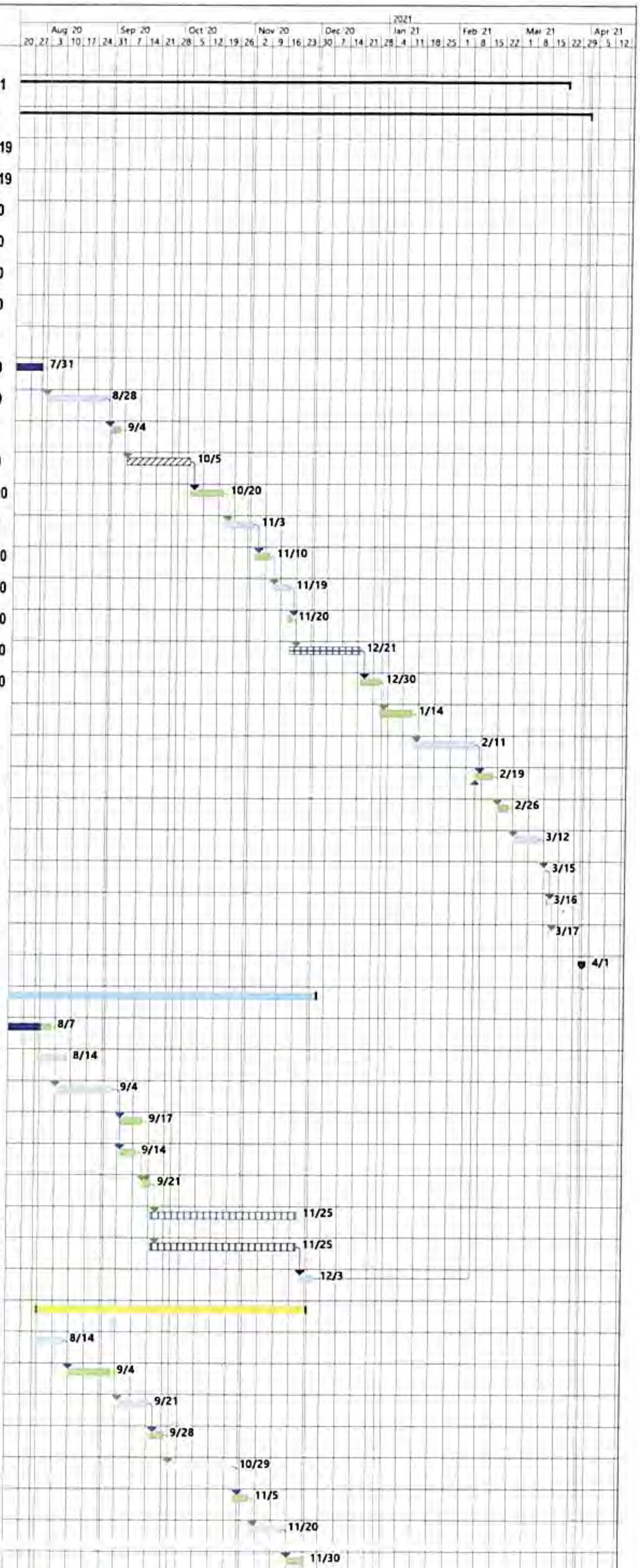
7. The RCCTO Technical Point of Contact (POC) for this action is Mr. Henry W. McElreath, henry.w.mcelreath.civ@mail.mil, office 256-336-6106. The USASMDC POC is Mr. David Fuller, david.g.fuller6@mail.mil, cell 256-425-2016.

Marcia Holmes

Encl

MARCIA B. HOLMES, SES
Deputy Director

ID	Task Name	Duration	Start	Finish
1				
2	Project Oversight	378 days	9/18/19	3/22/21
7	EA/OEA	385 days	9/19/19	4/1/21
8	✓ Preliminary Draft DOPAA	25 days	9/19/19	10/24/19
9	✓ PO Review Pre-Draft DOPAA	21 days	11/22/19	12/23/19
10	✓ Finalize DOPAA in PDEA	23 days	12/26/19	1/28/20
11	✓ PDEA/OEA	80 days	11/18/19	3/13/20
12	✓ PDEA/OEA PO Review	20 days	3/16/20	4/10/20
13	✓ Incorporate Comments/ Prepare CDEA/OEA and DFONSI	30 days	4/13/20	5/22/20
14	✓ PO CDEA/OEA Review	28 days	5/26/20	7/2/20
15	✓ Comment Resolution-Addition/ CDEA/OEA and DFONSI	20 days	7/6/20	7/31/20
16	CDEA/OEA and DFONSI - PO, Policy & Security	20 days	8/3/20	8/28/20
17	Update CDEA/OEA and DFONSI	5 days	8/31/20	9/4/20
18	CDEA/OEA and DFONSI - Agencies, Tribes, PSCA, MDA	20 days	9/8/20	10/5/20
19	Incorporate Comments/ Prepare DEA and DFONSI	10 days	10/6/20	10/20/20
20	PO Review DEA/OEA and DFONSI	10 days	10/21/20	11/3/20
21	DEA/OEA and DFONSI and Letters	5 days	11/4/20	11/10/20
22	Hard Copies DEA/OEA and DFONSI to KWAJ & RMI	6 days	11/12/20	11/19/20
23	Publish NOA (Kodiak plus Fri & Sat Kwaj)	2 days	11/19/20	11/20/20
24	Public Comment Period	21 days	11/20/20	12/21/20
25	Comment Resolution Agencies / Public	5 days	12/22/20	12/30/20
26	PFEA/OEA and FONSI	10 days	12/31/20	1/14/21
27	Staff PFEA/OEA and FONSI through PO, Legal, PA	20 days	1/15/21	2/11/21
28	Prepare FONSI, NOA, FEA/OEA to PO	6 days	2/12/21	2/19/21
29	PO Briefed on FEA/OEA and FONSI (with DEP)	5 days	2/22/21	2/26/21
30	PO Staff FEA/OEA for Signature	10 days	3/1/21	3/12/21
31	FEA/OEA Signed	1 day	3/15/21	3/15/21
32	Publish NOA (Kodiak plus Fri & Sat Kwaj)	1 day	3/16/21	3/16/21
33	FONSI Final	1 day	3/17/21	3/17/21
34	3Q FY21	1 day	4/1/21	4/1/21
35	Biological Assessment (Utilize FE-2 BA)	202 days	2/15/20	12/3/20
36	Draft BA	122 days	2/15/20	8/7/20
37	Coordination Letter to NMFS & USFWS AK & HI	10 days	8/3/20	8/14/20
38	Draft BA Review - PO, Policy & Security, + PAO	20 days	8/10/20	9/4/20
39	Update Draft BA	8 days	9/8/20	9/17/20
40	Draft Transmittal Letters to PO	5 days	9/8/20	9/14/20
41	BA to NMFS & USFWS for Informal Consult	2 days	9/18/20	9/21/20
42	USFWS Issue Concurrence Letter	45 days	9/22/20	11/25/20
43	NMFS Issue Concurrence Letter	45 days	9/22/20	11/25/20
44	PO Review Letters	5 days	11/27/20	12/3/20
45	DEP (BA Not Likely to Adversley Affect so no DEP)	82 days	8/3/20	11/30/20
46	Discuss Minor Modification of FE-2 DEP w RMI Agencies	10 days	8/3/20	8/14/20
47	Description of Minor Modification of FE-2 DEP	15 days	8/17/20	9/4/20
48	PO Review Description of Minor Modification	10 days	9/8/20	9/21/20
49	SMDC Transmit Minor Modification DEP to RMI & Agencies	5 days	9/22/20	9/28/20
50	RMI & Agencies - 30 day review of Minor Modification DEP	22 days	9/29/20	10/29/20
51	Address any Agency Comments	5 days	10/30/20	11/5/20
52	PO review Modified DEP & Response to Comments	10 days	11/6/20	11/20/20
53	Send Final Modified DEP to RMI & Agencies	5 days	11/23/20	11/30/20



FT-3 EA/OEA
Date: 8/3/20

Task	Project Summary	Manual Task	Start-only	Deadline			
Split	Inactive Task	Duration-only	Finish-only	Progress			
Milestone	Inactive Milestone	Manual Summary Rollup	External Tasks	Manual Progress			
Summary	Inactive Summary	Manual Summary	External Milestone				

DEPARTMENT OF DEFENSE
MISSILE DEFENSE AGENCY
5700 18TH STREET
FORT BELVOIR, VIRGINIA 22060-5573

MSR

Marcia B. Holmes, SES
Deputy Director
Army Rapid Capabilities and Critical Technologies Office (RCCTO)

Subject: COOPERATING AGENCY FOR HYPERSONIC FLIGHT TEST-3 ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT

Enclosure: (1) Invitation Letter dated August 24, 2020.

Thank you for your letter requesting that the Missile Defense Agency's (MDA) serve as a cooperating agency in the preparation of an Environmental Assessment (EA)/Overseas Environmental Assessment (OEA) to evaluate potential environmental impacts from the proposed testing of the Hypersonic Flight Test-3 (FT-3).

The MDA hereby agrees to be a cooperating agency on the EA/OEA to evaluate potential environmental impacts from the proposed testing of the Hypersonic Flight Test-3 (FT-3). As described in enclosure (1), subparagraphs 4.a through 4.e, the MDA agrees to the following responsibilities and actions as a cooperating agency on this proposed action:

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 requirements.

b) As appropriate, participate in meetings to discuss EA/OEA related issues to include cultural resource meetings and reviews.

c) Respond to RCCTO and USASMDC requests for information.

d) Assist RCCTO and USASMDC 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 RCCTO and USASMDC. Enclosure 1 provides the current FT-3 Milestone Schedule.

The MDA Point of Contact (POC) for this action is Mr. Chris Smith, Christopher.smith.ctr@mda.mil, (256) 450-2691.

Sincerely,

WATTS.TODD.L.1111981996 Digitally signed by WATTS.TODD.L.1111981996 Date: 2020.09.15 13:17:56 -05'00'

TODD L. WATTS, PE, PMP
Director of Real Property Investments, and Deployments

Enclosure: As stated

November 2, 2020

Steve Kolinski, PhD
National Marine Fisheries Service
Pacific Islands Regional Office
1845 Wasp Boulevard, Building 176
Honolulu, HI 96818

Dear Dr. Kolinski,

On September 22, 2020, the U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO), the action proponent, assisted by the U.S. Army Space and Missile Defense Command (USASMDC) submitted a Biological Assessment (BA) for the proposed Hypersonic Flight Test-3 (FT-3) program (Proposed Action) to the National Marine Fisheries Service Pacific Islands Regional Office. As described in the FT-3 BA, a number of UES and ESA protected species occur in the Action Area and the U.S. Army determined that several species may be but were not likely to be adversely affected by the Proposed Action.

Because of the potential effects of the Proposed Action on species listed as endangered or threatened under the Endangered Species Act (ESA), on species listed as consultation species under Section 3-4 of the U.S. Army Kwajalein Atoll Environmental Standards (UES), and on designated critical habitat, the U.S. Army initiated informal consultation with the National Marine Fisheries Service. Based on conversations with the National Marine Fisheries Service during BA review, we have revised our effect determinations for several species.

Based on analyses of all of the potential stressors resulting from the Proposed Action, the U.S. Army has determined that the Proposed Action would have no effect on 15 coral species (*Acanthastrea brevis*, *Acropora aculeius*, *A. aspera*, *A. dendrum*, *A. listeri*, *A. speciosa*, *A. tenella*, *A. vaughani*, *Alveopora verrilliana*, *Leptoseris incrustans*, *Montipora caliculata*, *Pavona cactus*, *P. decussata*, *Turbinaria mesenterina*, and *T. stellulata*), two mollusk species (*Pinctada margaritifera* and *Tridacna gigas*), olive ridley turtles (*Lepidochelys olivacea*), or the North Pacific DPS of green turtles (*Chelonia mydas*).

The U.S. Army has determined that the Proposed Action may affect but is not likely to adversely affect 20 marine mammal species, four sea turtle species, and 12 fish species listed under the ESA or listed as consultation species under the UES. The species not likely to be adversely affected by the Proposed Action are the cetaceans *Balaenoptera borealis*, *B. musculus*, *B. physalus*, *Delphinus delphis*, the Western North Pacific DPS of *Eschrichtius robustus*, *Eubalaena japonica*, *Feresa attenuata*, *Globicephala macrorhynchus*, *Grampus griseus*, *Kogia breviceps*, the Western North Pacific DPS of *Megaptera novaeangliae*, the Mexico DPS of *Megaptera novaeangliae*, *Mesoplodon densirostris*, *Orcinus orca*, *Peponocephala electra*, *Physeter macrocephalus*, *Stenella attenuata*, *S. coeruleoalba*, *S. longirostris*, and *Tursiops truncatus*; the Western DPS of Steller sea lion (*Eumetopias jubatus*); the North Pacific Ocean DPS of loggerhead turtle (*Caretta caretta*); the Central West Pacific DPS of green turtle (*Chelonia mydas*); the leatherback turtle (*Dermochelys coriacea*); the hawksbill turtle (*Eretmochelys imbricata*); and the fish *Alopias superciliosus*, *Carcharhinus longimanus*, *Cheilinus undulatus*, *Manta alfredi*, *M. birostris*, *Oncorhynchus keta*, *Oncorhynchus kisutch*, *Oncorhynchus mykiss*, *Oncorhynchus nerka*, *Oncorhynchus tshawytscha*, *Sphyrna lewini*, and *Thunnus orientalis*.

Through coordination with the National Marine Fisheries Service, the U.S. Army has revised its determination for seven coral and three mollusk species listed as consultation species under the UES. The U.S. Army has determined that the Proposed Action may affect and is likely to adversely affect the corals *Acropora microclados*, *A. polystoma*, *Cyphastrea agassizi*, *Heliopora coerulea*, *Pavona cactus*, *Pocillopora meandrina*, and *Turbinaria reniformis*; and the mollusks *Hippopus hippopus, Tectus niloticus,* and *Tridacna squamosa*.

Furthermore, the U.S. Army has determined that the Proposed Action would have no effect on North Pacific right whale (*Eubalaena japonica*) or Hawaiian monk seal (*Neomonachus schauinslandi*) critical habitat and is not likely to adversely affect Steller sea lion (*Eumetopias jubatus*) critical habitat.

Because of the potential for adverse effects to UES protected species, the U.S. Army would like to proceed with formal consultation with the National Marine Fisheries Service under Section 3-4.5 of the UES for potential effects in the Republic of the Marshall Islands to *Acropora microclados*, *A. polystoma*, *Cyphastrea agassizi*, *Heliopora coerulea*, *Pavona cactus*, *Pocillopora meandrina*, *Turbinaria reniformis*, *Hippopus hippopus*, *Tectus niloticus*, and *Tridacna squamosa*. The U.S. Army also requests your written concurrence if you agree with our determinations for those species the U.S. Army has determined may be but are not likely to be adversely affected by the Proposed Action.

Please contact David Fuller, USASMDC Environmental Division, regarding this consultation request at 256-425-2016 or david.g.fuller6.civ@mail.mil.

Sincerely,

HILL.WELDON.H.JR.1216862682 Digitally signed by HILL.WELDON.H.JR.1216862682 Date: 2020.11.02 11:29:07 -06'00'

Weldon H. Hill, Jr.
Deputy Chief of Staff for Engineering
U.S. Army Space and Missile Defense Command

September 22, 2020

Douglass Cooper
Endangered Species Branch Chief
Anchorage Fish and Wildlife Field Office
U.S. Fish and Wildlife Service
4700 BLM Road
Anchorage, Alaska 99507

Dear Mr. Cooper,

The United States Army Space and Missile Defense Command (USASMDC) is assisting the U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO), the action proponent, in evaluating the effects of the proposed Hypersonic Flight Test-3 (FT-3) program (Proposed Action). The Proposed Action involves a single developmental flight test from the Pacific Spaceport Complex Alaska (PSCA) to Kwajalein Atoll, Republic of the Marshall Islands (RMI).

We have evaluated the effects of the Proposed Action on species listed as endangered or threatened under the Endangered Species Act (ESA), on species listed as consultation species under Section 3-4 of the U.S. Army Kwajalein Atoll Environmental Standards (UES), and on designated critical habitat. We have determined that Proposed Action activities in and over Alaska waters and in the northern Pacific Ocean may affect but are not likely to adversely affect three seabird species and northern sea otters (*Enhydra lutris kenyoni*), and would have no effect on designated critical habitat for northern sea otters. Our supporting analysis is provided below. We request initiation of informal consultation under Section 7 of the ESA and request your written concurrence if you agree with our determinations.

Description of the Action Area and Proposed Action

The FT-3 launch vehicle consists of a three-stage booster system and an experimental payload. The FT-3 vehicle would launch from PSCA on Kodiak Island, Alaska. After launch the vehicle would fly over the Pacific Ocean towards Kwajalein Atoll. The three booster stages would separate after motor burn-out and fall into the north Pacific Ocean while the payload would continue flight towards Kwajalein Atoll (Figure 1).

The stage 1 booster drop zone is within U.S. territorial waters near Kodiak Island, Alaska (see Figure 2), and the over-ocean flight corridor extends from PSCA, over nearshore waters, to the broad ocean area (BOA) of the North Pacific Ocean. The coastal and pelagic waters offshore of Kodiak Island provide a diversity of highly productive habitats for marine organisms.

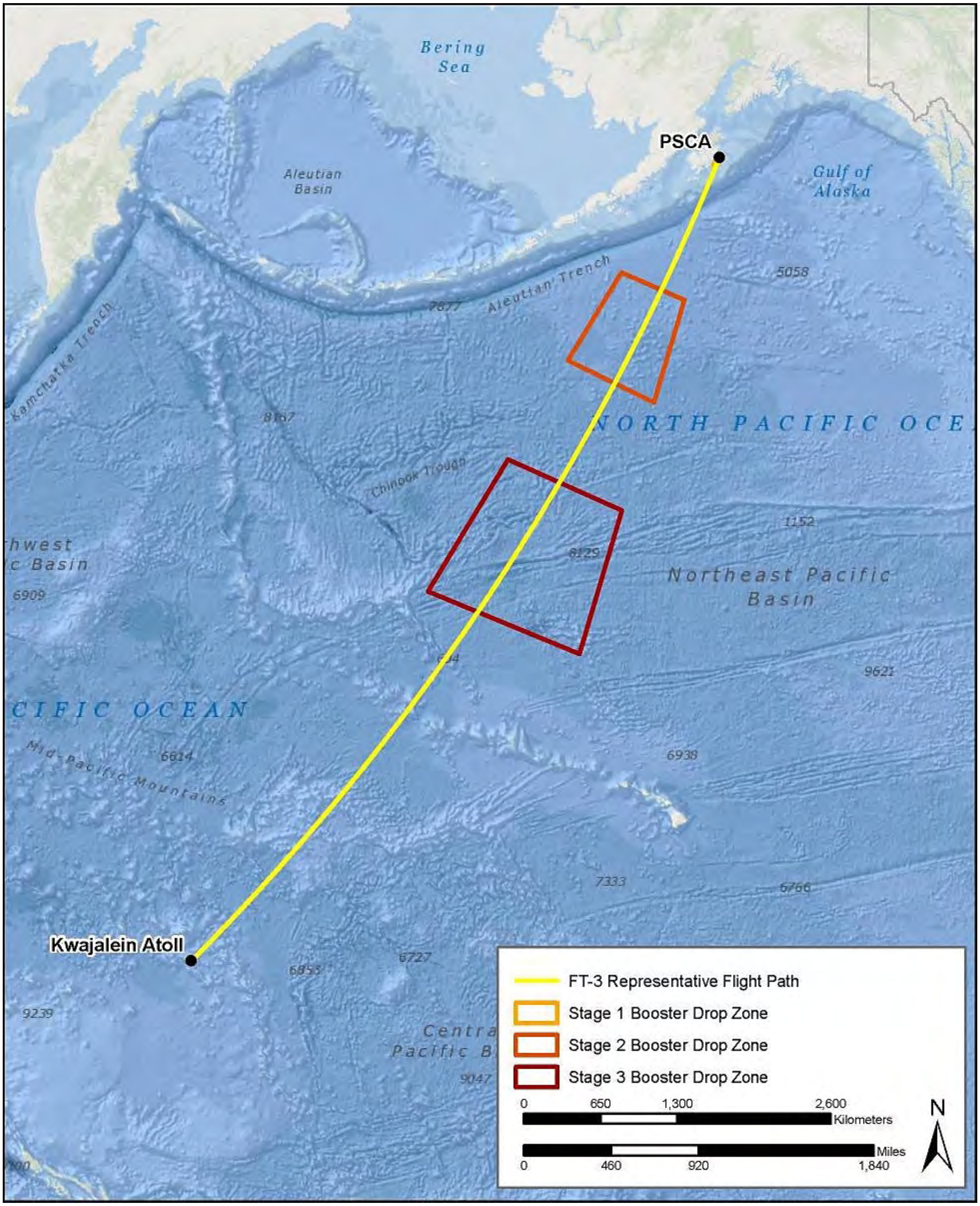


Figure 1. Flight Test-3 (FT-3) Representative Flight Path and Stage Drop Zones.

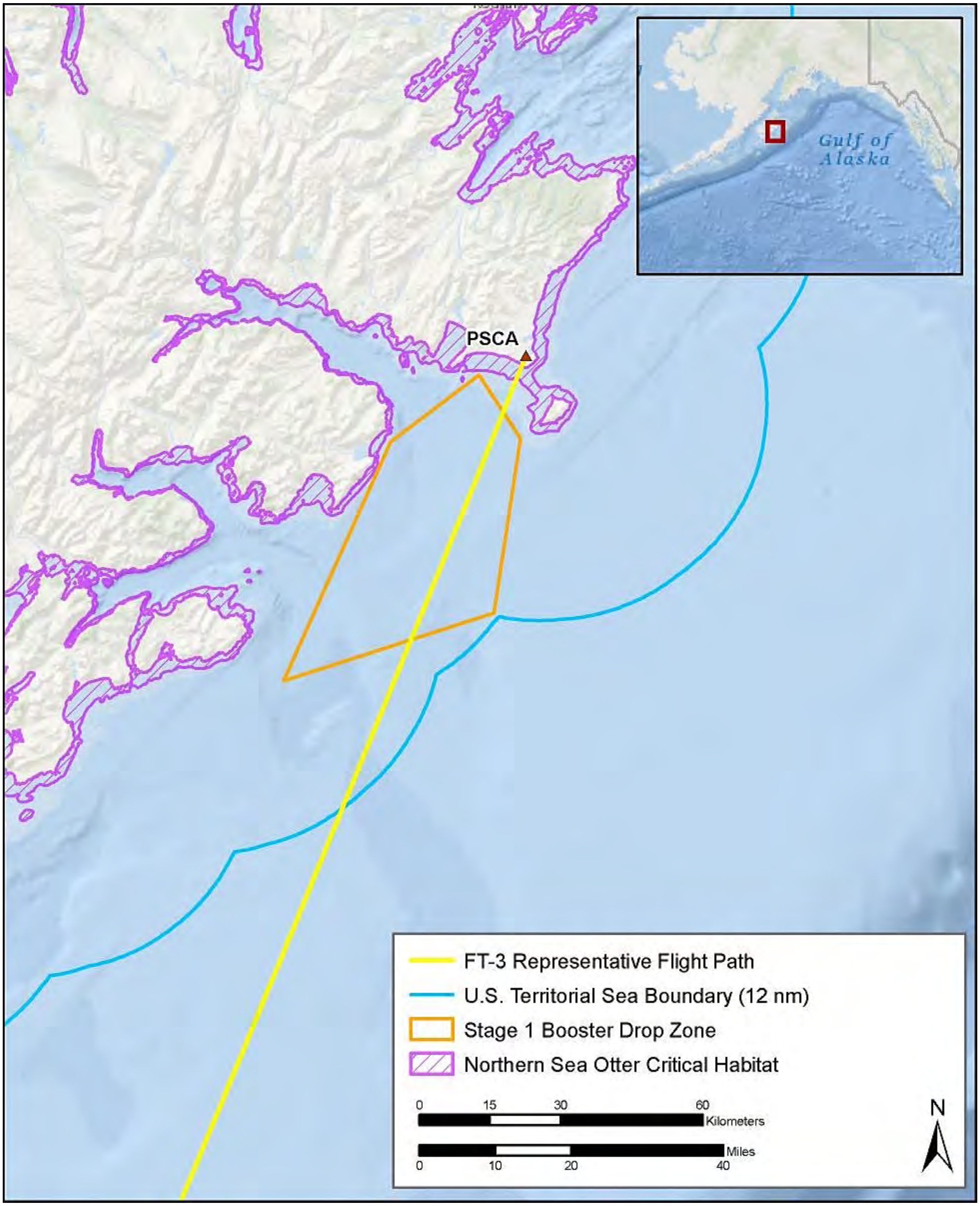


Figure 2. FT-3 Stage 1 Booster Drop Zone and Northern Sea Otter Critical Habitat.

Biodiversity studies in Gulf of Alaska waters have documented hundreds of species in plankton assemblages and of pelagic and benthic invertebrates (Fautin et al. 2010). These highly productive waters support large feeding congregations of many seabirds (Fautin et al. 2010).

The over-ocean flight path in the BOA includes a wide range of ocean regions extending from temperate waters of the Gulf of Alaska, through subtropical and tropical waters of the North Central Pacific, to equatorial waters of the RMI. The stage 2 and 3 booster drop zones would be in deep oceanic waters of the North Pacific current, subarctic current, and the subpolar and subtropical gyres (Figure 1). The North Pacific transition zone (between the subtropical and subarctic gyres) varies in location from year to year but is known to be a productive area that provides important habitat and feeding grounds for many pelagic organisms in the North Pacific (Polovina et al. 2017).The flight path includes flight over the Northwest Hawaiian Islands including the waters of the U.S. exclusive economic zone (EEZ) there (Figure 1). However, FT-3 flight would occur at a high altitude over the BOA and no debris would enter U.S. territory or EEZ waters near the Hawaiian Islands.

The terminal end of the payload flight would be at Kwajalein Atoll in the RMI with payload impact at Ronald Reagan Ballistic Missile Defense Test Site (RTS) at Illeginni.

The proposed FT-3 flight test activities analyzed in this letter consist of pre-flight preparation activities, FT-3 flight test activities, and post-flight operations in U.S. territory in Alaska and in the North Pacific Ocean. The Proposed Action flight test would occur sometime in the second half of fiscal year 2021 (April through September 2021). The FT-3 launch vehicle and payload characteristics and/or assumptions are detailed in Table 1 and Table 2.

Pre-Flight Preparations. PSCA and various other support facilities would participate in routine pre-flight support operations related to the Proposed Action. Support operations for the FT-3 Proposed Action would include base support, range safety, flight test support, and test instrumentation, at a minimum. The effects of pre-flight activities at these additional locations are covered under existing National Environmental Policy Act documentation and/or consultations for their ongoing activities. As such, analysis of these support operations is not included in this letter.

At Kwajalein Atoll, the Proposed Action would include pre-flight preparation activities on land at Illeginni Islet as well as in Kwajalein Atoll waters.

Table 1. FT-3 Vehicle Characteristics.

Component	Representative Launch Vehicle (not to scale)	Type	Diameter	Approximate Length	Propellant Type and Mass
Payload		Sandia National Laboratories	Unknown	Unknown	N/A
Stage 3 Booster		Orion 50 XLT	130 cm (50 inches)	3.1 m (10 ft)	Solid 3,915 kg (8,632 lb)
Stage 2 Booster		Orion 50S XLT	130 cm (50 inches)	9.2 m (30 ft)	Solid 15,037 kg (33,152 lb)
Stage 1 Booster		C4	188 cm (74 inches)	4.7 m (15.5 ft)	Solid 17,543 kg (38,677 lb)

Sources: MDA 2007, MDA 2019a, MDA 2019b

Abbreviations: cm = centimeters, ft = feet, kg = kilograms, lb = pounds, m = meters, N/A = not applicable

Table 2. FT-3 Launch Vehicle and Payload Characteristics.

	Launch Vehicle	Payload [a]
Major Components and Structure	Rocket motors, propellant, magnesium thorium (booster interstage), nitrogen gas, halon, asbestos, battery electrolytes (lithium-ion, silver zinc)	Aluminum, titanium, steel, tantalum, tungsten, carbon, silica, Teflon®, and alloys containing chromium, magnesium, and nickel
Communications	Various 5- to 20-watt radio frequency transmitters; one maximum 400-watt radio frequency pulse	Various 5- to 20-watt (radio frequency) transmitters
Power	Rechargeable lithium batteries	Lithium-ion batteries
Other	Small Class C (1.4) electro-explosive devices	Mechanical and flight termination Systems: initiators and explosive charges

Sources: USASMDC/ARSTRAT 2014, U.S. Army 2020

Flight Test. After launch from PSCA, the FT-3 vehicle would fly out over the BOA of the Pacific Ocean and on to Illeginni Islet in Kwajalein Atoll, RMI (Figure 1). A series of ground, sea, and/or air based sensors would monitor the FT-3 vehicle during flight and collect data on vehicle flight and system performance. All of these sensors are used for existing programs and would be scheduled for use based on availability. Following motor ignition and liftoff from the launch location, the vehicle booster stages would burn out sequentially and splash down in the North Pacific Ocean (Figure 1). The first-stage motor would burn out, separate from the second stage, and splash down in U.S. territorial waters off Kodiak Island (Figure 2). Farther into flight, the second-stage motor would burn out, separate, and splash down in the North Pacific Ocean (Figure 1). The shroud assembly would also be jettisoned prior to third stage ignition and would splash down in the stage 2 booster drop zone. After stage 3 motor burn-out and separation, the payload would continue flight over the Pacific Ocean toward Kwajalein Atoll while the stage 3 booster would splash down in the North Pacific Ocean (Figure 1).

If the launch vehicle were to deviate from its course or should other problems occur during flight that might jeopardize public safety, the onboard flight termination system would be activated. This action would initiate a predetermined safe mode for the vehicle, causing it to terminate flight and fall into the ocean. Computer-monitored destruct lines are pre-programmed into the flight safety software to avoid any debris falling on inhabited areas, and no termination debris would be expected to fall on land. Similarly, if data from the payload onboard sensors indicated that there was not sufficient energy to reach the target area, payload flight would be terminated, and the payload would fall along a ballistic trajectory into the BOA. The need for flight termination is unplanned and would be an unexpected and unlikely event.

Post-Flight Operations. With the exception of normal operations at the PSCA, the effects of which are covered under consultations on programmatic launch activities, all post-flight operations would take place at Kwajalein Atoll. The expended rocket motors and other vehicle components would not be recovered from the ocean following flight.

Consultation History

Early coordination and pre-consultation with the USFWS for the Proposed Action was conducted during a series of meetings, phone conversations, and email communications including:

- August 25, 2020 – USASMDC and KFS, LLC personnel met with Dan Polhemus, Michael Fry, and Jeremy Rynal of USFWS Pacific Islands Fish and Wildlife Office to provide USFWS with general information about the FT-3 project and to discuss a consultation plan for the Proposed Action. During this meeting, USFWS personnel requested that the Pacific Islands Fish and Wildlife Office conduct the required consultations under the UES for proposed activities at Kwajalein Atoll and that any necessary consultation under the ESA for portions of the Proposed Action in U.S. territory near Alaska be conducted with the USFWS Alaska Regional Office.

The following section includes a brief consultation history for launch activities at PSCA.

<u>Launch Activities at PSCA</u>. The PSCA was developed and is operated by the Alaska Aerospace Corporation (AAC) on Kodiak Island, Alaska. It supports the launch of rockets and satellites for commercial and Government aerospace interests. PSCA is located on State of Alaska land and is under an operating permit issued by the Federal Aviation Administration (FAA). RCCTO and USASMDC have concluded that all Proposed Action launch activities at PSCA are covered under existing programmatic consultations for ongoing space and missile launch activities at PSCA and that no further consultation with the USFWS is needed for Proposed Action launch activities.

The FAA and AAC have consulted with the USFWS for the effects of ongoing launch activities at the PSCA on ESA-listed species and designated critical habitats (consultation numbers 2004-093 and 2012 0127) (FAA 2016). In 2012, the FAA consulted with the USFWS on the effects of PSCA programmatic launch activities on ESA-listed species and critical habitats under USFWS jurisdiction. On 14 December 2012, the USFWS determined that programmatic launch activities were not likely to adversely affect northern sea otters or Steller's eiders (*Polysticta stelleri*), would have no effect on short-tailed albatross (*Phoebastria albatrus*), and would have no effect on designated critical habitat for northern sea otters (FAA 2016). In 2016, the FAA evaluated the effects of launch activities for small-lift and medium-lift rockets at PSCA and determined that these conclusions remained valid for these modifications to launch activities.

USFWS Listed Species and Critical Habitat in the Action Area

The portion of the Action Area in nearshore waters off PSCA includes the over-ocean flight corridor and stage 1 booster drop zone within the U.S. EEZ (200 nautical miles from shore) in the Gulf of Alaska. The ESA listed species under USFWS jurisdiction with the potential to occur in the Gulf of Alaska nearshore portion of the Action Area are listed in Table 3 and described below. In addition to these listed species, critical habitat for the northern sea otter occurs near the stage 1 booster drop zone.

The BOA portion of the Action Area includes the ocean area along the FT-3 flight path as well as the stage 2 and 3 booster drop zones. Since no effects to listed species are expected for overflight of the FT-3 vehicle in the BOA, this evaluation includes only species in the stage 2 and 3 booster drop zones. The ESA listed species with the potential to occur in the stage 2 and 3 booster drop zones are listed in Table 3.

Table 3. ESA-listed Species with the Potential to Occur in the FT-3 Booster Drop Zones.

Scientific Name	Common Name	ESA Listing Status	Occurrence in Stage 1 Drop Zone	Occurrence in Stage 2 and 3 Drop Zones
Mammals				
Enhydra lutris kenyoni	Northern sea otter – Southwest DPS	E	Potential	-
Birds				
Phoebastria albatrus	Short-tailed albatross	E	Likely	Likely
Polysticta stelleri	Steller's eider – Alaska Breeding DPS	T	Potential	-
Pterodroma sandwichensis	Hawaiian petrel	E	-	Potential

Sources: FAA 2016, AAC 2016, FAA 1996, U.S. Navy 2016

Abbreviations: DPS = Distinct Population Segment, E = ESA Endangered, ESA = U.S. Endangered Species Act, T = ESA Threatened, "-" = species does not occur in this portion of the action area.

Note: Species for which the Action Area is considered extralimital (i.e., very few confirmed sightings and the area is outside the normal range for the species) are not included in this table.

Northern Sea Otter (*Enhydra lutris kenyoni*). Sea otters are found in coastal areas from California to the Aleutian Islands. The range of the ESA-listed Southwest Distinct Population Segment (DPS) of northern sea otters extends from Attu Island to Western Cook Inlet. Sea otters use all types of coastal habitats within their range but are often found off rocky coasts or in large bays with kelp beds (USFWS 2010). While northern sea otters can be found at the surface in deeper waters, sea otters are primarily found in waters less than 100 m (328 ft) deep, which is the approximate extent of their diving ability (USFWS 2010). The highest densities of sea otters are found in shallower waters and in one study, 80 percent of otters were observed in waters less than 40 m (131 ft) deep (USFWS 2010).

The density and distribution of northern sea otters in the waters of the Action Area are largely unknown. However, given the distance from shore and water depth in the stage 1 booster drop zone, it is not likely that sea otters would occur in these areas. Sea otters are more likely to occur in coastal waters near Kodiak Island which are designated critical habitat for this species. A small number of northern sea otters have been observed in waters near PSCA during marine mammal surveys (FAA 2016). Between zero and eight northern sea otters are likely to occur in nearshore marine water of the Action Area where vehicle overflight would occur (FAA 2016). However, given the distance from shore and water depth in the stage 1 drop zone, it is not likely that sea otters would occur in this booster drop zone.

Northern Sea Otter Critical Habitat. Designated critical habitat for the Southwest DPS of the northern sea otter extends from the end of the Aleutian Islands to lower western Cook Inlet and includes waters around Kodiak Island (Figure 2). This Kodiak-Kamishak-Alaska Peninsula Unit of critical habitat includes nearshore marine waters ranging from the mean high tide line seaward for a distance of 100 m (328 ft), or to a water depth of 20 m (66 ft; USFWS 2009b). The primary constituent elements of sea otter critical habitat include shallow rocky areas, nearshore waters, and kelp forests that provide protection and escape from predators; and sufficient quantities of prey resources (USFWS 2009b). The Proposed Action would have no effect on these primary constituent elements, as the stage 1 booster drop zone is outside of designated critical habitat. Therefore, the Proposed Action would have no effect on this critical habitat and it is not discussed further in this evaluation.

Short-tailed Albatross (*Phoebastria albatrus*). Short-tailed albatross spend the majority of their lives at-sea, only coming to land to breed on remote islands in the western Pacific (USFWS 2009a). Outside of the breeding season, this species migrates to productive feeding grounds in waters of the Bering Sea, Aleutian Islands, and Gulf of Alaska (USFWS 2009a). Short-tailed albatross feed on prey seized from the water surface including squid, shrimp, fish, fish eggs, and crustaceans (USFWS 2009a).

Short-tailed albatross may occur in all three booster drop zones. The waters offshore of Kodiak Island are part of the core habitat for immature short-tailed albatross (USFWS 2014, Orben et al. 2018). Short-tailed albatross are considered rare in nearshore portions of the Action Area (FAA 2016) but likely occur in outer shelf waters. In a study of immature short-tailed albatross, birds were tracked throughout most of the North Pacific Ocean north of 30 degrees latitude where they were most likely to occur in pelagic areas during the winter and spring (Orben et al 2018). No density estimates are available for short-tailed albatross in the booster drop zones. As of the 2014 status review (USFWS 2014), the total population of breeding age short-tailed albatross was estimated to be 1,928 individuals.

Steller's Eider (*Polysticta stelleri*). The Alaska Breeding DPS of Steller's eider is listed as a threatened species under the ESA. Birds from the northern and western Alaska breeding populations winter in coastal waters of southwest Alaska where they mix with the larger Russian-Pacific breeding population of eiders (USFWS 2019). Steller's eiders spend most of the year in shallow, near-shore marine waters (generally within 402 m [1,320 ft] of shore) where they feed on invertebrates such as bivalves, amphipods, gastropods, crustaceans, and polychaete worms (USFWS 2019, USFWS 2000).

Steller's eiders have the potential to occur in the stage 1 booster drop zone during the winter months (mid-October through March; FAA 2016). Baseline studies of the Narrow Cape area in 1995 indicated that Steller's eiders were commonly observed in numbers ranging up to 600 off Narrow Cape in the winter months (FAA 1996). However, systematic surveys conducted for seven launches from PSCA (then Kodiak Launch Complex) recorded only small rafts of 30 to 60 birds on two occasions (FAA 2016). In a study of Steller's eiders wintering off Kodiak Island in Chiniak Bay (north of PSCA), most tagged birds migrated to eastern Arctic Russia and likely belonged to the Pacific-Russian breeding population, which is not ESA-listed (Rosenberg et al. 2014, USFWS 2019). At this time, there is not enough information to determine the proportion of eiders in the Action Area which are members of the ESA-listed Alaska breeding population (USFWS 2019).

Hawaiian Petrel (*Pterodroma sandwichensis*). Hawaiian petrels breed only in the southeastern Hawaiian Islands where they nest in burrows at high elevations (USFWS 2011). Little is known about their non-breeding range or about their pelagic foraging distribution, although satellite tagged birds have been recorded flying more than 3,000 miles (4,800 kilometers) on a single foraging trip from their breeding colonies (USFWS 2011). Hawaiian petrel foraging ranges are believed to extend throughout the east Pacific from the Aleutian Islands to the Equator (Wiley et al. 2012). In a 1995 at-sea study, Hawaiian petrels were observed between 125 and 165°W and from the equator north to at least 30°N (Spear et al. 1995).

Hawaiian petrels have the potential to occur in the southern portion of the stage 3 booster drop zone but would not occur in the stage 1 or 2 drop zones. No pelagic density estimates are available for Hawaiian petrels in the Action Area, but based on their life history and recorded distribution these birds would likely have very low densities in the stage 3 booster drop zone.

Effects Determination

This section describes how the Proposed Action has the potential to directly or indirectly affect listed species, their habitats, and/or designated critical habitats. The potential effects of four general types of project-related stressors are discussed in the subsections below: exposure to elevated sound levels, direct contact, hazardous materials, and human activity and equipment operation. The Proposed Action activities resulting in these stressors are detailed in Table 4. Due to the similarities between the proposed FT-3 activities, estimates from the FE-2 action are used for many of the Proposed Action stressors.

Exposure to Elevated Sound Levels. The Proposed Action has the potential to result in elevated noise levels both in-air and underwater. The primary elements of the Proposed Action that would result in elevated noise levels are: (1) sonic booms and (2) vehicle component splashdown noise (Table 4). The AAC and FAA have consulted with the USFWS on the effects of programmatic launch activities at the PSCA on ESA-listed species; therefore, vehicle launch noise is not considered further in this evaluation.

Table 4. Proposed FT-3 Action Stressors.

Stressor	North Pacific Ocean and Booster Drop Zones
Elevated Sound Pressure Levels	
Sonic Booms	Maximum sound pressure less than 145 dB in-water (re 1 µPa) and 119 dB in-air (re 20 µPa) at the surface near launch at PSCA. Maximum sound pressures less than 109 dB in-air at the ocean surface in the BOA. Duration 0.27 second.
Vehicle Splashdown	Estimated maximum of 218 dB in-water and 192 in-air at the ocean surface.
Direct Contact	
Vehicle Components	Three booster stage sections and payload shroud would splash down into the Pacific Ocean. Approximate dimensions: Stage 1 = 4.7 m long x 1.9 m diameter Stage 2 = 9.2 m long x 1.3 m diameter Stage 3 = 3.1 m long x 1.3 m diameter Shroud = 4.1 m long x 1.3 m diameter
Exposure to Hazardous Materials	
	Introduction of launch vehicle materials into deep ocean waters, including rocket motors, unused propellant, battery electrolytes, and heavy metals. Components and materials expected to sink to the bottom or rapidly dilute.

Abbreviations: µPa = micropascal, BOA = Broad Ocean Area, dB = decibels, dBA = A-weighted decibels, m = meters, ft = feet

Elevated sound levels could affect the behavior and hearing sensitivity in sea otters and seabirds in the Action Area. Loud sounds might cause these organisms to quickly react, altering their normal behavior either briefly or more long term or may even cause physical injury. The extent of these effects depends on the frequency, intensity, and duration of the sound as well as on the hearing ability and physiology of the organism. Detailed descriptions of general sound characteristics, the potential responses of consultation organisms to elevated noise levels, effect thresholds in consultation organisms, and analysis methodology can be found in several other sources (i.e., U.S. Navy 2019, U.S. Navy 2017, CALTRANS 2016) and are incorporated here by reference. In general, a sound pressure that is sufficient to cause permanent physical injury to auditory receptors is a sound that exceeds an organism's permanent threshold shift (PTS) level. A sound below the PTS threshold but high enough to cause temporary auditory impairment is a sound that exceeds an organism's temporary threshold shift (TTS) level. The extent of physical injury depends on the sound pressure level as well as the anatomy of each species. For example, unlike most other taxa, birds have the ability to regenerate hair cells in the inner ear, which allows them to recover from auditory injury better than other species, usually within several weeks (CALTRANS 2016). Noise effect thresholds for consultation organisms are summarized in Table 5.

Table 5. Thresholds for PTS, TTS, and Behavioral Disruption in Consultation Taxa from Single (Non-continuous) Exposure to Impulsive Sounds.

Group	PTS threshold (SPLpeak)	TTS Threshold (SPLpeak)	Behavioral Disruption
Mustelids (in-air, re 20 µPa)	176 dB	170 dB	100 dB
Mustelids (in-water, re 1 µPa)	218 dB	212 dB	195 dB
Birds (in-air, re 20 µPa)	140 dBA	unknown	93 dBA

Sources: U.S. Navy 2017, Finneran and Jenkins 2012, CALTRANS 2016

Abbreviations: µPa = micropascal, dB = decibels, dBA = A-weighted decibels, PTS = Permanent Threshold Shift, SELcum = Cumulative Sound Exposure Level, SPLpeak = Peak Sound Pressure Level, TTS = Temporary Threshold Shift

Based on the expected sound pressure levels (Table 4) and effect thresholds for consultation species (Table 5), elevated noise levels would have insignificant or discountable effects on consultation species. No physical injury to northern sea otters or seabirds would be expected. Sound pressures levels from sonic booms are below the PTS and TTS thresholds for all species. While component splashdown noise may exceed the PTS and TTS thresholds for sea otters and seabirds, it is extremely unlikely that any individual animals would be exposed. Sound pressures from stage 1 splashdown may be above 212 decibels (dB) in-water (the TTS threshold for otters) up to 79 m (261 ft) from stage 1 splashdown. Based on the distribution of sea otters and their low density in the stage 1 booster drop zone, it is extremely unlikely that any individuals would be exposed to sound pressures high enough to cause injury. Sound pressures from stage splashdown may be above 140 dB in-air (the PTS threshold for seabirds) up to 389 m (1,306 ft) from splashdown. While it is possible that some ESA-listed seabirds may be in the stage drop zones during a test, based on the limited distribution of these seabirds and their very low densities, it is considered discountable that any would be exposed to sounds loud enough to cause physical injury.

ESA-listed species in the booster drop zones may be exposed to very brief sounds above the behavioral disturbance threshold. However, for all species considered in this evaluation, the short duration sounds produced as a result of the proposed action would at most cause temporary behavioral disturbance such as changes in direction, speed, feeding, or socializing, that would have no measurable effect on individual fitness. Animals would be expected to return to normal behaviors within moments of exposure to FT-3 noise and the noise is expected to have insignificant effects on ESA-listed species in the Action Area.

Exposure to Direct Contact. The Proposed Action would result in vehicle components, including spent rocket motors and payload fairings, splashing down into the booster drop zones near Kodiak Island and in the BOA. These falling components would directly impact marine habitats and have the potential to directly contact ESA-listed species.

It is discountable that any ESA-listed species would be exposed to falling vehicle components in the booster drop zones of the BOA or nearshore waters off Kodiak Island. Northern sea otters are not likely to occur in any of the booster drop zones. While densities are not available for short-tailed albatross, Steller's eiders, or Hawaiian petrels in the booster drop zones, these birds have limited seasonal distributions in the Action Area and likely have very low densities. Because of the very low densities of consultation seabirds in the booster drop zones, it is considered discountable that any ESA-listed seabird would be struck by or otherwise adversely affected by a falling vehicle component.

Exposure to Hazardous Materials. For all species considered in this evaluation, exposure to hazardous materials as a result of the Proposed Action would have insignificant effects. Sources of hazardous material are listed in Table 4.

Any substances of which the launch vehicle is constructed or that are contained on the launch vehicle and are not consumed during flight or spent motor jettison (Table 2) would fall into the booster drop zones when the stage booster assemblies and nose fairing are released. Any hazardous materials would be rapidly diluted in seawater, and ESA-listed species would not be exposed to chemicals in sufficient concentrations to adversely affect individuals. Vehicle components are expected to sink to the ocean floor where consultation organisms would not be in contact with these materials.

Conclusions

Based on the above analysis and the conclusion that all effects of the Proposed Action would be insignificant and/or discountable, the U.S. Army has determined that the Proposed FT-3 Action may affect but is not likely to adversely affect the ESA-listed Southwest DPS of northern sea otters, short-tailed albatross, the Alaska Breeding DPS of Steller's eiders, or the Hawaiian petrel. The Proposed Action would have no effect on designated critical habitat for northern sea otters. We request your concurrence with these determinations.

We are also providing copies of this letter to Dr. Dan Polhemus, Pacific Islands Fish and Wildlife Office; and Dr. Steve Kolinski, National Marine Fisheries Service, Pacific Islands Regional Office.

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: 2020.09.23 10:37:10 -05'00'

Weldon H. Hill, Jr.
Deputy Chief of Staff for Engineering
U.S. Army Space and Missile Defense Command

Literature Cited

AAC (Alaska Aerospace Corporation). 2016. Application for a Five-Year Programmatic Permit for Small Takes of Marine Mammals Incidental to Launching of Space Launch Vehicles, Long Range Ballistic Target Missiles, and Smaller Missile Systems at Pacific Spaceport Complex Alaska, Kodiak Island, Alaska. Submitted to the National Marine Fisheries Service, Office of Protected Resources.

CALTRANS (California Department of Transportation). 2016. Technical Guidance for Assessment and Mitigation of the Effects of Highway and Road Construction Noise on Birds. Prepared by ICF International, Sacramento, CA, Robert Dooling and Arthur Popper.

FAA (Federal Aviation Administration). 1996. Environmental Assessment of the Kodiak Launch Complex, Kodiak Island, Alaska. May 1996.

_____. 2016. Final Environmental Assessment for Kodiak Launch Complex Launch Pad 3. April 2002.

Fautin, D., P. Dalton, L. S. Incze, J. C. Leong, C. Pautzke, A. Rosenberg, P. Sandifer, G. Sedberry, J. W. Tunnell Jr., I. Abbott, R. E. Brainard, M. Brodeur, L. G. Eldredge, M. Feldman, F. Moretzohn, P. S. Vroom, M. Wainstein, and N. Wolff. 2010. An Overview of Marine Biodiversity in United States Waters. PLoS ONE, 5(8): e11914.

Finneran, J. J. and A. K. Jenkins. 2012. Criteria and Thresholds for US Navy Acoustic and Explosive Effects Analysis. April 2012.

MDA (Missile Defense Agency). 2007. Flexible Target Family Environmental Assessment. October 2007.

_____. 2019a. Mechanical Engineering SMDC TIM4. July 2019.

_____. 2019b. Program Requirements Document Flight Test Other – 43 (FTX-43) Pacific Spaceport Complex-Alaska. November 2019.

Orben, R. A., A. J. O'Connor, R. M. Suryan, K. Ozaki, F. Sato, and T. Deguchi. 2018. Ontogenetic changes in at-sea distributions of immature short-tailed albatrosses *Phoebastria albatrus*. Endangered Species Research 35:23-37.

Polovina, J. J., E. A. Howell, D. R. Kobayashi, and M. P. Seki. 2017. The Transition Zone Chlorophyll Front Updated: Advances from a Decade of Research. Progress in Oceanography 150:79-85.

Rosenberg, D. H., M. J. Petrula, J. L. Schamber, D. Zwiefelhofer, T. E. Hollmen, and D. D. Hill, 2014. Seasonal Movements and Distribution of Steller's Eiders (*Polysticta stelleri*) Wintering at Kodiak Island, Alaska. Arctic 67(3): 347-359.

Spear, L. B., D. G Ainley, N. Nur, and S. N. G. Howell. 1995. Population size and factors affecting at-sea distributions of four endangered Procellariids in the Tropical Pacific. The Condor 97(3):613-638.

U.S. Army (United States Army). 2020. Draft Environmental Assessment/Overseas Environmental Assessment for Hypersonic Flight Test 3 (FT-3). September 2020.

U.S. Navy (United States Department of the Navy). 2016. Gulf of Alaska Navy Training Activities Supplemental Environmental Impact Statement /Overseas Environmental Impact Statement.

_____. 2017. Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase III). Technical Report. June 2017.

_____. 2019. Final Biological Assessment for Flight Experiment-2. June 2019.

USASMDC/ARSTRAT (United States Army Space and Missile Defense Command/Army Strategic Forces Command). 2014. Advanced Hypersonic Weapon Flight Test 2, Hypersonic Technology Test Environmental Assessment. July 2014.

USFWS (United States Fish and Wildlife Service). 2000. Endangered and Threatened Wildlife and Plants; Proposed Designation of Critical Habitat for the Steller's Eider. 65 FR 13262. 13 March 2000.

_____. 2009a. Short-tailed Albatross (*Phoebastria albatrus*) 5-Year Review: Summary and Evaluation. Anchorage Fish and Wildlife Field Office.

_____. 2009b. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for the Southwest Alaska Distinct Population Segment of the Northern Sea Otter. Final Rule. 74 FR 51988. 8 October 2009.

_____. 2010. Southwest Alaska Distinct Population Segment of the Northern Sea Otter (*Enhydra lutris kenyoni*) Draft Recovery Plan. U.S. Fish and Wildlife Service Region 7, Alaska. 171 pp.

_____. 2011. Hawaiian Dark-rumped Petrel (*Pterodroma phaeopygia sandwichensis*) 5-year Review Summary and Evaluation.

_____. 2014. 5-Year Review: Summary and Evaluation, Short-tailed Albatross (*Phoebastria albatrus*). Anchorage Fish and Wildlife Field Office.

_____. 2019. Status Assessment of the Alaska-breeding Population of Steller's Eiders. USFWS, Fairbanks Fish and Wildlife Field Office. March 2019.

Wiley, A. E., A. J. Welch, P. H. Ostrom, H. F. James, C. A. Stricker, R. C. Fleischer, H. Gandhi, J. Adams, D. G. Ainley, F. Duvall, N. Holmes, D. Hu, S. Judge, J. Penniman, K. A. Swindlee. 2012. Foraging Segregation and Genetic Divergence Between Geographically Proximate Colonies of a Highly Mobile Seabird. Oecologia 168:119-130.

September 22, 2020

Dan A. Polhemus, PhD
U.S. Fish and Wildlife Service
Pacific Islands Fish and Wildlife Office
P.O. Box 50088
Honolulu, Hawaii 96850

Dear Dr. Polhemus,

The United States Army Space and Missile Defense Command (USASMDC) is assisting the U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO), the action proponent, in evaluating the effects of the proposed Hypersonic Flight Test-3 (FT-3) program (Proposed Action). The Proposed Action involves a single developmental flight test from the Pacific Spaceport Complex Alaska (PSCA) to Kwajalein Atoll, Republic of the Marshall Islands (RMI).

We have evaluated the effects of the Proposed Action on species listed as endangered or threatened under the Endangered Species Act (ESA), on species listed as consultation species under Section 3-4 of the U.S. Army Kwajalein Atoll Environmental Standards (UES), and on designated critical habitat. We have determined that Proposed Action activities taking place at Kwajalein Atoll may affect but are not likely to adversely affect nesting or hauled out sea turtles protected under the UES. Furthermore, we have concluded that the Proposed Action would have no effect on any ESA-listed species or designated critical habitat under USFWS jurisdiction in the Hawaiian Islands. Our supporting analysis is provided below. We request initiation of informal consultation under the UES and request your written concurrence if you agree with our determinations.

Description of the Action Area and Proposed Action

The FT-3 launch vehicle consists of a three-stage booster system and an experimental payload. The FT-3 vehicle would launch from PSCA on Kodiak Island, Alaska. After launch the vehicle would fly over the Pacific Ocean towards Kwajalein Atoll. The three booster stages would separate after motor burn-out and fall into the north Pacific Ocean while the payload would continue flight towards Kwajalein Atoll (Figure 1).

The stage 1 booster drop zone is within U.S. territorial waters near Kodiak Island, Alaska and the over-ocean flight corridor extends from PSCA, over nearshore waters, to the broad ocean area (BOA) of the North Pacific Ocean.

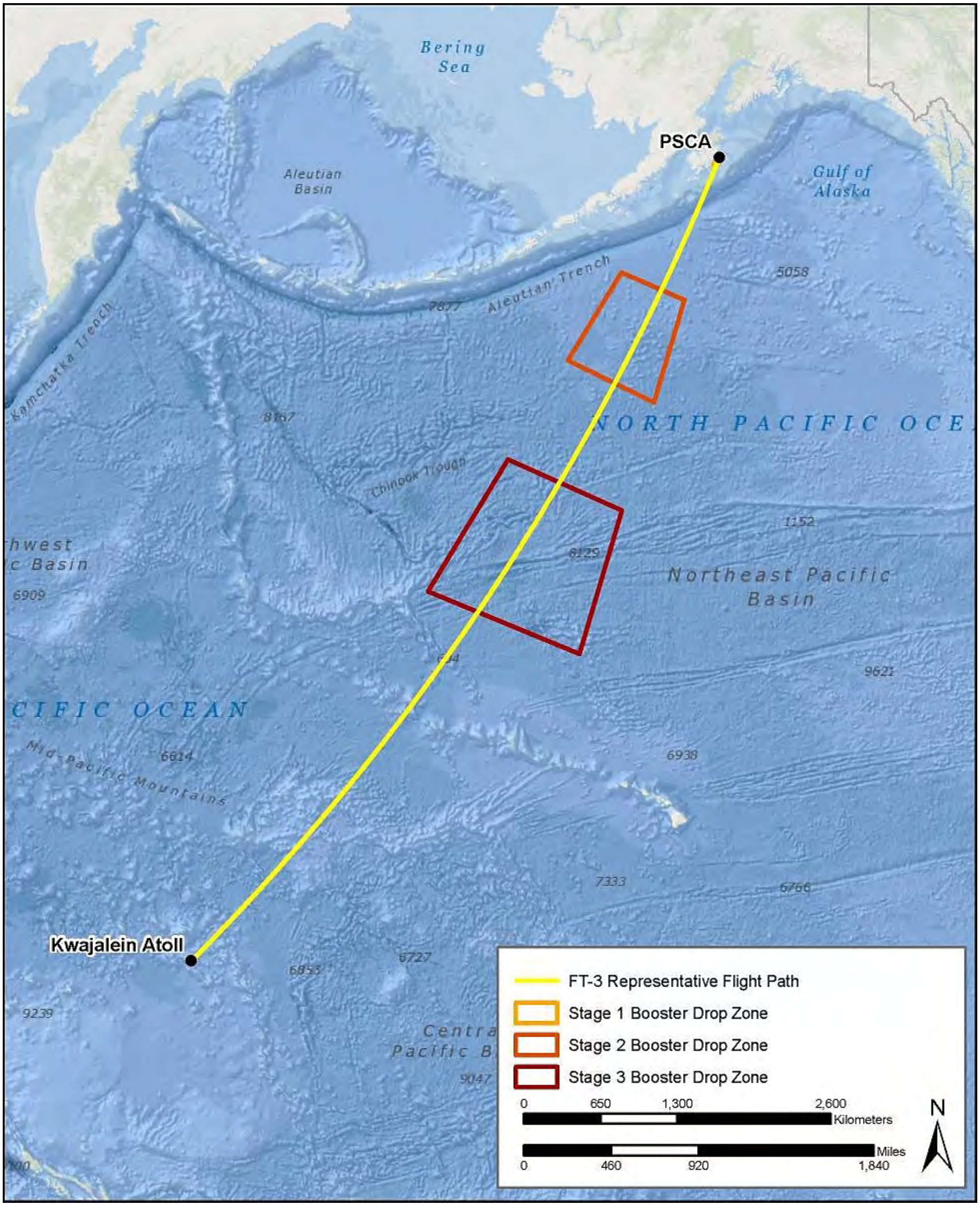


Figure 1. Flight Test-3 (FT-3) Representative Flight Path and Stage Drop Zones.

The over-ocean flight path in the BOA includes a wide range of ocean regions extending from temperate waters of the Gulf of Alaska, through subtropical and tropical waters of the North Central Pacific, to equatorial waters of the RMI. The stage 2 and 3 booster drop zones would be in deep oceanic waters of the North Pacific (Figure 1). The flight path includes flight over the Northwest Hawaiian Islands including the waters of the U.S. exclusive economic zone (EEZ) there (Figure 1). However, FT-3 flight would occur at a high altitude over the BOA and no debris would enter U.S. territory or EEZ waters near the Hawaiian Islands. The Proposed Action would have no effect on ESA-listed species or designated critical habitat in the Hawaiian Islands and this portion of the Action Area is not discussed further in this evaluation.

The terminal end of the payload flight would be at Kwajalein Atoll in the RMI with payload impact at Ronald Reagan Ballistic Missile Defense Test Site (RTS) at Illeginni Islet (see Figure 2). The payload impact zone on Illeginni Islet is an area approximately 137 meters (m) (450 feet [ft]) by 290 m (950 ft) on the non-forested, northwest end of the islet . Illeginni Islet has served as a flight test termination site for numerous Department of Defense ballistic and target test flights in the past several decades. The FT-3 flight test activities are consistent with the ongoing RTS mission and are well within the limits of current operations of RTS and U.S. Army Garrison–Kwajalein Atoll (USAG-KA).

The proposed FT-3 flight test activities analyzed in this letter consist of pre-flight preparation activities, FT-3 flight test activities including payload impact at Illeginni Islet, and post-flight operations at Kwajalein Atoll. The Proposed Action flight test would occur sometime in the second half of fiscal year 2021 (April through September 2021). The FT-3 launch vehicle and payload characteristics and/or assumptions are detailed in Table 1 and Table 2.

Pre-Flight Preparations. USAG-KA, RTS, and various other support facilities would participate in routine pre-flight support operations related to the Proposed Action. Support operations for the FT-3 Proposed Action would include base support, range safety, flight test support, and test instrumentation, at a minimum. The effects of pre-flight activities at these additional locations are covered under existing National Environmental Policy Act documentation and/or consultations for their ongoing activities. As such, analysis of these support operations is not included in this letter.

At Kwajalein Atoll, the Proposed Action would include pre-flight preparation activities on land at Illeginni Islet as well as in Kwajalein Atoll waters. Pre-flight activities would include several vessel round-trips and helicopter trips to Illeginni Islet for personnel and equipment transport. It is anticipated that, similar to other flight tests with payload impact at Illeginni Islet, there would be increased human activity on Illeginni Islet over a 3-month period (USASMDC 2020). Heavy equipment, such as a backhoe or loader, may be used for placement of test equipment on Illeginni Islet and would be transported to the islet by barge or landing craft. Several self-stationing raft-borne sensors may be deployed and recovered on both the ocean and lagoon sides of Illeginni Islet to collect data on payload descent and impact. Rafts would be deployed in waters at least 4 m (13 ft) deep by one or two landing craft utility vessels.

Figure 2. FT-3 Payload Impact Zone and Suitable Habitat for Sea Turtles on Illeginni Islet.

Table 1. FT-3 Vehicle Characteristics.

Component	Representative Launch Vehicle (not to scale)	Type	Diameter	Approximate Length	Propellant Type and Mass
Payload		Sandia National Laboratories	Unknown	Unknown	N/A
Stage 3 Booster		Orion 50 XLT	130 cm (50 inches)	3.1 m (10 ft)	Solid 3,915 kg (8,632 lb)
Stage 2 Booster		Orion 50S XLT	130 cm (50 inches)	9.2 m (30 ft)	Solid 15,037 kg (33,152 lb)
Stage 1 Booster		C4	188 cm (74 inches)	4.7 m (15.5 ft)	Solid 17,543 kg (38,677 lb)

Sources: MDA 2007, MDA 2019a, MDA 2019b

Abbreviations: cm = centimeters, ft = feet, kg = kilograms, lb = pounds, m = meters, N/A = not applicable

Table 2. FT-3 Launch Vehicle and Payload Characteristics.

	Launch Vehicle	Payload [a]
Major Components and Structure	Rocket motors, propellant, magnesium thorium (booster interstage), nitrogen gas, halon, asbestos, battery electrolytes (lithium-ion, silver zinc)	Aluminum, titanium, steel, tantalum, tungsten, carbon, silica, Teflon®, and alloys containing chromium, magnesium, and nickel
Communications	Various 5- to 20-watt radio frequency transmitters; one maximum 400-watt radio frequency pulse	Various 5- to 20-watt (radio frequency) transmitters
Power	Rechargeable lithium batteries	Lithium-ion batteries
Other	Small Class C (1.4) electro-explosive devices	Mechanical and flight termination Systems: initiators and explosive charges

Sources: USASMDC/ARSTRAT 2014, U.S. Army 2020

Flight Test. After launch from PSCA, the FT-3 vehicle would fly out over the BOA of the Pacific Ocean and on to Illeginni Islet in Kwajalein Atoll, RMI (Figure 1). A series of ground, sea, and/or air based sensors would monitor the FT-3 vehicle during flight and collect data on vehicle flight and system performance. All of these sensors are used for existing programs and would be scheduled for use based on availability. Following motor ignition and liftoff from the launch location, the vehicle booster stages would burn out sequentially and splash down in the North Pacific Ocean (Figure 1).

If the launch vehicle were to deviate from its course or should other problems occur during flight that might jeopardize public safety, the onboard flight termination system would be activated. This action would initiate a predetermined safe mode for the vehicle, causing it to terminate flight and fall into the ocean. Computer-monitored destruct lines are pre-programmed into the flight safety software to avoid any debris falling on inhabited areas, and no termination debris would be expected to fall on land. Similarly, if data from the payload onboard sensors indicated that there was not sufficient energy to reach the target area, payload flight would be terminated, and the payload would fall along a ballistic trajectory into the BOA. The need for flight termination is unplanned and would be an unexpected and unlikely event.

At the terminal end of the flight, the payload would impact on land on the non-forested western end of Illeginni Islet (Figure 2). A crater would form as a result of payload impact and natural substrate (coral rubble) would be ejected around the rim of the crater. Information concerning the vehicle’s energy release on impact is unknown. However, it is expected that cratering as a result of FT-3 payload impact would be less than observations of cratering for previous Minuteman III, Flight Experiment-2 (FE-2), and other test program impacts on Illeginni Islet. The Proposed Action has the potential to result in elevated noise levels near Illeginni Islet due to sonic booms from payload approach and due to impact of the payload.

Post-Flight Operations. At Kwajalein Atoll, personnel would recover FT-3 debris from land either manually or with heavy equipment similar to that used during site preparation following the test. The impact crater would be excavated using a backhoe or front-end loader, and the excavated material would be screened to recover debris. Following debris removal, the crater would be backfilled with the excavated material and substrate which was ejected during crater formation. USAG-KA and RTS personnel would be involved in these post-test operations. In preparation for the test, USASMDC would prepare a post-test recovery/cleanup plan detailing specific actions which would be taken, including the measures listed in the *Avoidance and Mitigation Measures* section, to avoid impacts to listed species. Accidental spills from support equipment operations would be contained and cleaned up according to the UES Kwajalein Environmental Emergency Plan. All waste materials would be appropriately stored and returned to Kwajalein Islet for proper disposal.

While debris is not expected to reach the ocean, if any FT-3 debris is present in the shallow waters (less than 55 m [180 ft] deep) near Illeginni Islet, it would be removed where reasonably possible without impacting listed species or sensitive habitats (i.e., suitable sea turtle nesting habitat). If an inadvertent impact occurs on the reef, reef flat, or in shallow waters less than 3 m

(10 ft) deep, an inspection by project personnel would occur within 24 hours. Representatives from the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) would also be invited to inspect the site as soon as practical after the test. The inspectors would assess any damage to coral and other natural and biological resources and, in coordination with USASMDC, USAG-KA, and RTS representatives, decide on any response measures that may be required.

Avoidance and Mitigation Measures

Similar to other flight tests which have been conducted with impacts at Illeginni Islet, several avoidance, minimization, and reporting measures shall be implemented as part of the Proposed Action to reduce the potential effects of the Proposed Action on consultation species. The measures which would be implemented as part of the Proposed FT-3 Action are the same measures proposed and implemented for the FE-2 flight test. Measures relevant to protected resources under USFWS jurisdiction include:

- Any observations of sea turtles during ship travel or overflights would be reported (including location, date, time, species or taxa, and number of individuals) to the USAG-KA Environmental Engineer who would maintain records of these observations and report sightings to NMFS and USFWS.
- 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.
- Any accidental spills from support equipment operations would be contained and cleaned up and all waste materials would be transported to Kwajalein Islet for proper disposal.
- Hazardous materials would be handled in adherence to the hazardous materials and waste management systems of USAG-KA. Hazardous waste incidents would comply with the emergency procedures set out in the Kwajalein Environmental Emergency Plan and the UES.
- Vessel and heavy equipment operators would inspect and clean equipment for fuel or fluid leaks prior to use or transport and would not intentionally discharge fuels or waste materials into terrestrial or marine environments.
- All equipment and packages shipped to Kwajalein Atoll will undergo inspection prior to shipment to prevent the introduction of alien species into Kwajalein Atoll.
- Pre-flight monitoring by qualified personnel will be conducted on Illeginni Islet for sea turtles or sea turtle nests. For at least 8 weeks preceding the launch, Illeginni Islet would be surveyed by pre-test personnel for sea turtles, sea turtle nesting activity, and sea turtle nests. If possible, personnel will inspect the area within days of the launch. If sea turtles or sea turtle nests are observed near the impact area, observations would be reported to appropriate test and USAG-KA personnel for consideration in approval of the launch and to the USFWS.
- Personnel will report any observations (including location, date, time, species, and number of individuals) of sea turtles or sea turtle nests on Illeginni Islet to the USAG-KA

Environmental Engineer who would maintain records of these observations and report sightings to USFWS.

- When feasible, within one day after the land impact test at Illeginni Islet, USAG-KA environmental staff would survey the islet and the near-shore waters for any injured wildlife or damage to sensitive habitats (i.e., reef habitat). Any impacts to biological resources would be reported to the Appropriate Agencies, with USFWS and NMFS offered the opportunity to inspect the impact area to provide guidance on mitigations.
- Although unexpected, any dead or injured sea turtles sighted by post-flight personnel would be reported to the USAG-KA Environmental Office and USASMDC, who would then inform USFWS and NMFS. USAG-KA 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 sea turtles.
- For recovery and rehabilitation of any injured migratory birds or sea turtles found at Illeginni Islet, USFWS and NMFS would be notified to advise on best care practices and qualified biologists would be allowed to assist in recovering and rehabilitating any injured sea turtles found.
- Debris recovery and site cleanup would be performed for the land impact. To minimize long-term risks to vegetation and wildlife, all visible project-related man-made debris would be recovered during post-flight operations. In all cases, recovery and cleanup would be conducted in a manner to minimize further impacts on biological resources.
- At Illeginni Islet, should any missile components or debris impact areas of sensitive biological resources (i.e., sea turtle nesting habitat or coral reef), a USFWS or NMFS biologist would be allowed to provide guidance and/or assistance in recovery operations to minimize impacts on such resources. To the greatest extent practicable, protected marine species will be avoided or effects to them will be minimized.
- During post-test recovery and cleanup, should personnel observe endangered, threatened, or other species requiring consultation moving into the area, work would be delayed until such species were out of harm’s way or leave the area.

Consultation History

Early coordination and pre-consultation with the USFWS for the Proposed Action was conducted during a series of meetings, phone conversations, and email communications including:

- August 25, 2020 – USASMDC and KFS, LLC personnel met with Dan Polhemus, Michael Fry, and Jeremy Rynal of USFWS Pacific Islands Fish and Wildlife Office to provide USFWS with general information about the FT-3 project and to discuss a consultation plan for the Proposed Action. During this meeting, USFWS personnel requested that the Pacific Islands Fish and Wildlife Office conduct the required consultations under the UES for proposed activities at Kwajalein Atoll and that any necessary consultation under the ESA for portions of the Proposed Action in U.S. territory near Alaska be conducted with the USFWS Alaska Regional Office.

The following section includes a brief consultation history for similar activities at Kwajalein Atoll.

Consultation History for Similar Actions at Kwajalein Atoll. Many aspects of the proposed FT-3 Action are very similar to other recent flight tests with terminal impacts at Illeginni Islet. The Proposed Action is most notably similar to the recent FE-2 test conducted by the U.S. Navy (U.S. Navy 2019). The U.S. Navy prepared a Biological Assessment for the FE-2 action to evaluate the effects of the action on ESA and UES consultation species and designated critical habitats (U.S. Navy 2019). Given the similarity of the two tests and the fact that the best available information on species occurrence and baseline conditions have not changed, a brief summary of the consultation history for FE-2 is included below.

The U.S. Navy consulted with the USFWS on the FE-2 action. On 29 July 2019, the USFWS issued a Letter of Concurrence for the U.S. Navy's conclusion that FE-2 activities at Kwajalein Atoll and in the BOA were not likely to adversely affect sea turtles or their nests and Newell's shearwaters (*Puffinus auricularis newelli*).

Listed Species and Critical Habitat in the Action Area

The species listed as consultation species under Section 3-4 of the UES (USASMDC/ARSTRAT 2018) and under USFWS jurisdiction with the potential to occur in the Kwajalein Atoll portion of the Action Area are listed in Table 3. No critical habitat has been designated in the RMI.

Table 3. Species Requiring Consultation under the UES Known to or with the Potential to Occur in the Kwajalein Atoll Portion of the Action Area.

Scientific Name	Common Name	UES Consultation Species Listing Status(1)	
		ESA	RMI Statute
Sea Turtles			
Chelonia mydas	Green turtle – Central West Pacific DPS	E	1, 3
Eretmochelys imbricata	Hawksbill turtle	E	3

Sources: USASMDC/ARSTRAT 2018, U.S. Navy 2019

Abbreviations: DPS = Distinct Population Segment, E = ESA Endangered, ESA = U.S. Endangered Species Act, UES: United States Army Kwajalein Atoll Environmental Standards (USASMDC/ARSTRAT 2018 Section 3-4.5.1).

(1) UES Consultation Species Listing Status based on Appendix 3-4A of the UES (USASMDC/ARSTRAT 2018).

RMI Statutes: 1 = Endangered Species Act 1975, Title 8 MIRC Chapter 3; 3 = Fisheries Act 1997, Title 51 MIRC Chapter 2.

Green Turtle (*Chelonia mydas*). Green turtles have the potential to haul out and nest in terrestrial habitats on Illeginni Islet. Green turtles in the Action Area likely belong to the Central West Pacific DPS which is listed as endangered under the ESA and is considered a consultation species under the UES (NMFS and USFWS 2016, USASMDC/ARSTRAT 2018). Green turtles are mostly herbivorous. They feed primarily on sea grass and algae, at or near the surface in both coastal and open ocean areas (NMFS and USFWS 2007). Green turtles spend the majority of their lives in coastal foraging grounds; however, oceanic habitats are used by oceanic-stage juveniles, migrating adults, and occasional foraging adults (NMFS and USFWS 2007).

There are 6 major green sea turtle nesting populations in the Pacific Ocean and at least 166 smaller nesting sites (NMFS and USFWS 2007, Seminoff et al. 2015, Maison et al. 2010). Green turtles nest on several atolls in the central Pacific, but Kwajalein Atoll is not a significant nesting area. Based on available information, Seminoff et al. (2015) estimated 300 nesting females in the RMI out of a total of 6,500 nesting females in the Central West Pacific DPS (4.6 percent of known breeding population). In a 2008 survey of Illeginni Islet, suitable nesting habitat (relatively open sandy beaches and seaward margins of herbaceous strand above tidal influence) for sea turtles was identified (Figure 2), and these areas were thoroughly surveyed on foot for nesting pits and tracks. These nesting and haul-out habitats were reevaluated during the 2010 inventory and were determined to still be suitable habitat; however, no sea turtle nesting activity or nests have been observed on Illeginni Islet in over 20 years. Sea turtle nest pits (unidentified species) were last found on Illeginni Islet in 1996, on the northern tip of the islet. No nesting was observed in surveys completed in 1998, 2000, 2002, 2004, 2006, 2008, or 2010, although suitable sea turtle nesting habitat was observed (USFWS and NMFS 2012).

Hawksbill Turtle (*Eretmochelys imbricata*). The hawksbill turtle is listed as endangered as a single global population under the ESA (NMFS and USFWS 1998) and is listed as a consultation species under the UES (USASMDC/ARSTRAT 2018). Hawksbills feed primarily on sponges, which comprise as much as 95 percent of their diet (Meylan 1988) but are more omnivorous in the Indo-Pacific including algae, soft corals, and other invertebrate species (NMFS and USFWS 2013). The hawksbill turtle is the most tropical of the world’s sea turtles, rarely occurring higher than 30°N or lower than 30°S in the Atlantic, Pacific, and Indian ocean. Abundance estimates are largely based on annual reproductive effort for sea turtle species (NMFS and USFWS 2013). A lack of nesting beach surveys for hawksbill turtles in the Pacific Ocean and the poorly understood nature of this species’ nesting have made it difficult for scientists to assess the population status of hawksbills in the Pacific (NMFS and USFWS 1998). Surveys of known nesting assemblages in the western and central Pacific Ocean indicate mostly decreasing population trends over the past 20 years (NMFS and USFWS 2013).

In the central Pacific, hawksbills are known to nest on beaches in American Samoa, Fiji, the Mariana Archipelago, Micronesia, Palau, the Solomon Islands, and Vanuatu (NMFS and USFWS 2013). Hawksbill nesting activity in the RMI includes activity on Wotje Islet in 1991 (NMFS and USFWS 1998), on Omelek Islet in 2009 (U.S. Navy 2019), and potentially on Bikar Atoll (Kabua and Edwards 2010) but hawksbill nesting is very rare in the RMI. As discussed above for green sea turtles, suitable nesting habitat occurs on Illeginni Islet. However, no sea turtle nesting activity has been observed on the islet in over 20 years and hawksbills are unlikely to nest on Illeginni Islet.

Effects Determination

This section describes how the Proposed Action has the potential to directly or indirectly affect listed species, their habitats, and/or designated critical habitats. The potential effects of four general types of project-related stressors are discussed in the subsections below: exposure to elevated sound levels, direct contact, hazardous materials, and human activity and equipment operation. The Proposed Action activities resulting in these stressors are detailed in Table 4. Due to the similarities between the proposed FT-3 activities, estimates from the FE-2 action are used for many of the Proposed Action stressors.

Exposure to Elevated Sound Levels. The Proposed Action has the potential to result in elevated noise levels both in-air and underwater. The primary elements of the Proposed Action that would result in elevated noise levels are: (1) sonic booms, (2) impact of the payload, and (4) human activity and equipment operation (Table 4).

Elevated sound levels could affect the behavior and hearing sensitivity in sea otters, seabirds, and sea turtles in the Action Area. Loud sounds might cause these organisms to quickly react, altering their normal behavior either briefly or more long term or may even cause physical injury. The extent of these effects depends on the frequency, intensity, and duration of the sound as well as on the hearing ability and physiology of the organism. Detailed descriptions of general sound characteristics, the potential responses of consultation organisms to elevated noise levels, effect thresholds in consultation organisms, and analysis methodology can be found in several other sources (i.e., U.S. Navy 2019, U.S. Navy 2017) and are incorporated here by reference. In general, a sound pressure that is sufficient to cause permanent physical injury to auditory receptors is a sound that exceeds an organism's permanent threshold shift (PTS) level. A sound below the PTS threshold but high enough to cause temporary auditory impairment is a sound that exceeds an organism's temporary threshold shift (TTS) level. The extent of physical injury depends on the sound pressure level as well as the anatomy of each species. Noise effect thresholds for sea turtles in-water (re 1 μPa) are 230 dB SPL_{peak} for PTS, 224 dB SPL_{peak} for TTS, and 160 dB SEL_{cum} for behavioral disturbance (U.S. Navy 2017. U.S. Navy 2019)

Based on the expected sound pressure levels (Table 4) and effect thresholds for consultation species, elevated noise levels would have insignificant or discountable effects on consultation species. No physical injury to sea turtles would be expected. Sound pressures levels from sonic booms are below the PTS and TTS thresholds for these species. Sea turtles near Illeginni Islet may be exposed to very brief sounds above the behavioral disturbance threshold. However, the short duration sounds produced as a result of the Proposed Action would at most cause temporary behavioral disturbance such as changes in direction, speed, feeding, or socializing, that would have no measurable effect on individual fitness. Animals would be expected to return to normal behaviors within moments of exposure to FT-3 noise and the noise is expected to have insignificant effects on UES-listed species in the Action Area.

Table 4. Proposed FT-3 Action Stressors.

Stressor	Activities at Kwajalein Atoll
Elevated Sound Pressure Levels	
Sonic Booms	Maximum sound pressure less than 149 dB in-air. Duration 0.075 second for loudest sounds and 0.27 second for sounds below 140 dB.
Payload Impact	Estimated maximum of 140 dB in-air at 18 m (59 ft) from impact.
Direct Contact and Shock Waves	
Cratering	Target area on land on the non-forested Western end of Illeginni Islet. Shoreline impact not planned or expected. Cratering estimated to be 6 to 9 m (20 to 30 ft) in diameter and 2.1 to 4.5 m (7 to 15 ft) deep.
Payload Ejecta/Debris	Ejecta estimated to extend 60 to 91 m (200 to 300 ft) from the impact location. Based on modeling, less than 1 percent of debris that might reach water's edge. Shoreline impact not planned or expected.
Shock Waves	Propagation of shock waves up to 37.5 m (123 ft) from the point of impact if on the shoreline. Shoreline impact not planned or expected.
Exposure to Hazardous Materials	
	Potential introduction of payload materials into terrestrial and marine environments. All visible test debris would be cleaned up where possible. Introduction of up to 45 kg (100 lb) of tungsten into terrestrial habitats. Potential for accidental spills or leaks from support equipment. Avoidance measures would be implemented.
Human Activity and Equipment Operation	
Human Activity	Increased human activity on Illeginni Islet for up to 3 months.
Equipment Operation	Several helicopter trips for personnel and equipment transport. Heavy equipment such as a backhoe or loader for equipment placement and post-test cleanup.

Exposure to Direct Contact or Shock Waves. The Proposed Action would result in impact of the payload on land at Illeginni Islet. These falling components would directly impact terrestrial habitats and have the potential to directly contact consultation organisms. Payload impact on land may also result in ejecta and shock waves radiating out from the point of impact.

No UES-consultation species would be at risk from crater formation. However, the potential exists for species in shoreline and nearshore habitats to be at risk from debris being ejected from the crater and by shock waves radiating out from the point of impact. While sea turtles hauled out or nesting on land and sea turtle nests have the potential to be adversely affected if struck by a piece of debris ejected during crater formation, no sea turtle nesting activity has been recorded on Illeginni Islet in over 20 years. Therefore, it is considered extremely unlikely that sea turtles would be in terrestrial habitats on Illeginni Islet and it is discountable that sea turtles would be adversely affected by direct contact or shock waves. As an additional avoidance measure, Illeginni Islet would be surveyed for sea turtle nesting and haul-out activity prior to the flight test as described in “*Avoidance and Mitigation Measures*.”

Exposure to Hazardous Materials. For all species considered in this evaluation, exposure to hazardous materials as a result of the Proposed Action would have insignificant effects. Sources of hazardous material are listed in Table 4.

Several avoidance and minimization measures would be in place as part of the Proposed Action to minimize the potential for hazardous material to affect protected resources (see *Avoidance and Mitigation Measures* section). It is possible that a very small amount of tungsten and other materials in the payload may remain in soils at Illeginni Islet despite cleanup efforts. The amount of tungsten on FT-3 is relatively small (approximately 10 percent) compared to the amount on FE-2. Soil and groundwater monitoring have been conducted at Illeginni Islet after previous tests (U.S. Navy 2019) and additional soil and ground water testing was conducted after the FE-2 test (RGNext 2019). Tungsten was detected in most of the groundwater samples collected from Illeginni Islet wells in 2019 and tungsten samples in several of the samples exceed the U.S. Environmental Protection Agency residential tap water screening levels (RGNext 2019). Tungsten was also detected in the soil at Illeginni Islet in 2019 but at levels below the limits of quantification for the study (RGNext 2019). Soil testing conducted before the FE-2 test indicated that soil tungsten concentrations were below the U.S. Environmental Protection Agency’s screening levels for soils in residential and industrial areas (U.S. Navy 2019). The potential effects of tungsten remaining in the soils at Illeginni Islet are largely unknown at this time but a description of the potential effects of deposition of tungsten is included in the FE-2 BA (U.S. Navy 2019). The FE-2 BA concluded that potentially hazardous materials, including residual tungsten, from FE-2 testing would have insignificant effects on UES-listed species on Illeginni Islet, and since the FT-3 test would have a fraction of tungsten, the effects would be insignificant as well.

Considering the small quantities of hazardous materials contained in the payload, the planned land impact, the planned cleanup of man-made materials, and the fact that no sea turtle nesting activity has been recorded on Illeginni Islet in over 20 years, it is considered discountable that materials released during test activities would be present in sufficient quantities or concentrations to adversely affect sea turtles.

Human Activity and Equipment Operation. Most of the human activities and equipment operation related to the Proposed Action would take place in terrestrial environments at Illeginni Islet. While hauled out or nesting sea turtles have the potential to be affected by human activity and equipment operations, no sea turtle nesting activity or nests have been observed on Illeginni in over 20 years. Several mitigation measures would be in place as part of the Proposed Action to minimize the chance of affecting sea turtles, including sea turtle nest and activity searches of suitable habitat at Illeginni Islet leading up to the test. Therefore, it is considered discountable that any sea turtles in terrestrial habitat or sea turtle nests would be exposed to human activity and equipment operation.

Conclusions

Based on the above analysis and the conclusion that all effects of the Proposed Action would be insignificant and/or discountable, the U.S. Army has determined that the Proposed FT-3 Action may affect but is not likely to adversely affect hauled out or nesting green or hawksbill turtles which are listed as consultation species under the UES. We request your concurrence with these determinations.

We are also providing copies of this letter to Ms. Moriana Phillip, Republic of the Marshall Islands Environmental Protection Authority–Majuro; Kanalei Shun, U.S. Army Corps of Engineers; Mr. John McCarroll, U.S. Environmental Protection Agency; Mr. Douglass Cooper, Anchorage Fish and Wildlife Field Office; and Dr. Steve Kolinski, National Marine Fisheries Service, Pacific Islands Regional Office.

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: 2020.09.23 10:34:50 -05'00'

Weldon H. Hill, Jr.
Deputy Chief of Staff for Engineering
U.S. Army Space and Missile Defense Command

Literature Cited

Kabua, E. N., and F. Edwards. 2010. Republic of the Marshall Islands (RMI) Marine Turtle Legislation Review. SPREP Report, October 2010.

Maison, K. A., I. K. Kelly, and K. P. Frutchey. 2010. Green Turtle Nesting Sites and Sea Turtle Legislation throughout Oceania. NOAA Technical Memo NMFS-F/SPO-110. September 2010.

MDA (Missile Defense Agency). 2007. Flexible Target Family Environmental Assessment. October 2007.

_____. 2019a. Mechanical Engineering SMDC TIM4. July 2019.

_____. 2019b. Program Requirements Document Flight Test Other – 43 (FTX-43) Pacific Spaceport Complex-Alaska. November 2019.

Meylan, A. B. 1988. Spongivory in hawksbill turtles: A diet of glass. Science 239(4838):393-395.

NMFS and USFWS (National Marine Fisheries Service and US Fish and Wildlife Service). 1998. Recovery Plan for US Pacific Populations of the Hawksbill Turtle (*Eretmochelys imbricata*). Silver Spring, Maryland (p. 83).

_____. 2007. Green Sea Turtle (*Chelonia mydas*) 5-Year Review: Summary and Evaluation. Silver Spring, Maryland (p. 102).

_____. 2013. Hawksbill Sea Turtle (*Eretmochelys imbricata*) 5-Year Review: Summary and Evaluation. Silver Springs Maryland (92 pp).

_____. 2016. Endangered and Threatened Wildlife and Plants; Final Rule to List Eleven Distinct Population Segments of the Green Sea Turtle (*Chelonia mydas*) as Endangered or Threatened and Revision of Current Listings Under the Endangered Species Act. 81 FR 20058. 6 April 2016.

RGNext. 2020. Illeginni Environmental & Biological Activity Survey & Sampling Report, FE-2 Pre & Post Test Activity. Prepared for United States Air Force. 29 July 2020.

Seminoff, J. A., C. D. Allen, G. H. Balazs, P. H. Dutton, T. Eguchi, H. L. Haas, S. A. Hargrove, M. Jensen, D. L. Klemm, A. M. Lauritsen, S. L. MacPherson, P. Opay, E. E. Possardt, S. Pultz, E. Seney, K. S. Van Houtan, and R. S. Waples. 2015. Status review of the green turtle (*Chelonia mydas*) under the Endangered Species Act. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Southwest Fisheries Science Center.

U.S. Army (United States Army). 2020. Draft Environmental Assessment/Overseas Environmental Assessment for Hypersonic Flight Test 3 (FT-3). September 2020.

U.S. Navy (United States Department of the Navy). 2017. Criteria and Thresholds for U.S. Navy Acoustic and Explosive Effects Analysis (Phase III). Technical Report. June 2017.

_____. 2019. Final Biological Assessment for Flight Experiment-2. June 2019.

USASMDC/ARSTRAT (United States Army Space and Missile Defense Command/Army Strategic Forces Command). 2014. Advanced Hypersonic Weapon Flight Test 2, Hypersonic Technology Test Environmental Assessment. July 2014.

_____. 2018. Environmental Standards and Procedures for United States Army Kwajalein Atoll Activities in the Republic of the Marshall Islands. Fifteenth Edition. September 2018.

USFWS and NMFS (US Fish and Wildlife Service and National Marine Fisheries Service). 2012. Final 2010 Inventory Report Endangered Species and Other Wildlife Resources Ronald Reagan Ballistic Missile Defense Test Site US Army Kwajalein Atoll, Republic of the Marshall Islands.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawai'i 96850

October 13, 2020

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

Subject: U. S. Fish and Wildlife Service comments on the Coordinating Draft Environmental Assessment / Overseas Environmental Assessment (EA/OEA) for Hypersonic Flight Test 3 (FT-3)

Dear Mr. Fuller:

The U.S. Fish and Wildlife Service (Service) is in receipt of the request from U.S. Army Space and Missile Defense Command (SMDC) for review and comment on the Coordinating Draft Environmental Assessment / Overseas Environmental Assessment (EA/OEA) for the Hypersonic Flight Test 3 (FT-3) dated 22 September 2020. The Service appreciates the opportunity to review this document, and commends SMDC for the protections to be given to black-naped terns and sea turtles, as explained in Sections 2.5.4.1, 4.3.1.2 and Table 4-7. Our remaining comments and concerns, provided below, center primarily around the potential for heavy metal contamination of ground water and air at the impact site.

Groundwater Quality. Section 3.3.4. This section provides summary results of expected and measured ground water tungsten concentrations following the FE-1 and FE-2 tests. The tungsten concentration of 0.65 mg/l significantly exceeds the EPA Residential Regional Screening Level (RSL) level for potable water of 0.016 mg/L. Modelling done by Lawrence Livermore National Laboratories additionally predicted tungsten concentrations to reach 25 mg/l. "Based on the original model dimensions, 2.5 m/yr rainfall precipitation rate, and an equilibrium tungsten concentration of 25 mg/L, all tungsten would be predicted to migrate away from the original location within a year" (LLNL, 2018).

The Service is concerned with possible unknown toxicity effects on adjacent reef organisms including coral and coral larvae, which would be subjected to elevated levels of tungsten migrating into the lagoon and ocean adjacent to the impact sites of the FE-1, FE-2, and proposed FT-3 tests. Although the reported amount of tungsten in the FT-3 payload will not exceed 45 kg, the additional tungsten in groundwater may pose a hazard for reef invertebrates. The NPA for FE-2 explains in Section 4.3 that water sampling wells have been installed on Illeginni Islet and will be sampled every 3 to 6 months for metals to include tungsten. The Service is requesting continuation of these monitoring tests, and requests results of these groundwater samples to assist in our ongoing toxicity testing with species of corals and coral larvae that could be impacted by groundwater migration into the lagoon or ocean adjacent to the test impact site. The Service request the inclusion of a discussion of this in Section 3.3.4

In addition to tungsten in the payload vehicle, tantalum is included in the list of metals, although the quantity is not given. Tantalum has a lower melting point (3017^{o} C) compared to tungsten (3400^{o} C) and could be expected to vaporize and enter the air and groundwater as well. The Service requests adding tantalum to the list of metals to be analyzed in groundwater. Additionally, tantalum vapor in the air exceeding 2.5 g/m^3 is classified as immediately dangerous to life and health (CDC-NIOSH 2015). Because tantalum is listed as a Toxic Substances Control Act (TSCA) chemical, OSHA has a permissible exposure limit (PEL) of 5 mg/m^3. A safety precaution should be included in Section 2.5.6.1 under hazardous materials to protect the initial UXO personnel entering the site after impact if winds are calm. The Service recommends that a similar precautionary statement could be included in Section 3.3.3 Public Health and Safety or Section 3.3.4 Hazardous Materials if the expected concentrations of tantalum vaporized in air would exceed these limits. The Service could find no information on tantalum exposure to wildlife.

The coral toxicity testing being conducted by the University of Hawaii includes only a subset of the marine species listed in the UES Consultation and Coordination Tables in Appendices 3-4A and 3-4C. The marine resources covered under the coordination procedures include all corals (black coral, stony corals, organ-pipe corals, fire corals, and lace corals) as well as the giant clam (*Tridacna maxima*), certain conchs (*Lambis lambis, Lambis scorpius, and Lambis truncata*), certain fish (*Plectropomus laevis* and *Epinephelus lanoceolatus*), the coconut crab (*Birgus latro*), and sea grass (*Halophila gaudichaudii*). There is a high likelihood some of these species will be present within the vicinity of Illeginni and could be impacted, although no data exist evaluating the toxicity of tungsten or tantalum to these marine organisms.

Finally, because the Service is responsible for the protection of sea turtles on land and sea turtle nests. All preflight monitoring reports of sea turtles on land or sea turtle nests should be reported to the Service.

We appreciate the opportunity to provide comments as well as concurrence on this Final DEP and NPA. If you have questions regarding our comments, please contact our Aquatic Ecosystem and Environmental Contaminants Program Manager, Dan Polhemus (dan_polhemus@fws.gov or 808-792-9400). For specific comments regarding coral toxicity testing, please contact

Environmental Toxicologist Michael Fry (michael_fry@fws.gov or 808-792-9461). For specific comments regarding marine resources, please contact marine biologist Jeremy Raynal (jeremy_raynal@fws.gov).

Sincerely,

DAN POLHEMUS

Digitally signed by DAN POLHEMUS
Date: 2020.10.13 09:45:36 -10'00'

Dan Polhemus

Aquatic Ecosystem and Environmental Contaminants Program Manager

Reference:

CDC_NIOSH 2015. Pocket Guide to Chemical Hazards, https://www.cdc.gov/niosh/npg/

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF
Environmental Division

18 December 2020

From: Weldon H. Hill, Jr., Deputy Chief of Staff for Engineering, USASMDC

To: Alaska Department of Fish and Game, Division of Habitat, Central Region Office (Attn: Mr. Ron Benkert, Regional Supervisor)

Subj: HYPERSONIC FLIGHT TEST-3 DRAFT ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT—REQUEST REVIEW

Encl: Flight Test-3 Draft Environmental Assessment/Overseas Environmental Assessment

The U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) and U.S. Army Space and Missile Defense Command (USASMDC) have prepared an Environmental Assessment / Overseas Environmental Assessment (EA/OEA) to evaluate potential environmental impacts from the proposed testing of the Hypersonic Flight Test-3 (FT-3). The EA/OEA has been prepared in accordance with the National Environmental Policy Act (NEPA), as implemented by the Council on Environmental Quality (CEQ) Regulations and U.S. Army regulations for implementing NEPA.

The Proposed Action consists of one flight test launched from the Pacific Spaceport Complex Alaska (PSCA) to Kwajalein Atoll, Republic of the Marshall Islands (RMI) during FY 2021 after the Finding of No Significant Impact / Finding of No Significant Harm (FONSI/FONSH) is signed, if approved. The purpose of the Proposed Action is to test a long-range weapon system and demonstrate a reduction of risk for longer-range payload systems.

A Notice of Availability of the Draft EA/OEA and Draft FONSI will be published in the local newspapers in Kodiak, Anchorage, Kwajalein and the Republic of the Marshall Islands on or before December 18, 2020. The Draft EA/OEA and Draft FONSI/FONSH are available at https://ft3eaoea.govsupport.us and in the following locations: 1) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Majuro, Marshall Islands; 2) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Ebeye, Marshall Islands; 3) Grace Sherwood Library, Kwajalein, Marshall Islands; 4) Roi-Namur Library, Roi-Namur, Marshall Islands; 5) Kodiak Public Library, Kodiak, AK; 6) Z. J. Loussac Public Library, Anchorage, AK.

Public comments on the Draft EA/OEA and Draft FONSI/FONSH will be accepted from December 18, 2020 to January 20, 2021 and can be provided in either of the following ways: (1) E-mail comments by January 20, 2021 to ft-3-eaoea-comments@govsupport.us; (2) Mail comments, postmarked no later than January 20, 2021, to: USASMDC, ATTN: SMDC-EN (D. Fuller), P.O. Box 1500, Huntsville, AL 35807.

If you have questions regarding this information, please contact Mr. David Fuller Environmental Protection Specialist, USASMDC, Environmental Division, at (256) 425-2016.

Sincerely,

HILL.WELDON.H.JR.1216862682 Digitally signed by HILL.WELDON.H.JR.1216862682 Date: 2020.12.21 08:37:59 -06'00'

WELDON H. HILL, JR.
Deputy Chief of Staff for Engineering
U.S. Army Space and Missile Defense Command

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF
Environmental Division

18 December 2020

From: Weldon H. Hill, Jr., Deputy Chief of Staff for Engineering, USASMDC

To: Alaska State Historic Preservation Office/Office of History and Archaeology (Attn: Ms. Sarah Meitl, Review and Compliance Coordinator)

Subj: HYPERSONIC FLIGHT TEST-3 DRAFT ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT—REQUEST REVIEW

Encl: Flight Test-3 Draft Environmental Assessment/Overseas Environmental Assessment

The U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) and U.S. Army Space and Missile Defense Command (USASMDC) have prepared an Environmental Assessment / Overseas Environmental Assessment (EA/OEA) to evaluate potential environmental impacts from the proposed testing of the Hypersonic Flight Test-3 (FT-3). The EA/OEA has been prepared in accordance with the National Environmental Policy Act (NEPA), as implemented by the Council on Environmental Quality (CEQ) Regulations and U.S. Army regulations for implementing NEPA.

The Proposed Action consists of one flight test launched from the Pacific Spaceport Complex Alaska (PSCA) to Kwajalein Atoll, Republic of the Marshall Islands (RMI) during FY 2021 after the Finding of No Significant Impact / Finding of No Significant Harm (FONSI/FONSH) is signed, if approved. The purpose of the Proposed Action is to test a long-range weapon system and demonstrate a reduction of risk for longer-range payload systems.

A Notice of Availability of the Draft EA/OEA and Draft FONSI will be published in the local newspapers in Kodiak, Anchorage, Kwajalein and the Republic of the Marshall Islands on or before December 18, 2020. The Draft EA/OEA and Draft FONSI/FONSH are available at https://ft3eaoea.govsupport.us and in the following locations: 1) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Majuro, Marshall Islands; 2) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Ebeye, Marshall Islands; 3) Grace Sherwood Library, Kwajalein, Marshall Islands; 4) Roi-Namur Library, Roi-Namur, Marshall Islands; 5) Kodiak Public Library, Kodiak, AK; 6) Z. J. Loussac Public Library, Anchorage, AK.

Public comments on the Draft EA/OEA and Draft FONSI/FONSH will be accepted from December 18, 2020 to January 20, 2021 and can be provided in either of the following ways: (1) E-mail comments by January 20, 2021 to ft-3-eaoea-comments@govsupport.us; (2) Mail comments, postmarked no later than January 20,

2021, to: USASMDC, ATTN: SMDC-EN (D. Fuller), P.O. Box 1500, Huntsville, AL 35807.

If you have questions regarding this information, please contact Mr. David Fuller Environmental Protection Specialist, USASMDC, Environmental Division, at (256) 425-2016.

Sincerely,

HILL.WELDON.H.JR.1216862682 Digitally signed by HILL.WELDON.H.JR.1216862682 Date: 2020.12.21 08:39:29 -06'00'

WELDON H. HILL, JR.
Deputy Chief of Staff for Engineering
U.S. Army Space and Missile Defense Command

Enclosure

From: Fuller, David G CIV USARMY SMDC (USA)
To: Hannah McCarty
Subject: Fwd: [Non-DoD Source] RE: HYPERSONIC FLIGHT TEST-3 DRAFT ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT—REQUEST REVIEW
Date: Monday, December 21, 2020 7:59:55 PM

From: "Meitl, Sarah J (DNR)" <sarah.meitl@alaska.gov>
Date: Monday, December 21, 2020 at 7:25:08 PM
To: "Fuller, David G CIV USARMY SMDC (USA)" <david.g.fuller6.civ@mail.mil>
Cc: "Meitl, Sarah J (DNR)" <sarah.meitl@alaska.gov>
Subject: [Non-DoD Source] RE: HYPERSONIC FLIGHT TEST-3 DRAFT ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT—REQUEST REVIEW

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.

Good afternoon,

Our office received the request for comments and it has been logged in with me under 2020-01125. Our office is in tolling in response to COVID-19, but I will endeavor to provide a timely response.

Best,
Sarah

Sarah Meitl
Review and Compliance Coordinator
Alaska State Historic Preservation Office
Office of History and Archaeology

550 West 7th Avenue, Suite 1310
Anchorage, AK 99501-3561
Office: 907-269-8720
sarah.meitl@alaska.gov < Caution-mailto:sarah.meitl@alaska.gov >
Teleworking - Email is the best method of communication.

From: Fuller, David G CIV USARMY SMDC (USA) <david.g.fuller6.civ@mail.mil>
Sent: Monday, December 21, 2020 9:48 AM
To: Meitl, Sarah J (DNR) <sarah.meitl@alaska.gov>

Subject: HYPERSONIC FLIGHT TEST-3 DRAFT ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT—REQUEST REVIEW

Ms Meitl,

The U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) and U.S. Army Space and Missile Defense Command (USASMDC) have prepared an Environmental Assessment / Overseas Environmental Assessment (EA/OEA) to evaluate potential environmental impacts from the proposed testing of the Hypersonic Flight Test-3 (FT-3).

Please provide comments by 20 January 2021.

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
Environmental Division

18 December 2020

From: Weldon H. Hill, Jr., Deputy Chief of Staff for Engineering, USASMDC

To: Alaska Department of Transportation & Public Facilities, Statewide Design & Engineering Services, Environmental Section (Attn: Mr. Doug Kolwaite, Statewide Environmental Program Manager)

Subj: HYPERSONIC FLIGHT TEST-3 DRAFT ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT—REQUEST REVIEW

Encl: Flight Test-3 Draft Environmental Assessment/Overseas Environmental Assessment

The U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) and U.S. Army Space and Missile Defense Command (USASMDC) have prepared an Environmental Assessment / Overseas Environmental Assessment (EA/OEA) to evaluate potential environmental impacts from the proposed testing of the Hypersonic Flight Test-3 (FT-3). The EA/OEA has been prepared in accordance with the National Environmental Policy Act (NEPA), as implemented by the Council on Environmental Quality (CEQ) Regulations and U.S. Army regulations for implementing NEPA.

The Proposed Action consists of one flight test launched from the Pacific Spaceport Complex Alaska (PSCA) to Kwajalein Atoll, Republic of the Marshall Islands (RMI) during FY 2021 after the Finding of No Significant Impact / Finding of No Significant Harm (FONSI/FONSH) is signed, if approved. The purpose of the Proposed Action is to test a long-range weapon system and demonstrate a reduction of risk for longer-range payload systems.

A Notice of Availability of the Draft EA/OEA and Draft FONSI will be published in the local newspapers in Kodiak, Anchorage, Kwajalein and the Republic of the Marshall Islands on or before December 18, 2020. The Draft EA/OEA and Draft FONSI/FONSH are available at https://ft3eaoea.govsupport.us and in the following locations: 1) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Majuro, Marshall Islands; 2) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Ebeye, Marshall Islands; 3) Grace Sherwood Library, Kwajalein, Marshall Islands; 4) Roi-Namur Library, Roi-Namur, Marshall Islands; 5) Kodiak Public Library, Kodiak, AK; 6) Z. J. Loussac Public Library, Anchorage, AK.

Public comments on the Draft EA/OEA and Draft FONSI/FONSH will be accepted from December 18, 2020 to January 20, 2021 and can be provided in either of the following ways: (1) E-mail comments by January 20, 2021 to ft-3-eaoea-comments@govsupport.us; (2) Mail comments, postmarked no later than January 20,

2021, to: USASMDC, ATTN: SMDC-EN (D. Fuller), P.O. Box 1500, Huntsville, AL 35807.

If you have questions regarding this information, please contact Mr. David Fuller Environmental Protection Specialist, USASMDC, Environmental Division, at (256) 425-2016.

Sincerely,

HILL.WELDON.H.JR.1216862682 Digitally signed by HILL.WELDON.H.JR.1216862682 Date: 2020.12.21 08:42:16 -06'00'

WELDON H. HILL, JR.
Deputy Chief of Staff for Engineering
U.S. Army Space and Missile Defense
Command

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF
Environmental Division

18 December 2020

From: Weldon H. Hill, Jr., Deputy Chief of Staff for Engineering, USASMDC

To: Environmental Protection Agency, Region 10, Office of Environmental Review and Assessment (Attn: Mr. Andrew Baca, Division Director for the NEPA Program)

Subj: HYPERSONIC FLIGHT TEST-3 DRAFT ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT—REQUEST REVIEW

Encl: Flight Test-3 Draft Environmental Assessment/Overseas Environmental Assessment

The U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) and U.S. Army Space and Missile Defense Command (USASMDC) have prepared an Environmental Assessment / Overseas Environmental Assessment (EA/OEA) to evaluate potential environmental impacts from the proposed testing of the Hypersonic Flight Test-3 (FT-3). The EA/OEA has been prepared in accordance with the National Environmental Policy Act (NEPA), as implemented by the Council on Environmental Quality (CEQ) Regulations and U.S. Army regulations for implementing NEPA.

The Proposed Action consists of one flight test launched from the Pacific Spaceport Complex Alaska (PSCA) to Kwajalein Atoll, Republic of the Marshall Islands (RMI) during FY 2021 after the Finding of No Significant Impact / Finding of No Significant Harm (FONSI/FONSH) is signed, if approved. The purpose of the Proposed Action is to test a long-range weapon system and demonstrate a reduction of risk for longer-range payload systems.

A Notice of Availability of the Draft EA/OEA and Draft FONSI will be published in the local newspapers in Kodiak, Anchorage, Kwajalein and the Republic of the Marshall Islands on or before December 18, 2020. The Draft EA/OEA and Draft FONSI/FONSH are available at https://ft3eaoea.govsupport.us and in the following locations: 1) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Majuro, Marshall Islands; 2) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Ebeye, Marshall Islands; 3) Grace Sherwood Library, Kwajalein, Marshall Islands; 4) Roi-Namur Library, Roi-Namur, Marshall Islands; 5) Kodiak Public Library, Kodiak, AK; 6) Z. J. Loussac Public Library, Anchorage, AK.

Public comments on the Draft EA/OEA and Draft FONSI/FONSH will be accepted from December 18, 2020 to January 20, 2021 and can be provided in either of the following ways: (1) E-mail comments by January 20, 2021 to ft-3-eaoea-comments@govsupport.us; (2) Mail comments, postmarked no later than January 20,

2021, to: USASMDC, ATTN: SMDC-EN (D. Fuller), P.O. Box 1500, Huntsville, AL 35807.

If you have questions regarding this information, please contact Mr. David Fuller Environmental Protection Specialist, USASMDC, Environmental Division, at (256) 425-2016.

Sincerely,

HILL.WELDON.H.JR.1216862682 Digitally signed by HILL.WELDON.H.JR.1216862682
Date: 2020.12.21 09:05:18 -06'00'

WELDON H. HILL, JR.
Deputy Chief of Staff for Engineering
U.S. Army Space and Missile Defense Command

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF
Environmental Division

18 December 2020

From: Weldon H. Hill, Jr., Deputy Chief of Staff for Engineering, USASMDC

To: Environmental Protection Agency, Region 10, Office of Environmental Review and Assessment (Attn: Mr. Theogene Mbabaliye, Senior Staff for the NEPA Program)

Subj: HYPERSONIC FLIGHT TEST-3 DRAFT ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT—REQUEST REVIEW

Encl: Flight Test-3 Draft Environmental Assessment/Overseas Environmental Assessment

The U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) and U.S. Army Space and Missile Defense Command (USASMDC) have prepared an Environmental Assessment / Overseas Environmental Assessment (EA/OEA) to evaluate potential environmental impacts from the proposed testing of the Hypersonic Flight Test-3 (FT-3). The EA/OEA has been prepared in accordance with the National Environmental Policy Act (NEPA), as implemented by the Council on Environmental Quality (CEQ) Regulations and U.S. Army regulations for implementing NEPA.

The Proposed Action consists of one flight test launched from the Pacific Spaceport Complex Alaska (PSCA) to Kwajalein Atoll, Republic of the Marshall Islands (RMI) during FY 2021 after the Finding of No Significant Impact / Finding of No Significant Harm (FONSI/FONSH) is signed, if approved. The purpose of the Proposed Action is to test a long-range weapon system and demonstrate a reduction of risk for longer-range payload systems.

A Notice of Availability of the Draft EA/OEA and Draft FONSI will be published in the local newspapers in Kodiak, Anchorage, Kwajalein and the Republic of the Marshall Islands on or before December 18, 2020. The Draft EA/OEA and Draft FONSI/FONSH are available at https://ft3eaoea.govsupport.us and in the following locations: 1) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Majuro, Marshall Islands; 2) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Ebeye, Marshall Islands; 3) Grace Sherwood Library, Kwajalein, Marshall Islands; 4) Roi-Namur Library, Roi-Namur, Marshall Islands; 5) Kodiak Public Library, Kodiak, AK; 6) Z. J. Loussac Public Library, Anchorage, AK.

Public comments on the Draft EA/OEA and Draft FONSI/FONSH will be accepted from December 18, 2020 to January 20, 2021 and can be provided in either of the following ways: (1) E-mail comments by January 20, 2021 to ft-3-eaoea-comments@govsupport.us; (2) Mail comments, postmarked no later than January 20,

2021, to: USASMDC, ATTN: SMDC-EN (D. Fuller), P.O. Box 1500, Huntsville, AL 35807.

If you have questions regarding this information, please contact Mr. David Fuller Environmental Protection Specialist, USASMDC, Environmental Division, at (256) 425-2016.

Sincerely,

HILL.WELDON.H.JR.1216862682 Digitally signed by HILL.WELDON.H.JR.1216862682 Date: 2020.12.21 09:06:43 -06'00'

WELDON H. HILL, JR.
Deputy Chief of Staff for Engineering
U.S. Army Space and Missile Defense Command

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF
Environmental Division

18 December 2020

From: Weldon H. Hill, Jr., Deputy Chief of Staff for Engineering, USASMDC

To: Environmental Protection Agency, Region 9, Pacific Island Office
(Attn: Mr. John McCarroll)

Subj: HYPERSONIC FLIGHT TEST-3 DRAFT ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT—REQUEST REVIEW

Encl: Flight Test-3 Draft Environmental Assessment/Overseas Environmental Assessment

The U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) and U.S. Army Space and Missile Defense Command (USASMDC) have prepared an Environmental Assessment / Overseas Environmental Assessment (EA/OEA) to evaluate potential environmental impacts from the proposed testing of the Hypersonic Flight Test-3 (FT-3). The EA/OEA has been prepared in accordance with the National Environmental Policy Act (NEPA), as implemented by the Council on Environmental Quality (CEQ) Regulations and U.S. Army regulations for implementing NEPA.

The Proposed Action consists of one flight test launched from the Pacific Spaceport Complex Alaska (PSCA) to Kwajalein Atoll, Republic of the Marshall Islands (RMI) during FY 2021 after the Finding of No Significant Impact / Finding of No Significant Harm (FONSI/FONSH) is signed, if approved. The purpose of the Proposed Action is to test a long-range weapon system and demonstrate a reduction of risk for longer-range payload systems.

A Notice of Availability of the Draft EA/OEA and Draft FONSI will be published in the local newspapers in Kodiak, Anchorage, Kwajalein and the Republic of the Marshall Islands on or before December 18, 2020. The Draft EA/OEA and Draft FONSI/FONSH are available at https://ft3eaoea.govsupport.us and in the following locations: 1) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Majuro, Marshall Islands; 2) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Ebeye, Marshall Islands; 3) Grace Sherwood Library, Kwajalein, Marshall Islands; 4) Roi-Namur Library, Roi-Namur, Marshall Islands; 5) Kodiak Public Library, Kodiak, AK; 6) Z. J. Loussac Public Library, Anchorage, AK.

Public comments on the Draft EA/OEA and Draft FONSI/FONSH will be accepted from December 18, 2020 to January 20, 2021 and can be provided in either of the following ways: (1) E-mail comments by January 20, 2021 to ft-3-eaoea-comments@govsupport.us; (2) Mail comments, postmarked no later than January 20, 2021, to: USASMDC, ATTN: SMDC-EN (D. Fuller), P.O. Box 1500, Huntsville, AL 35807.

I am also providing a transmittal letter, the Draft EA/OEA, Draft FONSI/FONSH, and Blank Comment Matrix for comment to: Dr. Dan Polhemus, United States Fish and Wildlife Service; Dr. Steven Kolinski, National Marine and Fisheries Service; Ms. Moriana Phillip and Mr. Nious Juniuos, Republic of the Marshall Islands Environmental Protection Authority; Mr. Derek Miller, United States Army Garrison—Kwajalein Atoll; and Mr. Kanalei Shun, United States Army Corps of Engineers.

If you have questions regarding this information, please contact Mr. David Fuller Environmental Protection Specialist, USASMDC, Environmental Division, at (256) 425-2016.

Sincerely,

HILL.WELDON.H.JR.1216862682 Digitally signed by HILL.WELDON.H.JR.1216862682 Date: 2020.12.21 09:09:11 -06'00'

WELDON H. HILL, JR.
Deputy Chief of Staff for Engineering
U.S. Army Space and Missile Defense Command

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF
Environmental Division

18 December 2020

From: Weldon H. Hill, Jr., Deputy Chief of Staff for Engineering, USASMDC

To: Federal Aviation Administration, Office of Commercial Space Transportation, AST-100 (Attn: Ms. Leslie Grey, Environmental Protection Specialist)

Subj: HYPERSONIC FLIGHT TEST-3 DRAFT ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT—REQUEST REVIEW

Encl: Flight Test-3 Draft Environmental Assessment/Overseas Environmental Assessment

The U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) and U.S. Army Space and Missile Defense Command (USASMDC) have prepared an Environmental Assessment / Overseas Environmental Assessment (EA/OEA) to evaluate potential environmental impacts from the proposed testing of the Hypersonic Flight Test-3 (FT-3). The EA/OEA has been prepared in accordance with the National Environmental Policy Act (NEPA), as implemented by the Council on Environmental Quality (CEQ) Regulations and U.S. Army regulations for implementing NEPA.

The Proposed Action consists of one flight test launched from the Pacific Spaceport Complex Alaska (PSCA) to Kwajalein Atoll, Republic of the Marshall Islands (RMI) during FY 2021 after the Finding of No Significant Impact / Finding of No Significant Harm (FONSI/FONSH) is signed, if approved. The purpose of the Proposed Action is to test a long-range weapon system and demonstrate a reduction of risk for longer-range payload systems.

A Notice of Availability of the Draft EA/OEA and Draft FONSI will be published in the local newspapers in Kodiak, Anchorage, Kwajalein and the Republic of the Marshall Islands on or before December 18, 2020. The Draft EA/OEA and Draft FONSI/FONSH are available at https://ft3eaoea.govsupport.us and in the following locations: 1) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Majuro, Marshall Islands; 2) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Ebeye, Marshall Islands; 3) Grace Sherwood Library, Kwajalein, Marshall Islands; 4) Roi-Namur Library, Roi-Namur, Marshall Islands; 5) Kodiak Public Library, Kodiak, AK; 6) Z. J. Loussac Public Library, Anchorage, AK.

Public comments on the Draft EA/OEA and Draft FONSI/FONSH will be accepted from December 18, 2020 to January 20, 2021 and can be provided in either of the following ways: (1) E-mail comments by January 20, 2021 to ft-3-eaoea-comments@govsupport.us; (2) Mail comments, postmarked no later than January 20,

2021, to: USASMDC, ATTN: SMDC-EN (D. Fuller), P.O. Box 1500, Huntsville, AL 35807.

If you have questions regarding this information, please contact Mr. David Fuller Environmental Protection Specialist, USASMDC, Environmental Division, at (256) 425-2016.

Sincerely,

HILL.WELDON.H.JR.1216862682 Digitally signed by HILL.WELDON.H.JR.1216862682
Date: 2020.12.21 09:13:16 -06'00'

WELDON H. HILL, JR.
Deputy Chief of Staff for Engineering
U.S. Army Space and Missile Defense
Command

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF
Environmental Division

18 December 2020

From: Weldon H. Hill, Jr., Deputy Chief of Staff for Engineering, USASMDC

To: Sun'aq Tribe of Kodiak (Attn: Mr. Thomas Lance, Natural Resources Director)

Subj: HYPERSONIC FLIGHT TEST-3 DRAFT ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT—REQUEST REVIEW

Encl: Flight Test-3 Draft Environmental Assessment/Overseas Environmental Assessment

The U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) and U.S. Army Space and Missile Defense Command (USASMDC) have prepared an Environmental Assessment / Overseas Environmental Assessment (EA/OEA) to evaluate potential environmental impacts from the proposed testing of the Hypersonic Flight Test-3 (FT-3). The EA/OEA has been prepared in accordance with the National Environmental Policy Act (NEPA), as implemented by the Council on Environmental Quality (CEQ) Regulations and U.S. Army regulations for implementing NEPA.

The Proposed Action consists of one flight test launched from the Pacific Spaceport Complex Alaska (PSCA) to Kwajalein Atoll, Republic of the Marshall Islands (RMI) during FY 2021 after the Finding of No Significant Impact / Finding of No Significant Harm (FONSI/FONSH) is signed, if approved. The purpose of the Proposed Action is to test a long-range weapon system and demonstrate a reduction of risk for longer-range payload systems.

A Notice of Availability of the Draft EA/OEA and Draft FONSI will be published in the local newspapers in Kodiak, Anchorage, Kwajalein and the Republic of the Marshall Islands on or before December 18, 2020. The Draft EA/OEA and Draft FONSI/FONSH are available at https://ft3eaoea.govsupport.us and in the following locations: 1) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Majuro, Marshall Islands; 2) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Ebeye, Marshall Islands; 3) Grace Sherwood Library, Kwajalein, Marshall Islands; 4) Roi-Namur Library, Roi-Namur, Marshall Islands; 5) Kodiak Public Library, Kodiak, AK; 6) Z. J. Loussac Public Library, Anchorage, AK.

Public comments on the Draft EA/OEA and Draft FONSI/FONSH will be accepted from December 18, 2020 to January 20, 2021 and can be provided in either of the following ways: (1) E-mail comments by January 20, 2021 to ft-3-eaoea-comments@govsupport.us; (2) Mail comments, postmarked no later than January 20, 2021, to: USASMDC, ATTN: SMDC-EN (D. Fuller), P.O. Box 1500, Huntsville, AL 35807.

If you have questions regarding this information, please contact Mr. David Fuller Environmental Protection Specialist, USASMDC, Environmental Division, at (256) 425-2016.

Sincerely,

HILL.WELDON.H.JR.1216862682 Digitally signed by HILL.WELDON.H.JR.1216862682
Date: 2020.12.21 09:14:46 -06'00'

WELDON H. HILL, JR.
Deputy Chief of Staff for Engineering
U.S. Army Space and Missile Defense Command

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF
Environmental Division

18 December 2020

From: Weldon H. Hill, Jr., Deputy Chief of Staff for Engineering, USASMDC

To: U.S. Fish and Wildlife Service, Anchorage Fish and Wildlife Field Office (Attn: Mr. Douglass M. Cooper, Branch Chief—Ecological Services)

Subj: HYPERSONIC FLIGHT TEST-3 DRAFT ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT—REQUEST REVIEW

Encl: Flight Test-3 Draft Environmental Assessment/Overseas Environmental Assessment

The U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) and U.S. Army Space and Missile Defense Command (USASMDC) have prepared an Environmental Assessment / Overseas Environmental Assessment (EA/OEA) to evaluate potential environmental impacts from the proposed testing of the Hypersonic Flight Test-3 (FT-3). The EA/OEA has been prepared in accordance with the National Environmental Policy Act (NEPA), as implemented by the Council on Environmental Quality (CEQ) Regulations and U.S. Army regulations for implementing NEPA.

The Proposed Action consists of one flight test launched from the Pacific Spaceport Complex Alaska (PSCA) to Kwajalein Atoll, Republic of the Marshall Islands (RMI) during FY 2021 after the Finding of No Significant Impact / Finding of No Significant Harm (FONSI/FONSH) is signed, if approved. The purpose of the Proposed Action is to test a long-range weapon system and demonstrate a reduction of risk for longer-range payload systems.

A Notice of Availability of the Draft EA/OEA and Draft FONSI will be published in the local newspapers in Kodiak, Anchorage, Kwajalein and the Republic of the Marshall Islands on or before December 18, 2020. The Draft EA/OEA and Draft FONSI/FONSH are available at https://ft3eaoea.govsupport.us and in the following locations: 1) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Majuro, Marshall Islands; 2) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Ebeye, Marshall Islands; 3) Grace Sherwood Library, Kwajalein, Marshall Islands; 4) Roi-Namur Library, Roi-Namur, Marshall Islands; 5) Kodiak Public Library, Kodiak, AK; 6) Z. J. Loussac Public Library, Anchorage, AK.

Public comments on the Draft EA/OEA and Draft FONSI/FONSH will be accepted from December 18, 2020 to January 20, 2021 and can be provided in either of the following ways: (1) E-mail comments by January 20, 2021 to ft-3-eaoea-comments@govsupport.us; (2) Mail comments, postmarked no later than January 20,

2021, to: USASMDC, ATTN: SMDC-EN (D. Fuller), P.O. Box 1500, Huntsville, AL 35807.

If you have questions regarding this information, please contact Mr. David Fuller Environmental Protection Specialist, USASMDC, Environmental Division, at (256) 425-2016.

Sincerely,

HILL.WELDON.H.JR.1216862682 Digitally signed by HILL.WELDON.H.JR.1216862682 Date: 2020.12.21 09:16:32 -06'00'

WELDON H. HILL, JR.
Deputy Chief of Staff for Engineering
U.S. Army Space and Missile Defense Command

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF
Environmental Division

18 December 2020

From: Weldon H. Hill, Jr., Deputy Chief of Staff for Engineering, USASMDC

To: U.S. Fish and Wildlife Service, Pacific Islands Fish & Wildlife Office (Attn: Dr. Dan Polhemus, Aquatic Ecosystem Conservation Program Coordinator)

Subj: HYPERSONIC FLIGHT TEST-3 DRAFT ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT—REQUEST REVIEW

Encl: Flight Test-3 Draft Environmental Assessment/Overseas Environmental Assessment

The U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) and U.S. Army Space and Missile Defense Command (USASMDC) have prepared an Environmental Assessment / Overseas Environmental Assessment (EA/OEA) to evaluate potential environmental impacts from the proposed testing of the Hypersonic Flight Test-3 (FT-3). The EA/OEA has been prepared in accordance with the National Environmental Policy Act (NEPA), as implemented by the Council on Environmental Quality (CEQ) Regulations and U.S. Army regulations for implementing NEPA.

The Proposed Action consists of one flight test launched from the Pacific Spaceport Complex Alaska (PSCA) to Kwajalein Atoll, Republic of the Marshall Islands (RMI) during FY 2021 after the Finding of No Significant Impact / Finding of No Significant Harm (FONSI/FONSH) is signed, if approved. The purpose of the Proposed Action is to test a long-range weapon system and demonstrate a reduction of risk for longer-range payload systems.

A Notice of Availability of the Draft EA/OEA and Draft FONSI will be published in the local newspapers in Kodiak, Anchorage, Kwajalein and the Republic of the Marshall Islands on or before December 18, 2020. The Draft EA/OEA and Draft FONSI/FONSH are available at https://ft3eaoea.govsupport.us and in the following locations: 1) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Majuro, Marshall Islands; 2) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Ebeye, Marshall Islands; 3) Grace Sherwood Library, Kwajalein, Marshall Islands; 4) Roi-Namur Library, Roi-Namur, Marshall Islands; 5) Kodiak Public Library, Kodiak, AK; 6) Z. J. Loussac Public Library, Anchorage, AK.

Public comments on the Draft EA/OEA and Draft FONSI/FONSH will be accepted from December 18, 2020 to January 20, 2021 and can be provided in either of the following ways: (1) E-mail comments by January 20, 2021 to ft-3-eaoea-comments@govsupport.us; (2) Mail comments, postmarked no later than January 20,

2021, to: USASMDC, ATTN: SMDC-EN (D. Fuller), P.O. Box 1500, Huntsville, AL 35807.

I am also providing a transmittal letter, the Draft EA/OEA, Draft FONSI/FONSH, and Blank Comment Matrix for comment to: Mr. John McCarroll, Environmental Protection Agency Region 9; Dr. Steven Kolinski, National Marine and Fisheries Service; Ms. Moriana Phillip and Mr. Nious Juniuos, Republic of the Marshall Islands Environmental Protection Authority; Mr. Derek Miller, United States Army Garrison—Kwajalein Atoll; and Mr. Kanalei Shun, United States Army Corps of Engineers.

If you have questions regarding this information, please contact Mr. David Fuller Environmental Protection Specialist, USASMDC, Environmental Division, at (256) 425-2016.

Sincerely,

HILL.WELDON.H.JR.1216862682 Digitally signed by HILL.WELDON.H.JR.1216862682
Date: 2020.12.21 09:17:51 -06'00'

WELDON H. HILL, JR.
Deputy Chief of Staff for Engineering
U.S. Army Space and Missile Defense Command

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF
Environmental Division

18 December 2020

From: Weldon H. Hill, Jr., Deputy Chief of Staff for Engineering, USASMDC

To: Old Harbor Native Corporation (Attn: Ms. Cynthia Berns, Vice President of Community and External Affairs)

Subj: HYPERSONIC FLIGHT TEST-3 DRAFT ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT—REQUEST REVIEW

Encl: Flight Test-3 Draft Environmental Assessment/Overseas Environmental Assessment

The U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) and U.S. Army Space and Missile Defense Command (USASMDC) have prepared an Environmental Assessment / Overseas Environmental Assessment (EA/OEA) to evaluate potential environmental impacts from the proposed testing of the Hypersonic Flight Test-3 (FT-3). The EA/OEA has been prepared in accordance with the National Environmental Policy Act (NEPA), as implemented by the Council on Environmental Quality (CEQ) Regulations and U.S. Army regulations for implementing NEPA.

The Proposed Action consists of one flight test launched from the Pacific Spaceport Complex Alaska (PSCA) to Kwajalein Atoll, Republic of the Marshall Islands (RMI) during FY 2021 after the Finding of No Significant Impact / Finding of No Significant Harm (FONSI/FONSH) is signed, if approved. The purpose of the Proposed Action is to test a long-range weapon system and demonstrate a reduction of risk for longer-range payload systems.

A Notice of Availability of the Draft EA/OEA and Draft FONSI will be published in the local newspapers in Kodiak, Anchorage, Kwajalein and the Republic of the Marshall Islands on or before December 18, 2020. The Draft EA/OEA and Draft FONSI/FONSH are available at https://ft3eaoea.govsupport.us and in the following locations: 1) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Majuro, Marshall Islands; 2) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Ebeye, Marshall Islands; 3) Grace Sherwood Library, Kwajalein, Marshall Islands; 4) Roi-Namur Library, Roi-Namur, Marshall Islands; 5) Kodiak Public Library, Kodiak, AK; 6) Z. J. Loussac Public Library, Anchorage, AK.

Public comments on the Draft EA/OEA and Draft FONSI/FONSH will be accepted from December 18, 2020 to January 20, 2021 and can be provided in either of the following ways: (1) E-mail comments by January 20, 2021 to ft-3-eaoea-comments@govsupport.us; (2) Mail comments, postmarked no later than January 20, 2021, to: USASMDC, ATTN: SMDC-EN (D. Fuller), P.O. Box 1500, Huntsville, AL 35807.

If you have questions regarding this information, please contact Mr. David Fuller Environmental Protection Specialist, USASMDC, Environmental Division, at (256) 425-2016.

Sincerely,

HILL.WELDON.H.JR.1216862682 Digitally signed by HILL.WELDON.H.JR.1216862682 Date: 2020.12.21 09:19:19 -06'00'

WELDON H. HILL, JR.
Deputy Chief of Staff for Engineering
U.S. Army Space and Missile Defense Command

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF
Environmental Division

18 December 2020

From: Weldon H. Hill, Jr., Deputy Chief of Staff for Engineering, USASMDC

To: National Marine and Fisheries Service, Pacific Islands Regional Office (Attn: Dr. Steven P. Kolinski, Fishery Biologist, Habitat Conservation Division)

Subj: HYPERSONIC FLIGHT TEST-3 DRAFT ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT—REQUEST REVIEW

Encl: Flight Test-3 Draft Environmental Assessment/Overseas Environmental Assessment

The U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) and U.S. Army Space and Missile Defense Command (USASMDC) have prepared an Environmental Assessment / Overseas Environmental Assessment (EA/OEA) to evaluate potential environmental impacts from the proposed testing of the Hypersonic Flight Test-3 (FT-3). The EA/OEA has been prepared in accordance with the National Environmental Policy Act (NEPA), as implemented by the Council on Environmental Quality (CEQ) Regulations and U.S. Army regulations for implementing NEPA.

The Proposed Action consists of one flight test launched from the Pacific Spaceport Complex Alaska (PSCA) to Kwajalein Atoll, Republic of the Marshall Islands (RMI) during FY 2021 after the Finding of No Significant Impact / Finding of No Significant Harm (FONSI/FONSH) is signed, if approved. The purpose of the Proposed Action is to test a long-range weapon system and demonstrate a reduction of risk for longer-range payload systems.

A Notice of Availability of the Draft EA/OEA and Draft FONSI will be published in the local newspapers in Kodiak, Anchorage, Kwajalein and the Republic of the Marshall Islands on or before December 18, 2020. The Draft EA/OEA and Draft FONSI/FONSH are available at https://ft3eaoea.govsupport.us and in the following locations: 1) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Majuro, Marshall Islands; 2) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Ebeye, Marshall Islands; 3) Grace Sherwood Library, Kwajalein, Marshall Islands; 4) Roi-Namur Library, Roi-Namur, Marshall Islands; 5) Kodiak Public Library, Kodiak, AK; 6) Z. J. Loussac Public Library, Anchorage, AK.

Public comments on the Draft EA/OEA and Draft FONSI/FONSH will be accepted from December 18, 2020 to January 20, 2021 and can be provided in either of the following ways: (1) E-mail comments by January 20, 2021 to ft-3-eaoea-comments@govsupport.us; (2) Mail comments, postmarked no later than January 20,

2021, to: USASMDC, ATTN: SMDC-EN (D. Fuller), P.O. Box 1500, Huntsville, AL 35807.

I am also providing a transmittal letter, the Draft EA/OEA, Draft FONSI/FONSH, and Blank Comment Matrix for comment to: Mr. John McCarroll, Environmental Protection Agency Region 9; Dr. Dan Polhemus, United States Fish and Wildlife Service; Ms. Moriana Phillip and Mr. Nious Juniuos, Republic of the Marshall Islands Environmental Protection Authority; Mr. Derek Miller, United States Army Garrison—Kwajalein Atoll; and Mr. Kanalei Shun, United States Army Corps of Engineers.

If you have questions regarding this information, please contact Mr. David Fuller Environmental Protection Specialist, USASMDC, Environmental Division, at (256) 425-2016.

Sincerely,

HILL.WELDON.H.JR.1216862682 Digitally signed by HILL.WELDON.H.JR.1216862682 Date: 2020.12.21 09:21:20 -06'00'

WELDON H. HILL, JR.
Deputy Chief of Staff for Engineering
U.S. Army Space and Missile Defense Command

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF
Environmental Division

18 December 2020

From: Weldon H. Hill, Jr., Deputy Chief of Staff for Engineering, USASMDC

To: Alaska Aerospace Corporation (Attn: Mr. Mark Lester, President and CEO)

Subj: HYPERSONIC FLIGHT TEST-3 DRAFT ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT—REQUEST REVIEW

Encl: Flight Test-3 Draft Environmental Assessment/Overseas Environmental Assessment

The U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) and U.S. Army Space and Missile Defense Command (USASMDC) have prepared an Environmental Assessment / Overseas Environmental Assessment (EA/OEA) to evaluate potential environmental impacts from the proposed testing of the Hypersonic Flight Test-3 (FT-3). The EA/OEA has been prepared in accordance with the National Environmental Policy Act (NEPA), as implemented by the Council on Environmental Quality (CEQ) Regulations and U.S. Army regulations for implementing NEPA.

The Proposed Action consists of one flight test launched from the Pacific Spaceport Complex Alaska (PSCA) to Kwajalein Atoll, Republic of the Marshall Islands (RMI) during FY 2021 after the Finding of No Significant Impact / Finding of No Significant Harm (FONSI/FONSH) is signed, if approved. The purpose of the Proposed Action is to test a long-range weapon system and demonstrate a reduction of risk for longer-range payload systems.

A Notice of Availability of the Draft EA/OEA and Draft FONSI will be published in the local newspapers in Kodiak, Anchorage, Kwajalein and the Republic of the Marshall Islands on or before December 18, 2020. The Draft EA/OEA and Draft FONSI/FONSH are available at https://ft3eaoea.govsupport.us and in the following locations: 1) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Majuro, Marshall Islands; 2) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Ebeye, Marshall Islands; 3) Grace Sherwood Library, Kwajalein, Marshall Islands; 4) Roi-Namur Library, Roi-Namur, Marshall Islands; 5) Kodiak Public Library, Kodiak, AK; 6) Z. J. Loussac Public Library, Anchorage, AK.

Public comments on the Draft EA/OEA and Draft FONSI/FONSH will be accepted from December 18, 2020 to January 20, 2021 and can be provided in either of the following ways: (1) E-mail comments by January 20, 2021 to ft-3-eaoea-comments@govsupport.us; (2) Mail comments, postmarked no later than January 20, 2021, to: USASMDC, ATTN: SMDC-EN (D. Fuller), P.O. Box 1500, Huntsville, AL 35807.

If you have questions regarding this information, please contact Mr. David Fuller Environmental Protection Specialist, USASMDC, Environmental Division, at (256) 425-2016.

Sincerely,

HILL.WELDON.H.JR.1216862682 Digitally signed by HILL.WELDON.H.JR.1216862682 Date: 2020.12.21 09:24:30 -06'00'

WELDON H. HILL, JR.
Deputy Chief of Staff for Engineering
U.S. Army Space and Missile Defense Command

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF
Environmental Division

18 December 2020

MEMORANDUM FOR MDA/MSR Environmental (Attn: Mr. Christopher Smith)

Subj: HYPERSONIC FLIGHT TEST-3 DRAFT ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT—REQUEST REVIEW

1. The U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) and U.S. Army Space and Missile Defense Command (USASMDC) have prepared an Environmental Assessment / Overseas Environmental Assessment (EA/OEA) to evaluate potential environmental impacts from the proposed testing of the Hypersonic Flight Test-3 (FT-3). The EA/OEA has been prepared in accordance with the National Environmental Policy Act (NEPA), as implemented by the Council on Environmental Quality (CEQ) Regulations and U.S. Army regulations for implementing NEPA.

2. The Proposed Action consists of one flight test launched from the Pacific Spaceport Complex Alaska (PSCA) to Kwajalein Atoll, Republic of the Marshall Islands (RMI) during FY 2021 after the Finding of No Significant Impact / Finding of No Significant Harm (FONSI/FONSH) is signed, if approved. The purpose of the Proposed Action is to test a long-range weapon system and demonstrate a reduction of risk for longer-range payload systems.

3. A Notice of Availability of the Draft EA/OEA and Draft FONSI will be published in the local newspapers in Kodiak, Anchorage, Kwajalein and the Republic of the Marshall Islands on or before December 18, 2020. The Draft EA/OEA and Draft FONSI/FONSH are available at https://ft3eaoea.govsupport.us and in the following locations: 1) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Majuro, Marshall Islands; 2) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Ebeye, Marshall Islands; 3) Grace Sherwood Library, Kwajalein, Marshall Islands; 4) Roi-Namur Library, Roi-Namur, Marshall Islands; 5) Kodiak Public Library, Kodiak, AK; 6) Z. J. Loussac Public Library, Anchorage, AK.

4. Public comments on the Draft EA/OEA and Draft FONSI/FONSH will be accepted from December 18, 2020 to January 20, 2021 and can be provided in either of the following ways: (1) E-mail comments by January 20, 2021 to ft-3-eaoea-comments@govsupport.us; (2) Mail comments, postmarked no later than January 20, 2021, to: USASMDC, ATTN: SMDC-EN (D. Fuller), P.O. Box 1500, Huntsville, AL 35807.

5. If you have questions regarding this information, please contact Mr. David Fuller Environmental Protection Specialist, USASMDC, Environmental Division, at (256) 425-2016.

Sincerely,

HILL.WELDON.H.JR.1216862682 Digitally signed by HILL.WELDON.H.JR.1216862682
Date: 2020.12.21 09:26:33 -06'00'

WELDON H. HILL, JR.
Deputy Chief of Staff for Engineering
U.S. Army Space and Missile Defense
Command

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF
Environmental Division

18 December 2020

MEMORANDUM FOR U.S. Army Kwajalein Atoll—Reagan Test Site, Environmental Management Office/Mr. Derek Miller

Subj: HYPERSONIC FLIGHT TEST-3 DRAFT ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT—REQUEST REVIEW

1. The U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) and U.S. Army Space and Missile Defense Command (USASMDC) have prepared an Environmental Assessment / Overseas Environmental Assessment (EA/OEA) to evaluate potential environmental impacts from the proposed testing of the Hypersonic Flight Test-3 (FT-3). The EA/OEA has been prepared in accordance with the National Environmental Policy Act (NEPA), as implemented by the Council on Environmental Quality (CEQ) Regulations and U.S. Army regulations for implementing NEPA.

2. The Proposed Action consists of one flight test launched from the Pacific Spaceport Complex Alaska (PSCA) to Kwajalein Atoll, Republic of the Marshall Islands (RMI) during FY 2021 after the Finding of No Significant Impact / Finding of No Significant Harm (FONSI/FONSH) is signed, if approved. The purpose of the Proposed Action is to test a long-range weapon system and demonstrate a reduction of risk for longer-range payload systems.

3. A Notice of Availability of the Draft EA/OEA and Draft FONSI will be published in the local newspapers in Kodiak, Anchorage, Kwajalein and the Republic of the Marshall Islands on or before December 18, 2020. The Draft EA/OEA and Draft FONSI/FONSH are available at https://ft3eaoea.govsupport.us and in the following locations: 1) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Majuro, Marshall Islands; 2) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Ebeye, Marshall Islands; 3) Grace Sherwood Library, Kwajalein, Marshall Islands; 4) Roi-Namur Library, Roi-Namur, Marshall Islands; 5) Kodiak Public Library, Kodiak, AK; 6) Z. J. Loussac Public Library, Anchorage, AK.

4. Public comments on the Draft EA/OEA and Draft FONSI/FONSH will be accepted from December 18, 2020 to January 20, 2021 and can be provided in either of the following ways: (1) E-mail comments by January 20, 2021 to ft-3-eaoea-comments@govsupport.us; (2) Mail comments, postmarked no later than January 20, 2021, to: USASMDC, ATTN: SMDC-EN (D. Fuller), P.O. Box 1500, Huntsville, AL 35807.

5. I am also providing a transmittal letter, the Draft EA/OEA, Draft FONSI/FONSH, and Blank Comment Matrix for comment to: Mr. John McCarroll, Environmental Protection Agency Region 9; Dr. Dan Polhemus, United States Fish and Wildlife Service; Dr. Steven Kolinski, National Marine and Fisheries Service; Ms. Moriana Phillip and Mr.

Nious Juniuos, Republic of the Marshall Islands Environmental Protection Authority; and Mr. Kanalei Shun, United States Army Corps of Engineers.

5. If you have questions regarding this information, please contact Mr. David Fuller Environmental Protection Specialist, USASMDC, Environmental Division, at (256) 425-2016.

Sincerely,

HILL.WELDON.H.JR.1216862682 Digitally signed by HILL.WELDON.H.JR.1216862682 Date: 2020.12.21 09:28:28 -06'00'

WELDON H. HILL, JR.
Deputy Chief of Staff for Engineering
U.S. Army Space and Missile Defense
Command

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF
Environmental Division

18 December 2020

MEMORANDUM FOR U.S. Army Corps of Engineers, Honolulu District, CEPOH-PP-E/Mr. Kanalei Shun

Subj: HYPERSONIC FLIGHT TEST-3 DRAFT ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT—REQUEST REVIEW

1. The U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) and U.S. Army Space and Missile Defense Command (USASMDC) have prepared an Environmental Assessment / Overseas Environmental Assessment (EA/OEA) to evaluate potential environmental impacts from the proposed testing of the Hypersonic Flight Test-3 (FT-3). The EA/OEA has been prepared in accordance with the National Environmental Policy Act (NEPA), as implemented by the Council on Environmental Quality (CEQ) Regulations and U.S. Army regulations for implementing NEPA.

2. The Proposed Action consists of one flight test launched from the Pacific Spaceport Complex Alaska (PSCA) to Kwajalein Atoll, Republic of the Marshall Islands (RMI) during FY 2021 after the Finding of No Significant Impact / Finding of No Significant Harm (FONSI/FONSH) is signed, if approved. The purpose of the Proposed Action is to test a long-range weapon system and demonstrate a reduction of risk for longer-range payload systems.

3. A Notice of Availability of the Draft EA/OEA and Draft FONSI will be published in the local newspapers in Kodiak, Anchorage, Kwajalein and the Republic of the Marshall Islands on or before December 18, 2020. The Draft EA/OEA and Draft FONSI/FONSH are available at https://ft3eaoea.govsupport.us and in the following locations: 1) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Majuro, Marshall Islands; 2) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Ebeye, Marshall Islands; 3) Grace Sherwood Library, Kwajalein, Marshall Islands; 4) Roi-Namur Library, Roi-Namur, Marshall Islands; 5) Kodiak Public Library, Kodiak, AK; 6) Z. J. Loussac Public Library, Anchorage, AK.

4. Public comments on the Draft EA/OEA and Draft FONSI/FONSH will be accepted from December 18, 2020 to January 20, 2021 and can be provided in either of the following ways: (1) E-mail comments by January 20, 2021 to ft-3-eaoea-comments@govsupport.us; (2) Mail comments, postmarked no later than January 20, 2021, to: USASMDC, ATTN: SMDC-EN (D. Fuller), P.O. Box 1500, Huntsville, AL 35807.

5. I am also providing a transmittal letter, the Draft EA/OEA, Draft FONSI/FONSH, and Blank Comment Matrix for comment to: Mr. Ron Benkert, Alaska Department of Fish & Game; Ms. Sarah Meitl, Alaska State Historic Preservation Office/Office of History and Archaeology; Mr. Doug Kolwaite, Alaska Department of Transportation; Mr. Andrew

Baca and Mr. Theogene Mbabaliye, Environmental Protection Agency Region 10; Mr. John McCarroll, Environmental Protection Agency Region 9; Ms. Leslie Grey, Federal Aviation Administration; Mr. Thomas Lance, Sun'aq Tribe of Alaska; Mr. Douglass M. Cooper and Dr. Dan Polhemus, United States Fish and Wildlife Service; Ms. Cynthia Berns, City of Old Harbor Native Corporation; Dr. Steven Kolinski, National Marine and Fisheries Service; Mr. Mark Lester, Alaska Aerospace Corporation; Ms. Moriana Phillip and Mr. Nious Juniuos, Republic of the Marshall Islands Environmental Protection Authority; Mr. Christopher Smith, Missile Defense Agency; and Mr. Derek Miller, United States Army Garrison–Kwajalein Atoll.

5. If you have questions regarding this information, please contact Mr. David Fuller Environmental Protection Specialist, USASMDC, Environmental Division, at (256) 425-2016.

Sincerely,

HILL.WELDON.H.JR.1216862682 Digitally signed by HILL.WELDON.H.JR.1216862682
Date: 2020.12.21 09:31:03 -06'00'

WELDON H. HILL, JR.
Deputy Chief of Staff for Engineering
U.S. Army Space and Missile Defense
Command

Enclosure

DEPARTMENT OF THE ARMY
U.S. ARMY SPACE AND MISSILE DEFENSE COMMAND
POST OFFICE BOX 1500
HUNTSVILLE, ALABAMA 35807-3801

REPLY TO
ATTENTION OF
Environmental Division

18 December 2020

From: Weldon H. Hill, Jr., Deputy Chief of Staff for Engineering, USASMDC

To: Republic of the Marshall Islands Environmental Protection Authority—Majuro (Attn: Ms. Moriana Phillip)

Subj: HYPERSONIC FLIGHT TEST-3 DRAFT ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT—REQUEST REVIEW

Encl: Flight Test-3 Draft Environmental Assessment/Overseas Environmental Assessment

The U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) and U.S. Army Space and Missile Defense Command (USASMDC) have prepared an Environmental Assessment / Overseas Environmental Assessment (EA/OEA) to evaluate potential environmental impacts from the proposed testing of the Hypersonic Flight Test-3 (FT-3). The EA/OEA has been prepared in accordance with the National Environmental Policy Act (NEPA), as implemented by the Council on Environmental Quality (CEQ) Regulations and U.S. Army regulations for implementing NEPA.

The Proposed Action consists of one flight test launched from the Pacific Spaceport Complex Alaska (PSCA) to Kwajalein Atoll, Republic of the Marshall Islands (RMI) during FY 2021 after the Finding of No Significant Impact / Finding of No Significant Harm (FONSI/FONSH) is signed, if approved. The purpose of the Proposed Action is to test a long-range weapon system and demonstrate a reduction of risk for longer-range payload systems.

A Notice of Availability of the Draft EA/OEA and Draft FONSI will be published in the local newspapers in Kodiak, Anchorage, Kwajalein and the Republic of the Marshall Islands on or before December 18, 2020. The Draft EA/OEA and Draft FONSI/FONSH are available at https://ft3eaoea.govsupport.us and in the following locations: 1) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Majuro, Marshall Islands; 2) Office lobby of the Republic of the Marshall Islands Environmental Protection Authority, Ebeye, Marshall Islands; 3) Grace Sherwood Library, Kwajalein, Marshall Islands; 4) Roi-Namur Library, Roi-Namur, Marshall Islands; 5) Kodiak Public Library, Kodiak, AK; 6) Z. J. Loussac Public Library, Anchorage, AK.

Public comments on the Draft EA/OEA and Draft FONSI/FONSH will be accepted from December 18, 2020 to January 20, 2021 and can be provided in either of the following ways: (1) E-mail comments by January 20, 2021 to ft-3-eaoea-comments@govsupport.us; (2) Mail comments, postmarked no later than January 20, 2021, to: USASMDC, ATTN: SMDC-EN (D. Fuller), P.O. Box 1500, Huntsville, AL 35807.

I am also providing a transmittal letter, the Draft EA/OEA, Draft FONSI/FONSH, and Blank Comment Matrix for comment to: Mr. John McCarroll, Environmental Protection Agency Region 9; Dr. Dan Polhemus, United States Fish and Wildlife Service; Dr. Steven Kolinski, National Marine and Fisheries Service; Mr. Nious Juniuos, Republic of the Marshall Islands Environmental Protection Authority; Mr. Derek Miller, United States Army Garrison—Kwajalein Atoll; and Mr. Kanalei Shun, United States Army Corps of Engineers.

If you have questions regarding this information, please contact Mr. David Fuller Environmental Protection Specialist, USASMDC, Environmental Division, at (256) 425-2016.

Sincerely,

HILL.WELDON.H.JR.1216862682 Digitally signed by HILL.WELDON.H.JR.1216862682 Date: 2020.12.21 09:35:02 -06'00'

WELDON H. HILL, JR.
Deputy Chief of Staff for Engineering
U.S. Army Space and Missile Defense Command

Enclosure

From:	Fuller, David G CIV USARMY SMDC (USA)
To:	Hannah McCarty
Subject:	FW: [Non-DoD Source] Re: HYPERSONIC FLIGHT TEST-3 DRAFT ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT—REQUEST REVIEW
Date:	Monday, December 21, 2020 4:11:55 PM

From: Moriana Phillip [morianaphillip.rmiepa@gmail.com]
Sent: Monday, December 21, 2020 3:57 PM
To: Fuller, David G CIV USARMY SMDC (USA); Caleb Christopher
Subject: [Non-DoD Source] Re: HYPERSONIC FLIGHT TEST-3 DRAFT ENVIRONMENTAL ASSESSMENT/OVERSEAS ENVIRONMENTAL ASSESSMENT—REQUEST REVIEW

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.

Acknowledging receipt of your email.

On Mon, Dec 21, 2020 at 3:47 PM Fuller, David G CIV USARMY SMDC (USA) <david.g.fuller6.civ@mail.mil < Caution-mailto:david.g.fuller6.civ@mail.mil > > wrote:

> Ms. Phillip,
>
> The U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO) and U.S. Army Space and Missile Defense Command (USASMDC) have prepared an Environmental Assessment / Overseas Environmental Assessment (EA/OEA) to evaluate potential environmental impacts from the proposed testing of the Hypersonic Flight Test-3 (FT-3).
>
> Please provide any comments by 20 January 2021.
>
> 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

--
Moriana Phillip
General Manager
RMI Environmental Protection Authority
P.O Box 1322
Majuro, Marshall Islands

96960
Telephone: (692) 625 3035/5203
Fax: n(692) 625-5202

From:	Polhemus, Dan <dan_polhemus@fws.gov>
Sent:	Friday, January 22, 2021 3:34 PM
To:	Fuller, David G CIV USARMY SMDC (USA)
Cc:	Cooper, Douglass; Kolinski, Steven P CIV (USA); McCarroll.John@epa.gov; kanalei.shun@usace.army; milmorianaphillip.rmiepa@gmail.com; Wes Norris; Karen Hoksbergen; Hasley, David C CIV USARMY SMDC (USA); Raynal, Jeremy M; Fry, Michael
Subject:	Re: [EXTERNAL] FT3 USFWS Pacific Islands Informal Consultation Letter (UNCLASSIFIED)
Attachments:	USFWS FT-3 Comments - 13 Oct. 2020.pdf

David -

We sent a letter with comments and concurrence on the FT-3 to your office on 13 October 2020 (see attached).

There is a possibility that the DOD firewall or other security software intercepted the message containing this attachement, and that as a result it never got to you. We were having a variety of similar problems in communicating with other DOD commands, particularly in the Mariana Islands, at around this same time. As with this case, we only tend to find out about these lost communications well after the fact, since we never receive any indication of non-delivery on our end. From what I understand, DOI and DOD staff at the DC level have been working to address this problem.

In addition, if the above letter needs to be slightly reformatted to indicate it is addressing the UES process we can easily do that, but the comments and concurrence will remain the same, so presumably the above letter can suffice in its present form.

- Dan Polhemus

Dr. Dan A. Polhemus
Pacific Islands Fish and Wildlife Office
U. S. Fish and Wildlife Service
Honolulu, HI 96850 USA

United States Department of the Interior

U.S. FISH AND WILDLIFE SERVICE
Anchorage Fish and Wildlife Conservation Office
4700 BLM Road
Anchorage, Alaska 99507

In Reply Refer to:
FWS/IR11/AFWCO

February 12, 2021

Mr. Weldon H. Hill, Jr.
Deputy Chief of Staff for Engineering
U.S. Army Space and Missile Defense Command
Post Office Box 1500
Huntsville, Alabama 35807

Subject: Hypersonic Flight Test-3, U.S. Army Space and Missile Defense Command, Pacific Spaceport Complex Alaska

Dear Mr. Hill:

Thank you for requesting consultation with the U.S. Fish and Wildlife Service (Service), pursuant to section 7 the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq., as amended; ESA). The United States Army Space and Missile Defense Command (USASMDC) is assisting the U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO), the action proponent, in evaluating the effects of the proposed Hypersonic Flight Test-3 (FT-3). This proposed action involves a single developmental flight test from the Pacific Spaceport Complex Alaska (PSCA) to Kwajalein Atoll, Republic of the Marshall Islands.

The USASMDC has evaluated the potential effects of FT-3 and has requested our concurrence with your determination that the activities in and over Alaska waters may affect but are not likely to adversely affect the federally endangered short-tailed albatross (*Phoebastria* albatrus) and Hawaiian petrel (*Pterodroma sandwichensis*), and the federally threatened Steller's eider (*Polysticta stelleri*), and the southwestern distinct population segment of northern sea otters (*Enhydra lutris kenyoni*). The USASMDC has also determined that the action would have no effect on designated critical habitat for northern sea otters.

The FT-3 launch consists of a three-stage booster system and an experimental payload. The vehicle would launch from PSCA on Kodiak Island and the three booster stages would separate after motor burn-out and fall into the northern Pacific Ocean. The payload would continue to fly to the Kwajalein Atoll. The stage 1 booster drop zone is located near Kodiak Island, Alaska while the stage 2 and 3 booster drop zones would be in deep oceanic waters of the North Pacific. The effects of pre-flight activities are covered under existing National Environmental Policy Act documentation and/or consultations.

Sea otter critical habitat includes nearshore marine waters ranging from the mean high tide line seaward for 100 meters (m) (318 feet [ft.]), or to a water depth of 20 m (66 ft.; USFWS 2009). No effects on northern sea otter critical habitat is expected because the stage 1 booster drop zone is outside of the area designated as critical habitat.

The potential effects of project-related stressors on ESA-listed species in the area are: A) exposure to elevated sound levels, B) direct contact with a species, and C) hazardous materials.

A) Exposure to elevated sound levels

Elevated sound levels could affect the behavior and hearing sensitivity of sea otters and seabirds in the action area. However, expected sound pressure levels resulting from sonic booms are below the peak threshold level and the temporary threshold shift identified for all species analyzed. Noise resulting from vehicle splashdown may exceed thresholds for sea otters and seabirds, but it is unlikely that individual animals would be exposed. The short duration of sound produced in the booster drop zones would at most cause temporary behavior disturbance. Based on the expected sound pressure levels and the thresholds for consultation species, USASMDC expects elevated noise levels would have insignificant or discountable effects.

B) Direct contact with a species

The proposed action would result in vehicle components splashing down in the three booster drop zones. Northern sea otters are not likely to occur in any of the booster drop zones because they are primarily found in shallow waters, typically less than 40 m (131 ft.) in depth (USFWS 2010). Population densities are not available for short-tailed albatross, Steller's eiders, or Hawaiian petrels in the booster drop zones, however these birds have limited seasonal distributions in the action area. Because of the low-density of listed species expected in the action area, USASMDC expects any effects of falling vehicle components on ESA-listed species would be discountable.

C) Hazardous materials

When the stage booster assemblies and nose fairing are released, any substances from the launch vehicle construction or substances that are contained on the launch vehicle and are not consumed during the flight would fall into the booster drop zones. However, it is expected that any hazardous materials would be rapidly diluted by seawater and ESA-listed species would not be exposed to chemicals in sufficient concentrations to adversely affect individuals. Vehicle components are expected to sink to the ocean floor where they will be out of contact with consultation organisms. For all species considered in this evaluation, USASMDC expects exposure to hazardous materials because of the proposed action would have insignificant effects on ESA-listed species.

After reviewing the proposed actions and their anticipated effects, the Service concurs with USASMDC's determination that the proposed research activities are not likely to adversely affect short-tailed albatross, Steller's eider, Hawaiian petrel, and northern sea otter in Alaskan waters. Based on your request and our concurrence, requirements of section 7 of the ESA have been satisfied. However, if new information reveals project impacts that may affect listed species or critical habitat in a manner or to an extent not previously considered, or if this action is subsequently modified in a manner which was not considered in this assessment, or if a new species is listed or critical habitat designated that may be affected by the proposed action, section 7 consultation must be reinitiated.

This letter relates only to federally listed or proposed species and/or designated or proposed critical habitat under jurisdiction of the Service. It does not address species under the jurisdiction of the National Marine Fisheries Service, or other legislation or responsibilities under the Fish and Wildlife Coordination Act, Migratory Bird Treaty Act, Marine Mammal Protection Act, Clean Water Act, National Environmental Policy Act, or Bald and Golden Eagle Protection Act.

If you have any questions or need additional information, please contact Ms. Sabrina Farmer at (907) 271-2778 or sabrina_farmer@fws.gov and reference consultation number 07CAAN00-2021-I-0147.

Sincerely,

DOUGLASS COOPER

Digitally signed by DOUGLASS COOPER
Date: 2021.02.12 10:12:29 -09'00'

Douglass M. Cooper
Ecological Services Branch Chief

<u>References</u>

[USFWS] U.S. Fish and Wildlife Service. 2009. Endangered and threatened wildlife and plants; designation of critical habitat for the southwest Alaska distinct population segment of the northern sea otter. Final rule. 74 FR 51988. 8 October 2009.

[USFWS]. 2010. Southwest Alaska distinct population segment of the northern sea otter (*Enhydra lutris kenyoni*) draft recovery plan. U.S. Fish and Wildlife Service, Region 7, Alaska. 171 pp.

This page intentionally left blank.

B

Comments and Responses on Draft EA/OEA

This page intentionally left blank.

COMMENT INCORPORATION SUMMARY

COMMENT INCORPORATOR KFS-LLC	DATE 1-7-2021
COMMENTOR Dr. Steven Kolinski	ORGANIZATION OF COMMENTOR
TITLE OF DOCUMENT Contract W9113M-17-D-0009, TO W9113M-19-F-2128 Draft Hypersonic Flight Test 3 (FT-3) Environmental Assessment / Overseas Environmental Assessment (EA/OEA)	DATE OF DOCUMENT 30 November 2020

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	3-65		13-14			Recommend removing “and averaged over the timespan of a year, densities would be very low.” That portion of the statement is meaningless, and may be construed as providing a misleading focus to the reader. Greater meaning might be implied by saying, “Gamete and larval densities would be expected to range from high (in-season) to very low (out of season)”. Since we don’t seem to have information on when these seasons occur (although very likely in the June-August timeframe), probably best to just leave it at that.	Yes	Revised as recommended.
2	3-67		11			Typo: there is no relevant “USFWS and NMFS 2017” reference for the topic at hand. The appropriate reference is “NMFS and USFWS 2017”.	Yes	Recommended changes made.
3	4-28		20-21 & 31-33			Specifically, the document states that, “There is some evidence that tungsten may be deposited in coral skeletons and may damage coral structure or health (Colín-García et al. 2016); however, the tungsten concentration at which any damaging effects might occur is unknown at this time.” This is followed by the conclusion that “While the potential exists for special status species to be exposed to potentially hazardous materials such as tungsten, it is not expected that marine animals would be exposed to any hazardous materials at concentrations high enough to cause any adverse effects and impacts would be less than significant.” This is not a logical premise based expectation. The existing evidence (albeit limited) suggests harm from	Yes	Test revised to acknowledge that individual animal have the potential to be harmed by hazardous material such as tungsten but that no change in the population abundance or distribution at Kwajalein Atoll is expected.

COMMENT INCORPORATION SUMMARY

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?)*
						exposure may occur, and given the concentrations, exposure durations and exposure frequencies that lead to harm are not known, the expectation at this time should be that, given exposure is expected to occur, harm may be expected to occur.		
4	4-35		26			The use of hydrophones on the rafts is interesting and should be described in more detail. NMFS has been requesting monitoring of marine mammal presence in reentry vehicle locations for some time now. Flyovers and vessel reporting are helpful, but observations are restricted to species surface presence. Acoustic recordings have some ability identify and track species that are submerged. To date a single study has been done with a single hydrophone to help identify marine mammal species presence in the Illeginni area. Multiple hydrophones on prepositioned rafts allow for species identification, triangulation of distance, and limited estimates of abundance (most likely with post event analysis). Strongly recommend that, in addition to their mission related use, the hydrophones be used to record biotic sounds to allow identifying and monitoring for marine mammal presence over the course of their deployment. This data would allow for more informed analyses of future activity risk, as well as some ability to assess, post-hoc, the risk of this activity. The hydrophones might similarly be used to assess/verify DB levels with distance from impact.	N/A	This request has been sent to SMDC but no commitment to using the hydrophone data to record marine mammals has yet been made by the program. No additional details of hydrophone use are available at this time.
5	4-49				4-7	Page 2-9 lines 6-7 state, “The area would be inspected within a day preceding the flight test” by qualified personnel for sea turtles and sea turtle nesting activity. That update is not, and should be reflected in Table 4-7. Also, if sea turtles or sea turtle nests are observed near the impact area, USFWS, RMIEPA and NMFS should be informed, not just NMFS, as stated (sea turtles on land fall under RMIEPA and USFWS mandates).	Yes	Revised as recommended.
6	4-54				4-7	First row, include NMFS in implementing and monitoring	Yes	Recommended changes made.
7	4-58				4-7	First row, measure indicates survey for impacted species will occur within 60 days of post-test clean up and restoration. 60 days? This must be a typo.	Yes	Removed “within 60 days of completing post-test clean-up and restoration”.

COMMENT INCORPORATION SUMMARY

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?)*
8	FONSI					The requested consultation and biological opinion will state whether the NMFS concurs with the Army's determinations on the potential for FT-3 adverse effects to U.S. ESA and UES protected marine consultation species, with analysis on the significance of likely effects.		

Return comments by email to David.g.fuller6.civ@mail.mil or norrisw@kfs-llc.com

This page intentionally left blank.

C

Formal Consultation Under the Environmental Standards for United States Army Kwajalein Atoll Activities in the Republic of the Marshall Islands Biological Opinion

Endangered Species Act – Section 7 Consultation

Action Agency:	Department of the Army, U.S. Army Rapid Capabilities and Critical Technologies Office (RCCTO), U.S. Army Space and Missile Defense Command (USASMDC) – Huntsville AL
Activity:	Single Hypersonic Flight Test-3 (FT-3)
Consulting Agency:	National Marine Fisheries Service, Pacific Islands Region, Protected Resources Division
NMFS File No. (PCTS):	PIRO-2020-03120
PIRO Reference No.:	I-PI-20-1865-AG
Approved By:	Michael D. Tosatto Regional Administrator, Pacific Islands Region
Date Issued:	03/26/2021

Table of Contents

List of Figures

List of Tables

1. ACRONYMS

AAC	Alaska Aerospace Corporation
ARSTRAT	Army Forces Strategic Command, US Army
BA	Biological Assessment
BMP	Best Management Practices
BO	Biological Opinion
BOA	Broad Ocean Area
CFR	Code of Federal Regulations
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
cm	Centimeter(s)
CO_2	Carbon Dioxide
dB	Decibel
DEP	Document of Environmental Protection
DPS	Distinct Population Segment
DQA	Data Quality Act
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FE-1	Flight Experiment-1
FE-2	Flight Experiment-2
ft	Feet
FR	Federal Register
FWS	US Fish and Wildlife Service
FT-3	Flight Test-3
Hz	Hertz
in	Inch(es)
kg	Kilogram(s)
km	Kilometer(s)
LAA	Likely to Adversely Affect
m	Meter(s)
MAC	Mid-Atoll Corridor
MMPA	Marine Mammal Protection Act
MMI	Minuteman I Program
MMIII	Minuteman III Program
NEPA	National Environmental Policy Act
NLAA	Not Likely to Adversely Affect
nm	Nautical Miles
NMFS	National Marine Fisheries Service (aka NOAA Fisheries)
NOAA	National Oceanic and Atmospheric Administration
PIRO	Pacific Islands Regional Office
PMRF	Pacific Missile Range Facility, Kauai
PSCA	Pacific Spaceport Complex Alaska
RCCTO	U.S. Army Rapid Capabilities and Critical Technologies Office
RMI	Republic of the Marshall Islands
ROV	Remotely Operated Vehicle
RTS	Ronald Reagan Ballistic Missile Test Site (aka Reagan Test Site)

RMS	Root Mean Square
USASMDC	Space and Missile Defense Command, US Army
SSP	Strategic Systems Programs
SEL	Sound Exposure Level
SPL	Sound Pressure Level
TTS	Temporary Threshold Shift
UES	USAKA Environmental Standards
US	United States
USAF	U.S. Air Force
USAKA	U.S. Army Kwajalein Atoll
yd^2	Square Yard(s)
μPa	Micro-Pascal (s)

1 INTRODUCTION

The proposed action involves launching a single developmental test missile (Hypersonic Flight Test-3, FT-3) from the Pacific Spaceport Complex Alaska (PSCA) on Kodiak Island, Alaska, which would travel across a broad ocean area (BOA) of the Pacific Ocean. The payload impact would be at the Ronald Reagan Ballistic Missile Defense Test Site (RTS) at Illeginni Islet in Kwajalein Atoll, Republic of the Marshall Islands (RMI) (Figure 1). The purpose of FT-3 is to demonstrate a reduction of risk for a longer-range payload system and the data collected from this flight would be used to improve performance prediction models of the system. The FT-3 is a flight test that will be similar to and a crucial step in the developmental process following the Flight Experiment-1 (FE-1) and Flight Experiment-2 (FE-2), which were flight tests conducted in 2017 and 2019, respectively.

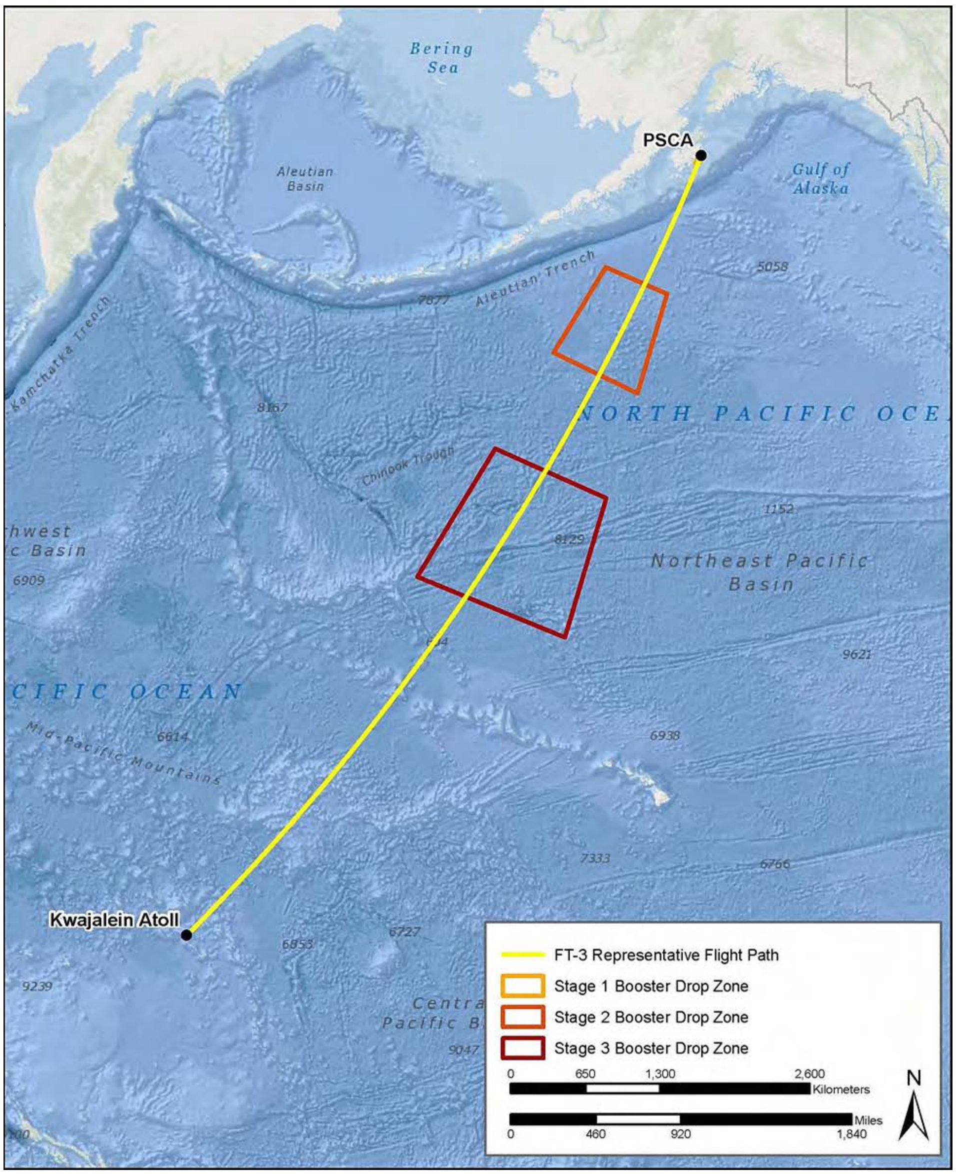


Figure 1. Flight Test-3 (FT-3) Representative Flight Path (image provided by the U.S. Army).

The Endangered Species Act (ESA) would apply for the portions of the action that would take place in and over United States (US) territory and international waters, but not for the portions of the action that would take place within the RMI. The Government of the RMI has agreed to allow the US Government to use certain areas of Kwajalein Atoll (collectively referred to as US Army Kwajalein Atoll or USAKA). “USAKA” is defined as “…the [USAKA]-controlled islands and the Mid-Atoll Corridor, as well as all USAKA-controlled activities within the [RMI], including the territorial waters of the RMI”. The USAKA controls 11 islets around the atoll. The relationship between the US Government and the Government of the RMI is governed by the Compact of Free Association (Compact), as Amended in 2003 (48 USC 1681). Section 161 of the Compact obligates the US to apply the National Environmental Policy Act of 1969 (NEPA) to its actions in the RMI as if the RMI were a part of the US. However, the ESA does not apply within the RMI. Instead, the Compact specifically requires the US Government to develop and apply environmental standards that are substantially similar to several US environmental laws, including the ESA and the Marine Mammal Protection Act (MMPA). The standards and procedures described in the Environmental Standards and Procedures for USAKA Activities in the RMI (aka USAKA Environmental Standards or UES, 15th Edition) were developed to satisfy that requirement. Therefore, the US Government must apply the UES to its activities within the RMI. Because the ESA and UES both apply to this action, this biological opinion was written in a manner that considers and complies with each of those standards, as applicable.

Section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended (ESA; 16 U.S.C. 1536(a)(2)) requires each federal agency to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. When a federal agency’s action “may affect” a listed species or its designated critical habitat, that agency is required to consult formally with the National Marine Fisheries Service (NMFS) or the U.S. Fish and Wildlife Service (FWS), depending upon the endangered species, threatened species, or designated critical habitat that may be affected by the action (50 CFR 402.14(a)). Federal agencies are exempt from this general requirement if they have concluded that an action “may affect, but is not likely to adversely affect” endangered species, threatened species or their designated critical habitat, and NMFS or the FWS concur with that conclusion (50 CFR 402.14 (b)).

If an action is likely to adversely affect a listed species, the appropriate agency (either NMFS or FWS) must provide a Biological Opinion (Opinion) to determine if the proposed action is likely to jeopardize the continued existence of listed species (50 CFR 402.02). “Jeopardize the continued existence of” means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species. *Id.*

The United States Army Rapid Capabilities and Critical Technologies Office (RCCTO) is the lead agency and action proponent for the proposed action, along with the United States Army Space and Missile Defense Command (USASMDC) as a participating agency. The UES requires all parties of the U.S. Government involved in this project to consult or coordinate with the NMFS and the FWS to conserve species and habitats of special concern at USAKA. We will address the USASMDC exclusively in this document as the participating agency. Section 3.4 of the UES establishes the standards and procedures to be followed “…to ensure that actions taken at USAKA will not jeopardize the continued existence of these species or result in destroying or adversely changing the habitats on which they depend." Section 3.4 is derived primarily from the regulations implementing the ESA, other U.S. regulations, and wildlife protection statutes of the RMI. As such, the list of UES consultation species includes all species present in the RMI that are listed under the ESA (including those that are candidates or are proposed for listing), all marine mammals protected under the MMPA, and all species and critical habitats as designated under RMI law. However, no critical habitat has yet been designated in the RMI.

Under the UES, "the final biological opinion shall contain the consulting agency's opinion on whether or not the action is likely to jeopardize the continued existence of a species or to eliminate a species at USAKA, or to eliminate, destroy, or adversely modify critical habitats in the RMI" (UES at 3-4.5.3(e)). Although the UES does not specifically define jeopardy, the Compact clearly intends that the UES provide substantially similar environmental protections as the ESA. We interpret this to include adoption of the ESA definition of jeopardy, as described above, and this review relies upon the ESA definition of jeopardy to reach its final conclusions.

This document represents NMFS' final Biological Opinion of the effects on marine species protected under the ESA and the UES that may result from the FT-3 flight test from the PSCA on Kodiak Island, Alaska, to the RTS at Illeginni Islet in Kwajalein Atoll. This Opinion is based on the review of: the RCCTO and USASMDC September 22, 2020, Biological Assessment (BA) for the proposed action; recovery plans for U.S. Pacific populations of ESA-listed marine mammals, sea turtles, and elasmobranchs; published and unpublished scientific information on the biology and ecology of ESA-listed marine species, UES-consultation marine species, and other marine species of concern in the action area; monitoring reports and research in the region; biological opinions on similar actions; and relevant scientific and gray literature (see Literature Cited).

1.1 Consultation History

A brief Section 7 consultation history for ongoing programmatic launch activities at PSCA is provided below for ESA-listed species and designated critical habitats:

In 2011, NMFS issued a programmatic Biological Opinion for space vehicle and missile launch operations at PSCA for the 5-year period from 2011-2016 (NMFS 2011). In this biological opinion, the NMFS concluded that launch operations at PSCA were not likely to adversely affect ESA-listed whales (i.e., fin whale, humpback whale, and North Pacific right whale). NMFS also concluded that launch operations would not destroy or adversely modify Steller sea lion (*Eumetopias jubatus*) critical habitat. NMFS concluded that launch noise from the loudest launch vehicles may affect and would likely adversely affect Steller sea lions through non-lethal incidental take[1]. The biological opinion concluded that this take was not likely to jeopardize the

[1] "Take" is defined by the ESA as "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" 16 U.S.C. 1532 (19). NMFS defines "harass" as to "create 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" (Application and Interpretation of the Term "Harass" Pursuant to the Endangered Species Act: NMFS Guidance Memo May 2, 2016). NMFS defines "harm" as "an act which actually kills or injures fish or wildlife." Such an act may include significant habitat modification or degradation where it actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding or sheltering.

continued existence of the species and required monitoring of pinnipeds quarterly and during launches (NMFS 2011).

In 2017, the Alaska Aerospace Corporation (AAC) applied for a new 5-year programmatic permit under the MMPA for minimal takes of marine mammals incidental to launching of space launch vehicles and missiles at the PSCA (AAC 2016). In their application, AAC concluded that ongoing space and missile launch activities at the PSCA would not affect ESA-listed marine species in the action area (i.e., Steller sea lions, gray whales, and humpback whales) (AAC 2016). When NMFS issued regulations (valid May 2017 through April 2022) allowing for the issuance of Letters of Authorization under the. MMPA for the incidental take of harbor seals during launch operations at the PSCA (82 FR 14996 [24 March 2017]), NMFS determined that proposed activities would not affect Steller sea lions (or any other ESA-listed species) and that no consultation was required under the ESA.

On March 2, 2017 the US Navy SSP consulted with NMFS on the effects of a near identical operation to the proposed action, the Flight Experiment 1 (FE-1). NMFS concluded in a biological opinion dated May 12, 2017 that the FE-1 would not jeopardize 59 marine ESA/UES consultation species (PIR-2017-10125; I-PI-17-1504-AG).

On September 27, 2019 NMFS issued a Biological Opinion for FE-2 activities (NMFS 2019) (PIRO-2019-02607; I-PI-19-1782-AG). In this biological opinion, NMFS concluded that the FE-2 action was not likely to adversely affect 54 marine ESA/UES consultation species and would have no effect on critical habitats designated under the ESA and/or the UES at Kwajalein Atoll. NMFS determined that exposure to FE-2 payload debris or impact ejecta was likely to adversely affect 11 UES consultation species in reef habitats near Illeginni Islet. Furthermore, NMFS determined that the FE-2 test was not likely to jeopardize the continued existence of any of these species.

On July 23, 2020 NMFS held a pre-consultation/technical assistance and coordination meeting with USASMDC and KFS, LLC. During this meeting, USASMDC and KFS (supporting company), LLC personnel met with NMFS Pacific Islands Regional Office (PIRO) staff to provide NMFS with information regarding the proposed FT-3 project and to discuss a desired consultation plan for the proposed action. NMFS PIRO personnel requested that PIRO conduct consultation for all portions of the proposed action and that PIRO would be responsible for coordination with the Alaska Regional Office where necessary. During this coordination meeting, parties discussed using the Flight Experiment–2 (FE-2) Biological Assessment (U.S. Navy 2019) for baseline conditions in the Kwajalein Atoll portion of the action area.

On September 24, 2020 NMFS received from RCCTO and USASMDC this consultation request in a letter dated September 22, 2020 stating that they had determined that the FT-3 program (the proposed action) may affect, but is not likely to adversely affect 38 marine ESA and/or UES consultation species and stellar sea lion critical habitat, and requested consultation for those species.

On October 20, 2020 NMFS sent David Fuller (action agency contact) an email informing the U.S. Army that NMFS will be moving forward with formal consultation.

On October 22, NMFS sent David Fuller an email requesting clarification on the RCCTO/USASMDC species determinations.

On October 29, 2020 the RCCTO/USASMDC and KFS, LLC personnel conducted a call with NMFS to discuss the proposed action and NMFS' reasoning for moving forward with a Biological Opinion.

On November 4, 2020 we received an email from the RCCTO/USASMDC with an updated consultation request letter with modifications clarifying the species determinations, and stating that they had determined that the FT-3 program (the proposed action) may affect 46 marine ESA and/or UES consultation species (Table 1 and Table 2), and requested consultation for those species.

In the BA, RCCTO/USASMDC further determined that the proposed action was not likely to adversely affect (NLAA) 36 consultation species (Table 1), and likely to adversely affect (LAA) the 10 marine UES consultation species listed in Table 2. Formal consultation was initiated on November 4, 2020.

Table 1. Marine consultation species not likely to be adversely affected by the proposed action

Scientific Name	**Species**	**ESA**	**MMPA**	**CITES**	**RMI**
		Sea Turtles			
Caretta caretta	North Pacific Loggerhead Sea Turtle Distinct Population Segment (DPS)	Endangered		X	X
Chelonia mydas	Central Western Pacific Green Sea Turtle DPS	Endangered		X	X
Dermochelys coriacea	Leatherback Sea Turtle	Endangered		X	X
Eretmochelys imbricata	Hawksbill Sea Turtle	Endangered		X	X
		Marine Mammals			
Eumetopias jubatus	Western Steller Sea Lion DPS	Endangered	X		
Balaenoptera borealis	Sei Whale	Endangered	X	X	
B. musculus	Blue Whale	Endangered	X	X	X
B. physalus	Fin Whale	Endangered	X	X	
Delphinus delphis	Short-beaked common Dolphin				X
Feresa attenuata	Pygmy Killer Whale		X		
Globicephala macrorhynchus	Short-finned Pilot Whale		X		
Grampus griseus	Risso's Dolphin		X		
Kogia breviceps	Pygmy Sperm Whale			X	
Megaptera novaeangliae	Mexico and Western North Pacific Humpback Whale DPSs	Endangered	X	X	
Mesoplodon densirostris	Blainville's Beaked Whale		X		
Orcinus orca	Killer Whale		X		
Peponocephala	Melon-Headed Whale		X		

Scientific Name	Species	ESA	MMPA	CITES	RMI
electra					
Physeter macrocephalus	Sperm Whale	Endangered	X	X	X
Eschrichtius robustus	Western North Pacific Gray Whale DPS				
Eubalaena japonica	North Pacific Right Whale				
Stenella attenuata	Spotted Dolphin				X
S. coeruleoalba	Striped Dolphin				X
S. longirostris	Spinner Dolphin		X		X
Tursiops truncatus	Bottlenose Dolphin, Pacific		X		
Fish					
Alopias superciliosus	Bigeye Thresher Shark				X
Manta alfredi	Reef manta ray				X
M. birostris	Giant manta ray				
Sphyrna lewini	Scalloped Hammerhead Shark	Threatened			X
Thunnus orientalis	Pacific bluefin tuna				X
Carcharhinus longimanus	Oceanic white-tip shark	Threatened			
Oncorhynchus keta	Hood Canal Summer-run Chum Salmon Evolutionary Significant Unit (ESU)/DPS	Threatened			
Oncorhynchus kisutch	Lower Columbia River Coho Salmon ESU/DPS	Threatened			
Oncorhynchus mykiss	Lower Columbia River, Middle Columbia River, Snake River Basin, Upper Columbia River, and Upper Willamette River Steelhead ESUs/DPSs	Threatened			
Oncorhynchus nerka	Snake River Sockeye Salmon ESU/DPS	Endangered			
Oncorhynchus tshawytscha	Lower Columbia River, Puget Sound, Snake River Fall, Snake River Spring/Summer, Upper Columbia River Spring, and Upper Willamette River Chinook Salmon ESUs/DPSs	Threatened; Upper Columbia River Spring ESU/DPS Endangered			

Table 2. Marine consultation species likely to be adversely affected by the proposed action

Scientific Name	Species	ESA	MMPA	CITES	RMI
		Fish			
Cheilinus undulatus	Humphead Wrasse			X	X
Corals					
A. microclados	No Common Name			X	X
A. polystoma	No Common Name			X	X
Cyphastrea agassizi	No Common Name			X	X
Heliopora coerulea	No Common Name			X	X
Pavona venosa	No Common Name			X	X
Turbinaria reniformis	No Common Name			X	X
Pocillopora meandrina	Cauliflower Coral				X
Mollusks					
Tectus niloticus	Top Shell Snail				X
Hippopus hippopus	Giant clam	Candidate			
Tridacna squamosa	Giant clam	Candidate			X

Furthermore, the U.S. Army has determined that the proposed action would have no effect on North Pacific right whale (*Eubalaena japonica*) or Hawaiian monk seal (*Neomonachus schauinslandi*) critical habitat, and is not likely to adversely affect Steller sea lion (*Eumetopias jubatus*) critical habitat.

The U.S. Army has determined that the proposed action would have no effect on 15 coral species (*Acanthastrea brevis, Acropora aculeus, A. aspera, A. dendrum, A. listeri, A. speciosa, A. tenella, A. vaughani, Alveopora verrilliana, Leptoseris incrustans, Montipora caliculata, Pavona diffluens, P. decussata, Turbinaria mesenterina, and T. stellulata*), two mollusk species (*Pinctada margaritifera and Tridacna gigas*), olive ridley sea turtles (*Lepidochelys olivacea*), or the North Pacific DPS of green turtles (*Chelonia mydas*).

On January 4th, 2021, NMFS sent the Action Agency a request to change the species determination for the humphead wrasse from NLAA to LAA. The Action Agency responded on January 7th, 2021, confirming their agreement to this change.

2 DESCRIPTION OF THE PROPOSED ACTION

The proposed action is described in detail in the RCCTO/USASMDC BA. The proposed FT-3 is designed to test a long-range, global strike capable technology. The purpose of the proposed action is to gain progress on testing, modeling, and to collect data on simulating developmental payload systems and to advance technologies necessary to establish operational strike capabilities. Specifically, the FT-3 experiment would develop, integrate, and flight test this longer-range payload system to demonstrate the maturity of key technologies. These technologies include precision navigation, guidance and control, and enabling capabilities, and data collected would be utilized to improve the models that predict the performance of the system. The developmental payload would be launched from the Pacific Spaceport Complex Alaska (PSCA) and would travel across a broad ocean area (BOA) of the Pacific Ocean, and payload impact at Ronald Reagan Ballistic Missile Defense Test Site (RTS) at Illeginni Islet, RMI.

The proposed action consists of pre-flight preparations in the BOA and at USAKA, the FT-3 flight test across the BOA with three motor splash downs, payload impact, and post-flight impact data collection, debris recovery, and clean-up operations at USAKA. The U.S. Army RCCTO proposes to conduct the one hypersonic flight test within the second half of fiscal year 2021. The following subsections include descriptions of the launch vehicle, pre-flight operations, flight, terminal phase operations, and post-flight operations.

Launch Vehicle Description

The FT-3 launch vehicle would consist of a 3-stage booster system (Table 3) and payload. Table 3 shows the FT-3 vehicle component characteristics. The first stage motor is 4.7 meters (m) (15.5 feet [ft]) long with a diameter of 74 inches (in) (188 centimeters [cm]). The second stage motor is 9.2 m (30 ft) long with a diameter of 50 in (130 cm) and the third stage motor is 3.1 m (10 ft) long with a diameter of 50 in (130 cm). The amount of solid propellant in the three boosters of the vehicle totals approximately 36,495 kilograms (kg; 80,461 pounds [lbs]).

Table 3. FT-3 Vehicle Component Characteristics

Component	Representative Launch Vehicle (not to scale)	Type	Diameter	Approximate Length	Propellant Type and Mass
Payload		Sandia National Laboratories	Unknown	Unknown	N/A
Stage 3 Booster		Orion 50 XLT	130 cm (50 inches)	3.1 m (10 ft)	Solid 3,915 kg (8,632 lb)
Stage 2 Booster		Orion 50S XLT	130 cm (50 inches)	9.2 m (30 ft)	Solid 15,037 kg (33,152 lb)
Stage 1 Booster		C4	188 cm (74 inches)	4.7 m (15.5 ft)	Solid 17,543 kg (38,677 lb)

Sources: MDA 2007, MDA 2019a, MDA 2019b

Table 4 details the launch vehicle and payload system characteristics. The FT-3 payload would weigh approximately 350 kilograms (kg) (750 pounds [lb]) and would be similar to the recently tested FE-2 payload (U.S. Navy 2019), except that the payload would contain approximately 10% of the tungsten contained on the FE-2 payload (which was 454 kg, or 1,000 lbs).

Table 4. Launch Vehicle and Payload Characteristics

	Launch Vehicle	**Payload** [a]
Major Components and Structure	Rocket motors, propellant, magnesium thorium (booster interstage), nitrogen gas, halon, asbestos, battery electrolytes (lithium-ion, silver zinc)	Aluminum, titanium, steel, tantalum, tungsten, carbon, silica, Teflon®, and alloys containing chromium, magnesium, and nickel
Communications	Various 5- to 20-watt radio frequency transmitters; one maximum 400-watt radio frequency pulse	Various 5- to 20-watt (radio frequency) transmitters
Power	Rechargeable lithium batteries	Lithium-ion batteries
Other	Small Class C (1.4) electro-explosive devices	Mechanical and flight termination Systems: initiators and explosive charges

Sources: USASMDC/ARSTRAT 2014, U.S. Army 2020.

Pre-flight Preparations: PSCA, United States Army Garrison- Kwajalein Atoll (USAG-KA), RTS, and various other support facilities would participate in routine pre-flight support operations related to the proposed action. Support operations for the FT-3 proposed action would include base support, range safety, flight test support, and test instrumentation, at a minimum. *Pre-flight activities at these additional locations are covered under existing NEPA documentation and/or ESA section 7 consultations (such as the FE-2 test) for their ongoing activities.*

Pre-flight preparation activities would also occur on land at Illeginni Islet as well as in Kwajalein Atoll waters. Pre-flight activities would include several vessel round-trips and helicopter trips to Illeginni Islet for personnel and equipment transport. It is anticipated that, similar to other flight tests with payload impact at Illeginni Islet, there would be increased human activity on Illeginni Islet over a 3-month period (U.S. Army 2020). Heavy equipment, such as a backhoe or loader, may be used for placement of test equipment on Illeginni Islet and would be transported to the islet by barge or landing craft.

Launch: The FT-3 missile will be launched from land at PSCA and enter an over-ocean flight phase within seconds after the launch. The PSCA was developed/is operated by the Alaska Aerospace Corporation (AAC) on Kodiak Island, Alaska, where it supports the launch of rockets and satellites for commercial and Government aerospace interests. For the purposes of this consultation, the U.S. Army RCCTO and USASMDC have concluded that all launch activities at PSCA are covered under existing programmatic consultations for ongoing space and missile launch activities at PSCA, and that no further consultation is needed for launch activities portion of this proposed action (see Consultation History). Therefore, effects of the launch will not be covered under or discussed further in this consultation.

Over-Ocean Flight: After launching, a series of ground, sea, and/or air based sensors would monitor the FT-3 vehicle during flight and collect data on vehicle flight and system performance. Following motor ignition and liftoff from the launch location, the vehicle booster stages would burn out sequentially and drop into the North Pacific Ocean during the test flight. The first-stage motor would burn out, separate from the second stage, and drop in U.S. territorial waters off Kodiak Island (Figure 2). Farther into flight over the BOA, the second-stage would burn out, separate, and splash down in the North Pacific Ocean. Jettison of the fairing and payload separation from the fairing would occur inside the atmosphere. Splashdown of all three spent motor stages and the fairing would occur at different points in the open ocean. Figure 1 depicts the drop zones for the rocket motors. After stage 3 motor burn-out and separation, the payload would continue flight over the Pacific Ocean toward Kwajalein Atoll while the stage 3 booster would splash down in the North Pacific Ocean.

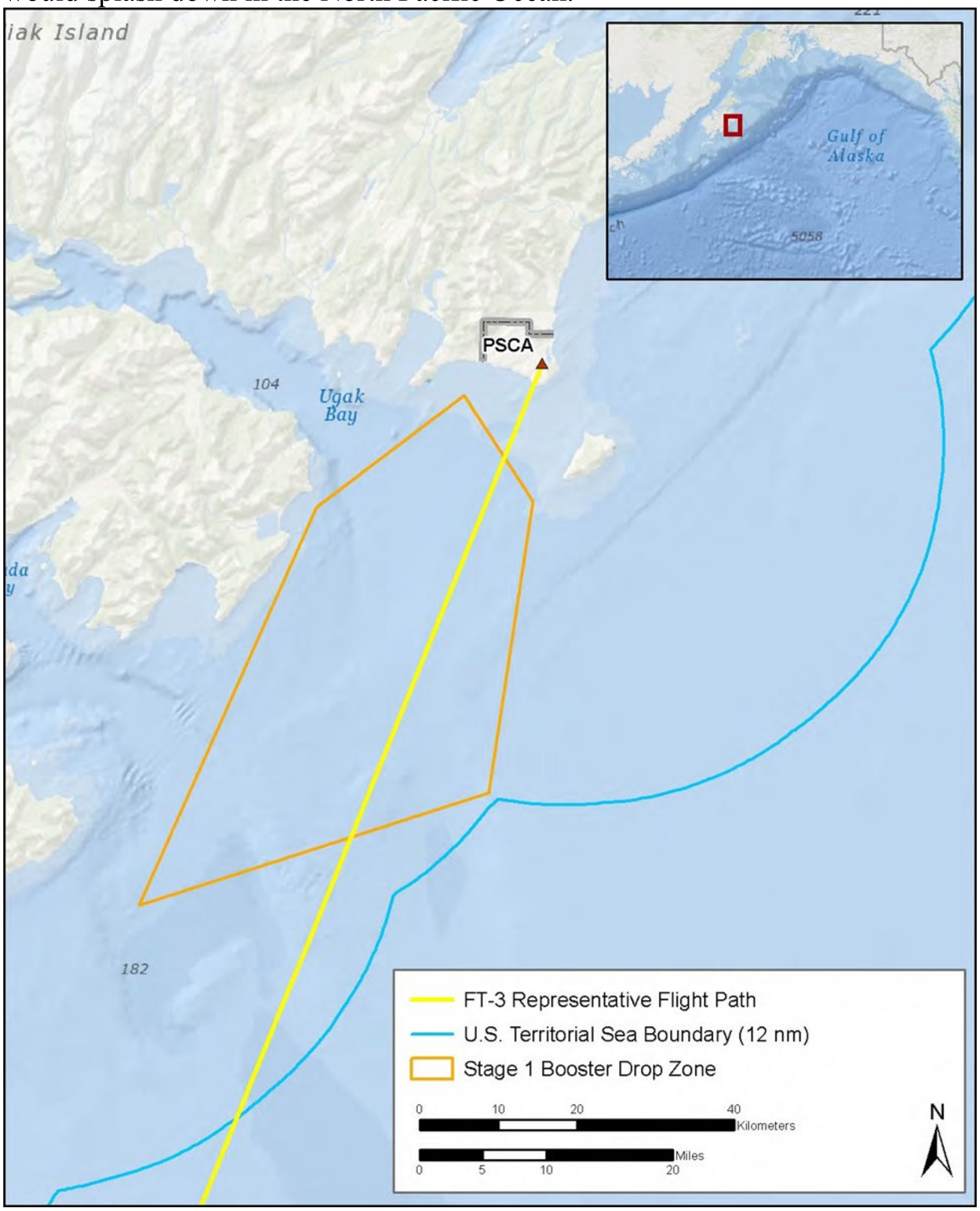


Figure 2. FT-3 Representative Flight Path and Stage 1 Booster Drop Zone.

If the launch vehicle were to deviate from its course or should other problems occur during flight that might jeopardize public safety, the onboard flight termination system would be activated. This action would initiate a predetermined safe mode for the vehicle, causing it to terminate flight and fall into the ocean. Computer-monitored destruct lines are pre-programmed into the flight safety software to avoid any debris falling on inhabited areas, and no termination debris would be expected to fall on land. Similarly, if data from the payload onboard sensors indicated that there was not sufficient energy to reach the target area, payload flight would be terminated, and the payload would fall along a ballistic trajectory into the BOA. The need for flight termination is unplanned and would be an unexpected and unlikely event.

The terminal end of the payload flight would be at Kwajalein Atoll in the RMI with payload impact at Illeginni Islet (Figure 3). The payload impact zone on Illeginni Islet is an area approximately 137 m (450 ft) by 290 m (950 ft) on the non-forested, northwest end of the islet. A reef or shallow water impact is not part of the proposed action, would be unintentional, and is considered very unlikely to occur. A crater would form as a result of payload impact and natural substrate (coral rubble) would be ejected around the rim of the crater. Information concerning the vehicle's energy release on impact is unknown. However, it is expected that cratering as a result of FT-3 payload impact would be similar cratering for previous test program impacts on Illeginni Islet. The proposed action has the potential to result in elevated noise levels near Illeginni Islet due to sonic booms from payload approach and payload impact.

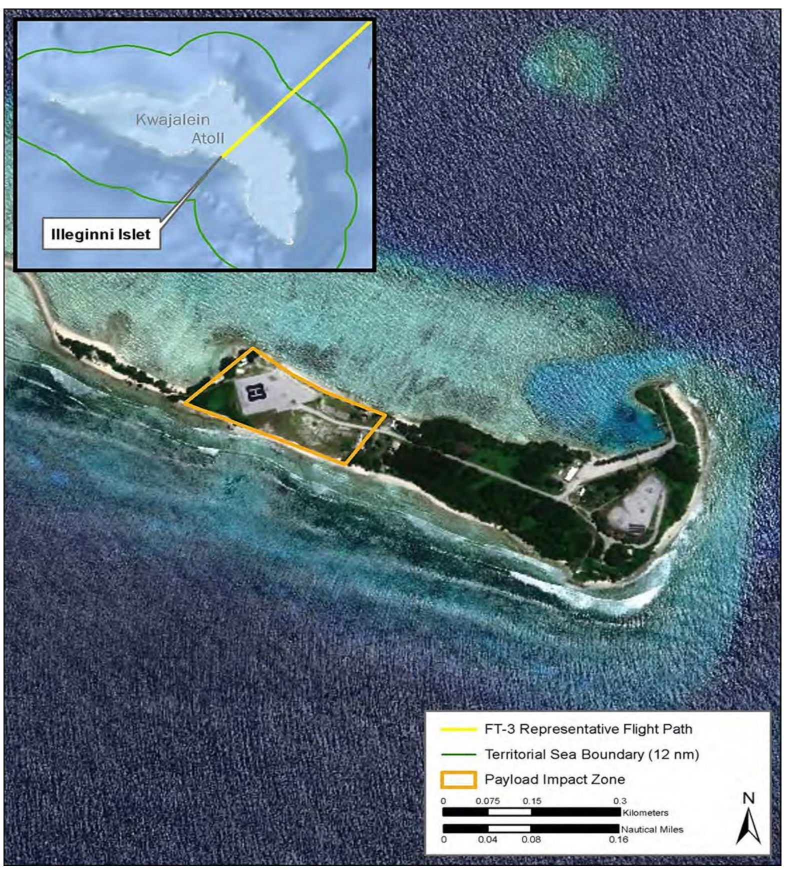


Figure 3. Representative Flight Path and Payload Impact Location, Illeginni Islet, Kwajalein Atoll, Republic of the Marshall Islands.

Sensor Coverage in the BOA:
The flight path would initiate from PSCA, travel across the BOA, and continue to USAKA in the RMI. A series of ground, sea, and/or air based sensors would monitor the FT-3 vehicle during flight and collect data on vehicle flight and system performance. All of these sensors are used for existing programs and would be scheduled for use based on availability. Ground based optics, telemetry, and radars at PSCA and USAG-KA may be used as well as several sea-based sensors (including the Range Safety System onboard the U.S. Motor Vessel Pacific Collector, the Kwajalein Mobile Range Safety System, and the Pacific Tracker). However, all of these sensors are used for existing programs and effects of their operation have been analyzed for those programs.

Sensor Coverage at USAKA:
Several self-stationing raft-borne sensors may be deployed and recovered on both the ocean and lagoon sides of Illeginni Islet to collect data on payload descent and impact. These rafts would be very similar used for the FE-2 flight, however the number of rafts is not specified for this test (Figure 4). Within a day of the flight test, one or two vessels would be used to deploy the rafts. These rafts would be equipped with battery-powered electric motors for propulsion to maintain position in the water. Two types of rafts would be used, hydrophone rafts and camera/radar rafts. Hydrophone rafts are equipped with hydrophones that are deployed off the back of the raft and hang in the water at a depth of approximately 3.7 m (12 ft). Camera rafts are equipped with stabilized cameras and/or radar as well as hydrophones as described above. Before the flight test, one or two landing craft utility vessels would be used to deploy the rafts. Rafts would be deployed in waters at least 4 m (13 ft) deep to avoid contact with the substrate and/or coral colonies (pers. comm. via email between Biologist Shelby Creager and David Fuller [U.S. Army], December 21, 2020).

Figure 4. Notional Locations of LIDSS Rafts.

Post-flight Operations:
Post flight operations would include personnel recovering FT-3 post-flight debris from land either manually or with heavy equipment similar to that used during site preparation. While the U.S. Army RCCTO and USASMDC do not expect debris to reach the ocean, if any FT-3 debris is present in the shallow waters (less than 55 m [180 ft] deep) near Illeginni Islet, it would be removed where reasonably possible without impacting listed species or habitats such as reef. The impact crater would be excavated using a backhoe or front-end loader and the excavated material would be screened to recover debris. The crater would then be backfilled with the excavated material and substrate which was ejected during crater formation. USAG-KA and RTS personnel are usually involved in these operations. In preparation for the test, USASMDC would prepare a post-test recovery/cleanup plan detailing specific actions which would be taken, including the Mitigation Measures/Best Management Practices (BMPs) listed below, to avoid impacts to listed species. All waste materials would be appropriately stored and returned to Kwajalein Islet for proper disposal.

If an inadvertent impact occurs on the reef, reef flat, or in shallow waters less than 3 m (10 ft) deep, an inspection by project personnel would occur within 24 hours. Representatives from NMFS and the USFWS would also be invited to inspect the site as soon as practical after the test. The inspectors would assess any damage to coral and other natural and biological resources and, in coordination with USASMDC, USAG-KA, and RTS representatives, decide on any response measures that may be required. Payload recovery/cleanup operations and removal of surface floating debris in the lagoon and ocean reef flats, within 152 to 300 m (500 to 1,000 ft) of the shoreline, would be conducted similarly to land operations when tide conditions and water depth permit. In the event of an unintentional shallow water impact, visible debris would be removed as feasible and while protecting sensitive shallow-water resources.

Mitigation Measures/Best Management Practices (BMPs):

- During travel to and from impact zones, including Illeginni Islet, ship personnel would monitor for marine mammals and sea turtles to avoid potential ship strikes. Vessel operators would adjust speed or raft deployment based on expected animal locations, densities, and or lighting and turbidity conditions.
- Any observation of marine mammals or sea turtles during ship travel or overflights would be reported to the USAG-KA Environmental Engineer.
- 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 materials and waste management systems of USAG-KA.
- Vessel and heavy equipment operators would inspect and clean equipment for fuel or fluid leaks prior to use or transport and would not intentionally discharge fuels or waste materials into terrestrial or marine environments.
- All equipment and packages shipped to USAKA will undergo inspection prior to shipment to prevent the introduction of alien species into Kwajalein Atoll.

- Pre-flight monitoring by qualified personnel will be conducted on Illeginni Islet for sea turtles or sea turtle nests. For at least 8 weeks preceding the FT-3 launch, Illeginni Islet would be surveyed by pre-test personnel for sea turtles, sea turtle nesting activity, and sea turtle nests. If possible, personnel will inspect the area within days of the launch. If sea turtles or sea turtle nests are observed near the impact area, observations would be reported to appropriate test and USAG-KA personnel for consideration in approval of the launch and to NMFS.
- Personnel will report any observations of sea turtles or sea turtle nests on Illeginni to appropriate test and USAG-KA personnel to provide to NMFS.
- To avoid impacts on coral heads in waters near Illeginni Islet, sensor rafts would not be located in waters less than 4 m (13 ft) deep.
- When feasible, within one day after the land impact test at Illeginni Islet, USAG-KA environmental staff would survey the islet and the near-shore waters for any injured wildlife, damaged coral, or damage to sensitive habitats. Any impacts to biological resources would be reported to the Appropriate Agencies, with USFWS and NMFS offered the opportunity to inspect the impact area to provide guidance on mitigations.
- Although unlikely, any dead or injured marine mammals or sea turtles sighted by post-flight personnel would be reported to the USAG-KA Environmental Office and SMDC, who would then inform NMFS and USFWS. USAG-KA 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.
- For recovery and rehabilitation of any injured migratory birds or sea turtles found at Illeginni Islet, USFWS and NMFS would be notified to advise on best care practices and qualified biologists would be allowed to assist in recovering and rehabilitating any injured sea turtles found.
- If an inadvertent impact occurs on the reef, reef flat, or in shallow waters less than 3 m (10 ft) deep, an inspection by project personnel would occur within 24 hours. Representatives from the NMFS and USFWS would also be invited to inspect the site as soon as practical after the test. The inspectors would assess any damage to coral and other natural and biological resources and, in coordination with SSP, USAG-KA and RTS representatives, decide on any response measures that may be required.
- Debris recovery and site cleanup would be performed for land or shallow water impacts. To minimize long-term risks to marine life, all visible project-related debris would be recovered during post-flight operations, including debris in shallow lagoon or ocean waters by range divers. In all cases, recovery and cleanup would be conducted in a manner to minimize further impacts on biological resources.
- At Illeginni Islet, should any missile components or debris impact areas of sensitive biological resources (i.e., sea turtle nesting habitat or coral reef), a USFWS or NMFS biologist would be allowed to provide guidance and/or assistance in recovery operations to minimize impacts on such resources. To the greatest extent practicable, when moving or operating heavy equipment on the reef during post-test clean up, protected marine species including invertebrates will be avoided or effects to them will be minimized. This may include movement of these organisms out of the area likely to be affected.
- During post-test recovery and cleanup, should personnel observe endangered, threatened, or other species requiring consultation moving into the area, work would be delayed until such species were out of harm’s way or leave the area.

2.1 Interrelated/Interdependent Actions

Military training and testing at Kwajalein Atoll has been ongoing since World War II. Testing of missile programs at Kwajalein began in 1959 for the Nike Zeus missile program. The Minuteman (MM) I program began in 1962, MMII began in 1965, and MMIII began in 1970. In addition to the MM program, anti-ballistic missile (ex. THAAD), and other missile development and testing take place at the RTS, along with other military training and testing activities, and commercial missile launches. If it were not for these numerous activities, it is doubtful that the facilities at USAKA and RTS would be required. Therefore, actions to develop and maintain USAKA and RTS facilities and infrastructure, and to support the various missions, are interrelated and/or interdependent with the training and testing activities that occur at the USAKA and RTS. However, much of the infrastructure and facilities are designed to support numerous programs and missions, with few being project-specific. Therefore, support activities that are solely attributable to the FT-3 program constitute a small portion of the total that occur at USAKA and RTS in support of the site's numerous missions. Further, per the Document of Environmental Protection (DEP) procedures outlined in the UES, any USAKA and RTS actions that may affect the USAKA environment require structured environmental review, with coordination and/or consultation as appropriate. Based on this, we expect that interrelated or interdependent actions that may be solely attributable to the FT-3 flight would be virtually inseparable from the routine activities at USAKA and RTS, and any impacts those actions may have would be considered through the DEP procedures outlined in the UES.

2.2 Action Area

As described above, the action area for this consultation begins after the launch immediately offshore from PSCA, Kodiak Island, Alaska, where the sonic boom of the accelerating missiles would reach the ocean surface. The PSCA was developed and is operated by the Alaska Aerospace Corporation (AAC) on Kodiak Island, Alaska. It supports the launch of rockets and satellites for commercial and Government aerospace interests. PSCA is located on State of Alaska land and is under an operating permit issued by the Federal Aviation Administration (FAA).

The action area then extends from there, across the Pacific Ocean along a relatively narrow band of ocean area directly under the flight path of the missile, where the sonic boom and spent missile components are expected to impact the surface (Figure 1). The flight path includes flight over the Northwest Hawaiian Islands including the waters of the U.S. exclusive economic zone (EEZ) there. However, FT-3 flight would occur at a high altitude over the BOA and no debris would enter U.S. territory or EEZ waters near the Hawaiian Islands. The action area also includes the area of and around Kwajalein Atoll, RMI where the payload would impact the target areas (Figure 3), as well as the areas immediately around support vessels and sensor rafts used to monitor the payload impacts, and the down-current extent of any plumes that may result from discharges of wastes or toxic chemicals such as fuels and/or lubricants associated with the machinery used for this activity.

The launch portion of this action is located within Steller sea lion (Western DPS) critical habitat.

3 SPECIES AND CRITICAL HABITATS NOT LIKELY TO BE ADVERSELY AFFECTED

As explained above in Section 1, RCCTO/USASMDC determined that the proposed action was not likely to adversely affect (NLAA) the 36 consultation species listed in Table 1. The proposed action would also have no effect on North Pacific right whale or Hawaiian monk seal critical habitat, and is not likely to adversely affect Steller sea lion critical habitat. This section serves as our concurrence under section 7 of the ESA of 1973, as amended (16 U.S.C. §1531 et seq.), and under section 3-4.5.3(d) of the UES, 15th Edition, with RCCTO/USASMDC's determination.

The UES does not specifically define the procedure to make a NLAA determination. However, the Compact clearly intends that the UES provide substantially similar environmental protections as the ESA. We interpret this to include adoption of the ESA NLAA determination process. In order to determine that a proposed action is not likely to adversely affect listed species, under the ESA, we must find that the effects of the proposed action are expected to be insignificant, discountable[2], or beneficial as defined in the joint FWS-NMFS Endangered Species Consultation Handbook. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs; discountable effects are those that are extremely unlikely to occur; and beneficial effects are positive effects without any adverse effects (USFWS and NMFS 1998). As described in Section 2, test flights have three distinct phases: Launch; Over-Ocean Flight; and Terminal Flight and Impact in the RMI. Each phase has potential stressors, listed below, that are based on what the missile is doing, and on activities done to support the test. As discussed earlier, effects from launch activities associated with the proposed action are covered under an existing Programmatic and will not be discussed further in this consultation.

<u>Over-Ocean Flight</u>: The potential stressors during over-ocean flight are:

a. Exposure to elevated noise levels;
b. Impact by falling missile components; and
c. Exposure to hazardous materials.

<u>Terminal Flight and Reentry Vehicle Impact in the RMI</u>: The potential stressors during terminal flight, payload impact, and preparation and restoration work at Kwajalein Atoll are:

a. Exposure to elevated noise levels;
b. Impact by falling missile components;
c. Exposure to hazardous materials;
d. Disturbance from human activity and equipment operation; and
e. Collision with vessels.

NMFS has determined an additional stressor from this proposed action:

a. Long-term addition of man-made objects to the ocean.

Each of these stressors are addressed below to determine whether or not individuals of any of the ESA-listed and UES-protected marine species considered in this consultation are likely to be

[2] When the terms "discountable" or "discountable effects" appear in this document, they refer to potential effects that are found to support a "not likely to adversely affect" conclusion because they are extremely unlikely to occur. The use of these terms should not be interpreted as having any meaning inconsistent with the ESA regulatory definition of "effects of the action."

adversely affected by that stressor. The species that may be exposed to stressors during each phase, and their likely response to exposure are based on the biological and/or ecological characteristics of each species. Any incidence where a stressor has more than a discountable risk of causing an adverse effect on any individual of the ESA- and/or UES-protected species will result in that stressor and those species being considered in the following biological opinion. Each stressor will have the exact same effects to species as described in the FE-2 program, with the exception of the differences listed below:

- Sound pressure levels at BOA/Alaska: no splashdown model was conducted for the FT-3, and therefore the FE-2 max will be used as a surrogate.
- Exposure to hazardous material at BOA/Alaska; same materials as FE-2 with the exception of larger quantities of propellant before launch.
- Elevated sound pressure levels at Kwajalein: sound pressure of payload impact expected to be less than 140 dB in-air at 18 m (59 ft) from impact. In-water sound pressures expected to be less than 166 dB.
- Exposure to hazardous material: there could be an introduction of up to 45 kg (100 lbs) of tungsten into terrestrial habitats.

a. Exposure to elevated noise levels: While in flight between PSCA and Kwajalein Atoll, the missile and the payload would travel at velocities that cause sonic booms. High-intensity in-water noise would be created when large missile components, such as spent rocket motors, impact the ocean's surface (splash-down). The impact from the payload hitting the ground will also create a sound to land that could transfer to water causing impulsive sound sources. High intensity impulsive noises can adversely affect marine life. The RCCTO/USASMDC will also create sounds from vessels and human activity in and near water during placement and retrieval of sensors and other data collecting instruments, and retrieval of debris from the impact. Effects vary with the frequency, intensity, and duration of the sound source, and the body structure and hearing characteristics of the affected animal. Effects may include: non-auditory physical injury; temporary or permanent hearing damage expressed as temporary threshold shift (TTS) and permanent threshold shift (PTS) respectively; and behavioral impacts such as temporarily masked communications or acoustic environmental cues and modified behaviors.

Sound is a mechanical disturbance consisting of minute vibrations that travel through a medium, such as air, ground, or water, and is generally characterized by several variables. Frequency describes the sound's pitch and is measured in hertz (Hz) or cycles per second. Sound level describes the sound's loudness. Loudness can be measured and quantified in several ways, but the logarithmic decibel (dB) is the most commonly used unit of measure, and sound pressure level (SPL) is a common and convenient term used to describe intensity. Sound exposure level (SEL) is a term that is used to describe the amount of sound energy a receiver is exposed to over time. The dB scale is exponential. For example, 10 dB yields a sound level 10 times more intense than 1 dB, while a 20 dB level equates to 100 times more intense, and a 30 dB level is 1,000 times more intense. Sound levels are compared to a reference sound pressure, based on the medium, and the unit of measure is the micro-Pascal (μPa). In water, sound pressure is typically referenced to a baseline of 1 μPa (re 1 μPa), vice the 20 μPa baseline used for in-air measurements. As a rule of thumb, 26 dB must be added to an in-air measurement to convert to an appropriate in-water value for an identical acoustic source (Bradley and Stern 2008). Root mean square (RMS) is the quadratic mean sound pressure over the duration of a single impulse. RMS is used to account for both positive and negative values so that they may be accounted for in the summation of pressure levels (Hastings and Popper 2005). This measurement is often used in the context of discussing behavioral effects, in part because behavioral effects, which often result from auditory cues, may be better expressed through averaged units rather than by peak pressures. For brevity, all further references to sound level assume dBRMS re 1 µPa, unless specified differently.

Transmission loss (attenuation of sound intensity over distance) varies according to several factors in water, such as water depth, bottom type, sea surface condition, salinity, and the amount of suspended solids in the water. Sound energy dissipates through mechanisms such as spreading, scattering, and absorption (Bradley and Stern 2008). Spreading refers to the apparent decrease in sound energy at any given point on the wave front because the sound energy is spread across an increasing area as the wave front radiates outward from the source. In unbounded homogenous water, sound spreads out spherically, losing as much as 7 dB with each doubling of range. Toward the other end of the spectrum, sound may expand cylindrically when vertically bounded such as by the surface and substrate, losing only about 3 dB with each doubling of range. Scattering refers to the sound energy that leaves the wave front when it "bounces" off of an irregular surface or particles in the water. Absorption refers to the energy that is lost through conversion to heat due to friction. Irregular substrates, rough surface waters, and particulates and bubbles in the water column increase scattering and absorption loss. Shallow nearshore water around Illeginni where the payload may impact, is vertically bounded by the seafloor and the surface, but is considered a poor environment for acoustic propagation because sound dissipates rapidly due to intense scattering and absorption. The unbounded deep open ocean waters where the motors would impact is considered a good acoustic environment where spherical spreading would predominate in the near field.

In the absence of location-specific transmission loss data, equations such as RL = SL – #Log(R) (RL = received level (dB); SL = source level (dB); # = spreading coefficient; and R = range in meters (m)) are used to estimate RL at a given range (isopleth). Spherical spreading loss is estimated with spreading coefficient of 20, while cylindrical spreading loss is estimated with spreading coefficient of 10. Spreading loss in near shore waters is typically somewhere between the two, with absorption and scattering increasing the loss. $RL = SL - 20_{Log}(R)$ was used here to estimate ranges in deep open ocean water, and $RL = SL - 15_{Log}(R)$ was used to estimate ranges in the lagoon and reef flat areas around Illeginni.

The sound pressures associated with non-auditory injury are very high and are generally associated with a shock wave that is generally not found in sounds that are created by a splashdown. The Navy identified a threshold for non-auditory injury based on gastrointestinal bursting at 237 dB re: 1 µPa (Finneran and Jenkins 2012). The sounds estimated from the splashdowns and sonic booms are clearly below those thresholds and are not likely to cause non-auditory injury to marine mammals, sea turtles, elasmobranchs, and large fishes.

Table 5. Estimated thresholds for TTS and behavioral changes for hearing groups.

Hearing Group	**TTS peak pressure threshold (SPL_{peak})**	**Weighted TTS onset threshold (SEL_{CUM})**	**Estimated threshold for behavioral changes**
Low-frequency cetaceans (humpback whale and other baleen whales)	213 dB	179 dB	Continuous = 120 dB_{RMS} Non-continuous = 160 dB (re: 1 µPa)
Mid-frequency cetaceans (dolphins, pilot whales and other toothed whales)	224 dB	178 dB	Continuous = 120 dB_{RMS} Non-continuous = 160 dB (re: 1 µPa)
High-frequency cetaceans (Kogia, true porpoises)	196 dB	153 dB	Continuous = 120 dB_{RMS} Non-continuous = 160 dB (re: 1 µPa)
Phocid pinnipeds (Hawaiian monk seals and other true seals)	212 dB	181 dB	Continuous = 120 dB_{RMS} Non-continuous = 160 dB (re: 1 µPa)
Sea turtles	224 dB	200 dB	160 dB
Sharks, rays, and fish	229 dB*	186 dB*	150 dB

* - SPL for lethal and sublethal damage to fish with swim bladders exposed to not specific to hearing.
Source: Finneran and Jenkins 2012; Popper et al. 2014; NMFS 2016.

The threshold for the onset of behavioral disturbance for all marine mammals from a single exposure to impulsive in-water sounds is ≥ 160 dB. Ongoing research suggests that these thresholds are both conservative and simplistic (detailed in Southall et al. 2007 and NOAA 2013). The draft revised thresholds for marine mammals uses two metrics: 1) exposure to peak sound pressure levels (SPL_{peak}); and 2) exposure to accumulated sound exposure levels (SELcum). The thresholds for single exposures to impulsive in-water sounds are listed in Table 5 for the onset of injury and temporary hearing impacts (NMFS 2016). Corals and mollusks can react to exposure to intense sound and could be affected by concussive forces if exposed to very intense sound sources such as an underwater detonation.

Sonic booms

A sonic boom is a thunder-like noise caused by the shock wave generated by an object moving at supersonic speed. As objects travel through the air, the air molecules are pushed aside with great force and this forms a shock wave much like a boat creates a bow wave (Kahle et al. 2019). Exposure to sonic booms would have insignificant effects on any of the species considered in this consultation. The FT-3 vehicle may generate sonic booms from shortly after launch, along the flight path in the BOA, to impact at or near Illeginni. Sound attenuates with distance from the source due to spreading and other factors. The higher the missile climbs, the quieter the sonic boom would be at the Earth's surface. Similarly, the greater the distance either side of the centerline of the flight path, the quieter the sonic boom. Therefore, the sound intensity would be loudest directly below the missile when the component is closest to the surface. Additionally, Laney and Cavanagh (2000) report that sound waves arriving at the air/water interface at an angle less steep than 13.3º from of the vertical will not normally propagate into water. This means that within the footprint of the sonic boom, only those marine animals within 13.3º of directly below the source could be expected to hear the sonic boom. Sounds originating in air, even intense ones like sonic booms transfer poorly into water, and most of its energy would refract at the surface or absorb in waves or natural surface disturbance at the surface. Once in the water, the sounds of a sonic boom would attenuate with distance. For this project, Kahle et al. (2019) estimated sound transfer from air to water using a model absent all atmospheric variables that would increase refraction, absorption, and dissipation. Sonic booms are also an impulsive and non-continuous sound. It's a "one shot" sound that doesn't repeat, and therefore, we use the peak sound as opposed to SEL. The loudest sounds were assumed to be near launch (145 dB re: 1 μPa) and at impact site (175 dB). Considering the short (few seconds) duration of the exposure, as noted below, neither are loud or long enough to cause TTS in animals of any of the hearing groups.

Using a model absent most variables that would reduce spreading, (Navy 2017) predicted the sonic boom footprint of sounds ≥ 160 dB to cover at most a 20.9 square mile radius, and 130.5 square mile radius for sounds ≥ 150 dB. The duration of a sonic boom at any given point within the footprint would be about 0.27 seconds.

In summary, at its loudest (175 dB), an in-water sonic boom exceeds no thresholds for injury to any of the species considered in this consultation, and it is well below the new proposed threshold for the onset of temporary hearing impacts for all hearing groups. Large areas were estimated to be affected by sounds high enough to cause behavioral responses for turtles and fish. However, the models did not account for refraction at the surface, wind or other atmospheric factors like wind and moisture that would dissipate the spreading; it will actually be a much smaller area, as would the corresponding estimate of animals affected by the sonic boom. Those factors would also significantly reduce the intensity of the noise in the water column where most of the UES consultation species spend the majority of their time. Nonetheless, the RCCTO/USASMDC estimated that they could affect animals in those respective areas of effect if they were near the surface. All animals in the action area could be exposed to the sonic boom at the impact site for no more than 0.3 seconds. We believe that, at most, an exposed individual may experience temporary behavioral disturbance in the form of slight changes in swimming direction or speed, feeding, or socializing, that would have no measurable effect on the animal's fitness, and would return to normal within moments of the exposure. Therefore, the exposure is expected to have insignificant effects.

Exposure to splash-down noise caused by the impact of the falling components in the BOA would be discountable for any of the species considered in this consultation. Three spent rocket motors and a nose fairing will fall into the ocean during the flight. The motors are the only components of sufficient size and velocity to create significant noise levels on splash-down. The noise generated by the splash-down will be heard by every hearing group, some even up to a few miles away. The RCCTO/USASMDC predicted the impulsive noises created by the splash based on the size of the components, listed in Table 6, and are based on the levels from the FE-2 flight.

While the location for the elevated noise levels would be different than for the FE-2 action, the effects on ESA-listed species in the BOA are not expected to be different.

Table 6. Stage Impact Contact Areas and Peak Sound Pressure Levels for FT-3 Vehicle Components (Kahle et al. 2019).

Stage	Contact Area m^2 (ft^2)	Peak Sound Pressure Level (dB re 1 µPa)
Stage 1 Spent Motor	27.73 (81.12)	218
Stage 2 Spent Motor	10.17 (33.38)	205
Nose Fairing	16.81 (55.14)	196
Stage 3 Spent Motor	5.94 (19.5)	201

Of the three motors, the first stage is the largest and the one expected to make the most noise on impact; a brief (less than one second) impulse of 218 dB @ 1m (Kahle et al. 2019). All objects would fall into deep open ocean waters. The first would splash-down shortly after takeoff in U.S. territorial waters just off Kodiak Island. The remaining objects would splash-down in deep ocean waters and closer to the target site at Illeginni Islet. The marine mammals, sea turtles, and fish (with the exception of humphead wrasses) listed in Tables 1 and 2 may be affected by this stressor. Steller sea lions and their critical habitat (discussed below) may be affected by this stressor near the launch.

As sounds dissipate with distance, they get less intense and are less capable of producing injury and behavioral responses. Assuming spherical spreading, the range to the hearing groups' TTS isopleths around each splash-down are listed in Table 7. Since exposure to sounds that could cause TTS would be harmful, we evaluated the probability of an exposure to UES consultation species. The best information available to describe the abundance and distribution of open ocean species considered in this consultation, supports the understanding that these animals are widely scattered, and their densities are very low in the open ocean areas where the motors would splash-down. We know of no information to suggest that the splash-down zones are in areas of any significance that would cause any congregations of these species.

Because the area of influence for TTS is within feet of their impact with the surface, the splash-downs will create an acoustic area of effect little or no greater than that of direct contact. As such, the probability of exposure is the same as a direct contact. Based on the methodology in the FE-2 BA, FT-3 BA, and the best available density estimates for consultation species in the action area, the number of expected exposures to sound pressures greater than the TTS threshold was calculated and modeled. Even when summed across all components, the maximum number of exposures to noise levels above the TTS threshold for any ESA-listed marine mammal was estimated to be less than 0.000001 individuals. Their modeling suggests that the probability of exposing marine mammals to a TTS-level exposure for a test flight would be between 1 in 1 million chance for the most common and sensitive species (Hanser et al. 2013; Rone et al. 2017; U.S. Navy 2014; Wade et al. 2016). This is likely an overestimate, since those calculations did not include weighting factors used in our evaluations, which reduce the zone of influence. Density estimates are not available to ESA-listed fish in the action area but these species would have similarly low densities and corresponding exposure risk. Based on the low annual number of splash-downs, their wide spacing, their small area of effect (< 100 m), and the expected low densities of the consultation species in the affected areas, we believe that the risk of exposure to splash-down acoustic effects in the open ocean is discountable for all of the species considered in this consultation.

Table 7. Estimated distances from source noise to TTS thresholds

Hearing Group	TTS peak pressure threshold (SPL_{peak})	Isopleths to TTS threshold from:			
		218 dB	205 dB	201 dB	196 dB
Low-frequency cetaceans (humpback whale and other baleen whales)	213 dB	1.8 m (5.9 feet)	0.4 m	0 m	0 m
Mid-frequency cetaceans (dolphins, pilot whales and other toothed whales)	224 dB	0 m	0 m	0 m	0 m
High-frequency cetaceans (Kogia, true porpoises)	196 dB	0.2 m (0.65 feet)	0 m	0 m	0 m
Phocid pinnipeds (Hawaiian monk seals and other true seals)	212 dB	1 m (3.28 feet)	0.2 m	0 m	0 m
Sea turtles	224 dB	0 m	0 m	0 m	0 m
Sharks, rays, and fish	229 dB*	0 m	0 m	0 m	0 m

In each hearing group, the individuals affected would have to be within six feet of the source to experience TTS. The sounds produced by splashdowns will be louder or equal to the 160 dB behavior response thresholds for all hearing groups, up to ½ mile away from the source for some species, and some species should be able to detect sounds (below behavior thresholds) for a few more miles. The sounds will be a short impulse, which will dissipate within seconds of impact. We believe that, at most, an exposed individual may experience temporary behavioral disturbance in the form of slight changes in swimming direction or speed, feeding, or socializing, that would have no measurable effect on the animal's fitness, and would return to normal within moments of the exposure.

The RCCTO/USASMDC will use vessels of varying size to install and retrieve equipment in water to gather data and remove debris. Large vessels can create sounds ranging from 170-190 dB (re: 1 μPa). Smaller vessels like skiffs with outboards range from 150-170 dB. Vessels are generally moving and the sound sources are considered non-impulsive and mobile. Human activity in water during retrieval of instruments, debris, and ejecta are not louder than those sources. Air bubbles from SCUBA are among the higher noise sources considered, and were reported by Radford et al. (2005) with mean levels of 161 dB and mean peak levels of 177 dB at 1 meter. We consider this source a non-impulsive, mobile, intermittent noise source. Because of the mobile nature of vessels and the intermittent nature of SCUBA bubbles, animals of all hearing groups are not likely to be exposed to the source long enough or continuously enough to experience TTS from vessels and SCUBA air bubbles. Furthermore, behavioral disturbances are likely brief because the mobile and temporary nature of the sources, and the noises will likely have an immeasurable effect on an individual's behavior during and after exposure.

For payload impacts in the ocean south of Illeginni, sea turtles, scalloped hammerhead sharks, oceanic white tip sharks, bigeye thresher sharks, manta rays, and humphead wrasse along the outer edge of the fringing reef may be exposed to a brief pulse of sound from air or underground. The RCCTO/USASMDC recorded similar payload strikes at Illeginni that produced sounds at a level of 140 dB re: 20 µPa 18 m from the source. Using backtracking, the measurements corresponds to a source level of 165 dB, and loosely corresponds to underwater sounds at 191 dB. This is likely an overestimate, because the model did not account for sound refraction, absorption, and other dissipation which happens in natural environments. By the time the sound reaches water, it will likely be less than 191 dB. The sound at payload impact will be too low to cause TTS. At most, we expect that an exposed individual may experience a temporary behavioral disturbance, in the form of slight change in swimming direction or speed, feeding, or socializing, that would have no measurable effect on the animal's fitness, and would return to normal within moments of the exposure. Therefore, the exposure is expected to have insignificant effects. Being much less acoustically sensitive, any exposed corals or mollusks that may be on the outer reef edge are expected to be unaffected by payload impact noise. Based on the best available information, exposure to splash-down noise is expected to have insignificant effects for all species considered in this consultation.

b. Impact by falling missile components: For the reasons discussed below, it is discountable that any of the species considered in this consultation would be hit by falling missile components, or to be close enough to an impact site to be significantly affected by concussive forces. It is also discountable that any of the species identified in Table 1 would be hit by payload or ejecta, or be significantly affected by concussive forces during the single planned payload strike on Illeginni Islet. However, the payload strike on Illeginni Islet may adversely affect the species identified in Table 2. Therefore, the potential effects of this stressor on those species are considered below in the effects of the action section (Section 6).

Direct Contact

The proposed action will result in spent rocket motors and the nose fairing splashing down into the BOA as well as impact of the payload on land at Illeginni Islet. These falling components will directly contact aquatic and/or terrestrial habitats and have the potential to directly contact consultation species. Payload component contact with the land may result in cratering and ejecta radiating out from the point of impact.

On January 11, 2005, the FWS issued a no-jeopardy Opinion regarding effects on nesting green sea turtles at Illeginni Islet for the U.S. Air Force's (USAF) Minuteman III (MMIII) testing, another missile test operation which is conducted at the same Islet and target site. The FWS Opinion included an incidental take statement for the annual loss of no more than three green sea turtle nests, or injury or loss of up to 300 hatchlings, per year as a result of reentry vehicles impacts at Illeginni Islet. While direct estimates for cratering and ejecta field size are not available for the FT-3 proposed payload, cratering and ejecta are expected to be similar to previous flight tests conducted at Illeginni Islet and less than those of MMIII reentry vehicles (RVs). Therefore, MMII estimates of cratering and shock waves (USAFGSC and USASMDC/ARSTRAT 2015) are used as a maximum bounding case for this proposed action.

Three spent rocket motors, and various smaller/lighter missile components would fall into the ocean during the flight. To be struck by a missile component, an animal would have to be at, or very close to the surface, and directly under the component when it hits. RCCTO/USASMDC (2020) reports that the first stage motor is about 4.7 m long and 74 in in diameter. The second stage motor is 9.2 m long with a diameter of 50 in and the third stage motor is 3.1 m long with a diameter of 50 in. If a spent rocket motor or other FT-3 component were to strike a cetacean, sea turtle, or fish near the water surface, the animal would most likely be killed or injured.

Based on FE-2 estimates, direct contact areas for these individual components are listed in Table 8 and total approximately 61 m^2. The number of expected exposures to direct contact from falling vehicle components was also calculated based on the methodology in the FE-2 BA and the best available density estimates for consultation species in the action area (U.S. Navy 2019)

A probability of direct contact and total number of exposures by falling components in the BOA were calculated for each marine mammal species and for a sea turtle guild for each FT-3 component based on component characteristics and animal density in the Action Area (SSP 2019). The probability analysis is based on probability theory and modified Venn diagrams with rectangular "footprint" areas for the individual animals and the component impact footprints within the Action Area. Sea turtles were combined into a "sea turtle guild" for analyses due to the lack of species specific occurrence data (Hanser et al. 2013). This sea turtle guild is composed of primarily green and hawksbill turtles as they account for nearly all sightings; however, in theory, the guild also encompasses leatherback, olive ridley, and loggerhead turtles (Hanser et al. 2013; SSP 2017, 2019). These analyses assume that all animals would be at or near the surface 100 percent of the time and that the animals are stationary. While these assumptions do not account for animals that spend the majority of time underwater or for any animal movement or potential avoidance to proposed activities, these assumptions should lead to a conservative estimate of direct contact effect on listed species.

Their modeling suggests that the probability of exposing marine mammals to direct impact or injurious concussive force for a test flight would be 0.00008 individuals. This corresponds to a 1 in 12,900 chance of being exposed to direct contact for the highest density species (i.e., fin whales) in the action area. These estimates are based on conservative analysis assumptions including that all animals would be at or near the surface 100 percent of the time and that the animals are stationary; therefore, these are likely overestimates of exposure. Density estimates are not available for listed fish or sea turtles in the booster drop zones; however, these species would have similarly low densities and corresponding exposure risk. Based on that and the expectation that they would be well below the surface most of the time, we believe that the probability of their exposure to direct impact or injurious concussive force would be as low or lower than those described above. While larval stages of fish, corals, and mollusks may also be found in the BOA we believe that the densities are also relatively low and will also be at depths greater than where significant impacts are expected to occur and therefore the probability that any will be impacted is extremely low. The corals considered in this consultation are restricted to shallow nearshore waters well away from missile components falling into the ocean. Therefore, that stressor would have no effect on them. Based on the best available information, we believe that it is discountable that any of the species considered in this consultation would be exposed to missile components falling into the BOA.

Table 8. Estimated Marine Mammal Density and Number of Exposure to Elevated Sound Pressures and Direct Contact in the FT-3 Booster Drop Zones.

Scientific Name	Common Name	Stage 1 Booster Drop Zone			Stage 2 Booster Drop Zone			Stage 3 Booster Drop Zone		
		Density[1] (per km^2)	Number of Potential TTS Exposures	Number of Direct Contact Exposures	Density[2] (per km^2)	Number of Potential TTS Exposures	Number of Direct Contact Exposures	Density[3] (per km^2)	Number of Potential TTS Exposures	Number of Direct Contact Exposures
Cetaceans										
Balaenoptera borealis	Sei whale	0.0001	9.9E-10	6.0E-08	0.0001	9.9E-10	1.4E-07	0.0001	9.9E-10	3.4E-08
Balaenoptera musculus	Blue whale	0.0001	9.9E-10	1.1E-07	0.0014	1.4E-08	3.3E-06	0.0001	9.9E-10	6.6E-08
Balaenoptera physalus	Fin whale	0.0680	6.8E-07	5.8E-05	0.0040	4.0E-08	7.5E-06	0.0235	2.3E-07	1.2E-05
Eschrichtius robustus[4]	Gray whale	0.0487	4.8E-07	2.5E-05	0.0001	9.9E-10	1.2E-07	-	-	-
Western North Pacific DPS[4]		ND			ND			-	-	-
Eubalaena japonica	North Pacific right whale	0.00001	9.9E-11	5.2E-09	0.00001	9.9E-11	1.2E-08	-	-	-
Megaptera novaeangliae[5]	Humpback whale							0.0001	9.9E-10	3.4E-08
Mexico DPS[5]		0.0098	9.7E-08	5.9E-06	0.0001	1.0E-09	1.5E-07	ND		
Western North Pacific DPS[5]		0.0005	4.6E-09	2.8E-07	0.00001	5.0E-11	7.0E-09	ND		
Physeter macrocephalus	Sperm whale	0.0030	-	1.1E-06	0.0030	-	3.8E-06	0.0014	-	4.2E-07
Pinnipeds										
Eumetopias jubatus	Steller sea lion									
Western DPS		0.0098	-	2.2E-06	0.0098	-	5.6E-06	-	-	-

Abbreviations: DPS = distinct population segment, km2 = square kilometers, ND = no data, TTS = Temporary Threshold Shift, "-" = does not occur in this area or no exposures.

1. Density estimates for the stage 1 booster drop zone from inshore/nearshore estimates in Rone et al. 2017 and U.S. Navy 2014.
2. Density estimates for the stage 2 booster drop zone derived from offshore estimates in the GOA from Rone et al. 2017 and U.S. Navy 2014.
3. Density estimates for the stage 3 booster drop zone based on estimates and models for the U.S. Navy's Hawaii Range Complex from Hanser et al. 2017. Where possible average densities were calculated for the portion of the model area overlapping the stage 3 booster drop zone area.
4. Density estimates for gray whales include whales from all DPSs in the GOA and are not specific to ESA-listed populations. Gray whales in the GOA are likely from unlisted Eastern Populations. It is possible that a small (but unknown) number of these whales are from the Western DPS.
5. Density estimates for humpback whales included whales from all DPSs. Humpback whales feeding in the GOA may be from the Hawai`i DPS (89%), the Mexico DPS (10.5%), and the Western North Pacific DPS (0.5%) (Wade et al. 2016) and it was assumed the same DPSs may be represented in the stage 1 and 2 booster drop zones.

Debris and ejecta from a land impact would be expected to fall within 91 m of the impact point. Of the species identified in Table 1, only green and hawksbill sea turtles may occur close enough to the potential impact site at Illeginni Islet to be affected by these stressors. Therefore we believe that, with the exception of green and hawksbill sea turtles, it is discountable that any of those species would be exposed to debris from the payload impact on Illeginni Islet. Empirical evidence from previous tests corroborates predictions of the propagation of shock waves associated with impact were approximately 37.5 m through the adjacent reef from the point of impact on the shoreline (USAFGSC and USASMDC/ARSTRAT 2015). Although green and hawksbill sea turtles may occur around Illeginni Islet, they do so infrequently and in low numbers, and typically in waters closer to the reef edge, which is over 500 feet from shore, where they spend the majority of their time under water. Therefore, we consider it unlikely that either turtle species would be close enough to shore to be within the range of shock wave effects, and that any exposure to ejecta would be in the form of relatively slow moving material sinking to the bottom near the animal. In the unlikely event of a turtle being within the ejecta zone during the impact, at most, an exposed animal may experience temporary behavioral disturbance in the form of slight changes in swimming direction or speed, feeding, that would have no measurable effect on the animal's fitness, and would return to normal within moments of the exposure. Therefore, the exposure is expected to have insignificant effects.

Non-larval Fish, Corals, and Mollusks near Illeginni Islet. Non-larval forms of 7 coral species, 1 fish species, and 3 mollusk species have the potential to occur on the reefs and waters in the vicinity of Illeginni Islet. These forms include the relevant coral and mollusk species and adults and juveniles of the relevant fish species. Although coral reefs are not planned or expected to be targeted, a land payload impact on the shoreline of Illeginni could result in ejecta/debris fall, shock waves, and post-test cleanup operations, which may affect and will likely adversely affect at least some of the consultation fish, coral and mollusk species on the adjacent reef. The analysis of these potential effects are analyzed below in Section 6.

<u>c. Exposure to hazardous materials</u>: For all of the species considered in this consultation, exposure to action-related hazardous materials is expected to have insignificant effects. During over-ocean flight, any substances of which the launch vehicle is constructed or that are contained on the launch vehicle and are not consumed during FT-3 flight or spent motor jettison will fall into the BOA when first-, second-, and third-stage launch vehicle motors and nose fairing are released. The launch vehicle includes rocket motors, solid rocket propellant, magnesium thorium in the booster interstage, asbestos in the second stage, battery electrolytes (lithium-ion and silver-zinc), radio frequency transmitters, and small electro-explosive devices. Though the batteries carried onboard the rocket motors would be discharged by the time they splash down in the ocean, they would still contain small quantities of electrolyte material. The amount of other toxic substances, such as battery acid, hydraulic fluids, explosive residues and heavy metals is small (SSP 2017, 2019; USASMDC/ARSTRAT 2014; U.S. Army 2020). The affected areas would be very small locations within the drop zones, and the hazardous materials within the missile component debris would sink quickly to the seafloor at depths of multiple thousands of feet; well away from protected marine species. Materials leaked at the surface and in the water column as the debris sinks would be quickly diluted by the enormous relative volume of sea water, aided by the debris' movement through the water column and by ocean currents, thus never accumulating to levels expected to elicit a detectable response should a protected species be exposed to the

material in the upper reaches of the water column. On the seafloor, the materials would leak or leach into the water and be rapidly diluted by ocean currents, or leach into bottom sediments. However, it is discountable that any of the consultation species would encounter the diluted materials near the seafloor, or in the bottom sediments. Pre-test preparatory and post-test cleanup activities may involve heavy equipment and ocean-going vessels, which have the potential to introduce fuels, hydraulic fluids, and battery acids to terrestrial habitats as well as marine habitats. Any accidental spills from support equipment operations would be contained and quickly cleaned up. All waste materials would be transported to Kwajalein Islet for proper disposal in the U.S. With the payload impact on Illeginni, debris including hazardous materials would fall on Illeginni and possibly into nearshore habitats.

The payload carries up to 45 kg (100 lbs) of tungsten alloy (which is only 10% of the tungsten associated with the FE-2 flight) which will enter the terrestrial and possible marine environments upon impact. The Navy estimated tungsten concentrations at Illeginni Islet over time by using a model which incorporated the results of the column experiments measuring dissolution and sorption of tungsten in Illeginni Islet soils (U.S. Navy 2017b). The dissolution rate and sorption affinities were used to estimate tungsten concentrations in the freshwater zone just below the zone of tungsten deposition in soil. Shortly after tungsten is deposited in the carbonate soil, aqueous tungsten concentrations would increase. With regular precipitation (assumed at 2.5 m/yr) modeled concentrations reached a steady state in less than one year and remained constant for the following 25 years, the period for which the model was run. The steady state concentration was primarily controlled by the rate of tungsten alloy dissolution and the rate of precipitation. Based on the model parameters, estimated aqueous tungsten concentrations will be between 0.006 mg/L and 0.015 mg/L. s Additional soil and groundwater testing was conducted after the FE-2 test, where tungsten was detected in most of the groundwater samples collected from Illeginni Islet wells in 2019 and tungsten samples in several of the samples exceed the U.S. Environmental Protection Agency residential tap water screening levels (RGNext 2019). Tungsten was also detected in the soil at Illeginni Islet in 2019 but at levels below the limits of quantification for the study (RGNext 2019).

Although possible that species could be exposed, we do not have enough information to suggest that this level of exposure would cause any adverse effects. In addition, it is expected that these concentrations will be so immeasurable due to the volume of water and orders of magnitude lower than known exposures and their effects to other fish species (https://cfpub.epa.gov/ecotox/search.cfm). Using rainbow trout as a surrogate, species considered in this consultation would be exposed to levels much lower than those known to cause mortality to rainbow trout (15.61 AI mg/L) and therefore we would not expect mortality. Considering these reasons described above, we expect that the effects from exposure would be insignificant to listed species.

The payload structure itself contains heavy metals including aluminum, titanium, steel, magnesium, tungsten, and other alloys. Debris and ejecta from a land impact would be expected to fall within 91 m of the impact point. Only trace amounts of hazardous chemicals are expected to remain in terrestrial areas. If any hazardous chemicals enter the marine environment, they are expected to dilute and disperse quickly by currents and wave action. Post-flight cleanup of the impact area will include recovery/cleanup of all visible debris including during crater backfill. Searches for debris would be attempted out to water depths of up to 55 m if debris enters the marine environment. Considering the quantities of hazardous materials, the planned land impact, and the dilution and mixing capabilities of the ocean and lagoon waters, we believe that any effects from chemicals will be insignificant to protected species in the area.

d. Long-term addition of man-made objects to the ocean: This operation will scatter missile components throughout the Pacific Ocean. Man-made objects in the form of vessels, piles, pipelines, vehicles, and purposeful and unintended marine debris has entered all oceans for millennia and most of it is unquantified, especially things that do not float. Whales and sea turtles are most commonly observed entangled in fishing gear that floats on the surface, and recent surveys of sea turtles noted that they ingest plastics that float (high-density polyethylene, low-density polyethylene, and polypropylene) more commonly than plastic that does not float (Jung et al. 2018; White et al. 2018). This may suggest that man-made objects that float may pose more risk than objects that lay at the bottom of the ocean.

Almost all of the products in the missiles sink as soon as they impact the water and will likely remain on the bottom after the project is implemented. The missile is approximately 17 m long and the payload weights approximately 350 kg (750 lbs). The booster contains a solid propellant of hydroxyl terminated polybutadiene (HTPB) composition. The amount of solid propellant in all three boosters weighs a total of approximately 80,461 lbs, most of which will burn and release into the atmosphere leaving very little left as it enters the ocean and sinks to the bottom (MDA 2007, MDA 2019a, MDA 2019b; U.S. Navy 2019; U.S. Army 2020). We expect complete combustion of propellant and liquid fuel therefore the amount of material expected to sit at the bottom of the ocean would be less than the reported maximums here.

All components of the missile (stages 1-3) are expected to sink immediately after entry into the water. If the payload does not detach and the missile is lost to the BOA, it would be expected to sink as well. We also understand that there is a paucity of data or observations of animals' interactions with debris at the bottom of the ocean, and that carcasses that do not float on the surface are almost never observed or captured for study. Nonetheless, based on empirical observation, the majority of entanglements are observed in gear that floats, and no animals have ever been observed to be entangled in gear from any RCCTO/USASMDC/ARSTRAT activities. Similarly, material that floats are observed more often in ingested non-organic material. The pelagic species are generally observed in the water column and are not considered bottom-dwelling, and they are less likely to be exposed to objects that are at the bottom than if they were mid-column or at the surface and impacts from projectiles are discussed in section b above. We therefore expect the addition to debris to the bottom of the ocean to have insignificant effects to listed species.

e. Disturbance from human activities and equipment operation: Many of the activities done to complete pre-flight preparations and post-flight restoration work at Kwajalein Atoll would take place in marine waters inhabited by protected marine species covered by this consultation. Those activities may affect any of the species considered in this consultation should those species encounter or be directly impacted by ongoing activities. However, none of the planned activities would intentionally contact marine substrates or consultation species, except those activities taken to restore in-water areas that may be impacted by the payload at Illeginni Islet. Impact restoration actions that may be taken in marine waters around Illeginni Islet may adversely affect species identified in Table 2, but not any of the species identified in Table 1. The motile species in Table 1 either do not occur in the area that may be impacted (marine mammals and three oceanic turtles), or they are expected to temporarily leave the area with no measurable effect on their fitness (green and hawksbill turtles, manta rays, oceanic white tip sharks, bigeye thresher sharks, and scalloped hammerhead sharks). The potential effects of in-water restoration activities on the corals, top shell snails, and giant clams in Table 2 will be considered later in the Effects of the Action Section.

For all other operations (vessel movement, dive operations, deployment and recovery of the LIDSS rafts, etc.) the most likely reaction to exposure to the activities, would be a short-term avoidance behavior, where motile species such as marine mammals, sea turtles, and fish temporarily leave the immediate area with no measurable effect on their fitness, then return to normal behaviors within minutes of cessation of the activity. Sessile organisms such as mollusks may temporarily close their shells or adhere more tightly to the substrate, also returning to normal behaviors within minutes of cessation of the activity. Although top shell snails and giant clams may be moved, because of their protective shells, it is unlikely that these animals would be killed or significantly injured.

Corals are not expected to have any measurable reaction to short-term non-contact activities. While it has properly been assumed for listed vertebrate species that physical contact of equipment or humans with an individual constitutes an adverse effect due to high potential for harm or harassment, the same assumption does not hold for listed corals due to two key biological characteristics:

1. All corals are simple, sessile invertebrate animals that rely on their stinging nematocysts for defense, rather than predator avoidance via flight response. So whereas it is logical to assume that physical contact with a vertebrate individual results in stress that constitutes harm and/or harassment, the same does not apply to corals because they have no flight response; and
2. Most reef-building corals, including all the listed species, are colonial organisms, such that a single larva settles and develops into the primary polyp, which then multiplies into a colony of hundreds to thousands of genetically-identical polyps that are seamlessly connected through tissue and skeleton. Colony growth is achieved mainly through the addition of more polyps, and colony growth is indeterminate. The colony can continue to exist even if numerous polyps die, or if the colony is broken apart or otherwise damaged. The individual of these listed species is defined as the colony, not the polyp, in the final coral listing rule (79 FR 53852). Thus, affecting some polyps of a colony does not necessarily constitute harm to the individual.

Planned protective measures would reduce the potential for interactions by watching for and avoiding protected species during the execution of pre-flight preparations and post-flight restoration work. Based on the best available information, project-related disturbance may infrequently cause an insignificant level of behavioral disturbance for the species identified in Table 1, but may adversely affect the species identified in Table 2.

<u>f. Collision with vessels</u>: The proposed action has the potential to increase ocean vessel traffic in the action area during both pre-flight preparations and post-flight activities. As part of FT-3 test monitoring and data collection, sea based sensors will be deployed along the flight path on vessels in the BOA. These vessels will travel from PSCA or USAKA to locations along the flight path. Pre-flight activities at or near USAKA will include vessel traffic to and from Illeginni Islet. Prior to launch, radars will be placed on Illeginni Islet and would be transported aboard ocean going vessels. Sensor rafts will also be deployed near the impact site from a LCU vessel.

Approximately four vessel round trips to Illeginni will be conducted for pre-flight and four for post-flight activities.

Post-flight, payload debris recovery and clean-up will take place at Illeginni Islet. These post-test cleanup and recovery efforts will result in increased vessel traffic to and from Illeginni Islet. Vessels will be used to transport heavy equipment (such as backhoe or grader) and personnel for manual cleanup of debris, backfilling or any craters, and instrument recovery. Deployed sensor rafts (Figure 4) will also be recovered by a LCU vessel. In the event of an unintended shallow water impact or debris entering the shallow water environments from a land impact near the shoreline, debris would be recovered. Smaller boats will transport divers, and ROVs if needed, to and from Illeginni to locate and recover this debris in waters up to approximately 30.5 m deep on the ocean side of Illeginni and within 152 to 305 m of the islet's shoreline on the lagoon side.

Sea turtles and cetaceans must surface to breathe air. They also rest or bask at the surface. Therefore, when at or near the surface, turtles and cetaceans are at risk of being struck by vessels or their propellers as the vessels transit. Corals could also be impacted if a vessel runs aground or drops anchors on the reef. Conversely, scalloped hammerhead sharks, bigeye thresher sharks, oceanic white tip sharks, manta rays, and humphead wrasse respire with gills and as such do not need to surface to breathe and are only infrequently near the surface. They are also agile and capable of avoiding oncoming vessels.

The conservation measures that are part of this action include requirements for vessel operators to watch for and avoid marine protected species, including adjusting their speed based on animal density and visibility conditions. Additionally, no action-related anchoring is planned and vessel operators are well trained to avoid running aground. Therefore, based on the best available information we consider the risk of collisions between project-related vessels and any of the consultation species identified in Tables 1 and 2 to be discountable.

Critical Habitat: The flight path of the FT-3 is expected to cross over Steller sea lion, North Pacific right whale, and Hawaiian monk seal critical habitat; however, given the in-air distance from the ocean's surface and location of the booster drops, the stressors associated with this action will have no effect on either North Pacific right whale or Hawaiian monk seal critical habitat.

The 20-nautical mile aquatic zones surrounding rookeries and major haulout sites provide foraging habitats, prey resources, and refuge considered essential to the conservation of lactating female, juvenile, and non-breeding Steller sea lions (58 FR 45269; August 27, 1993).

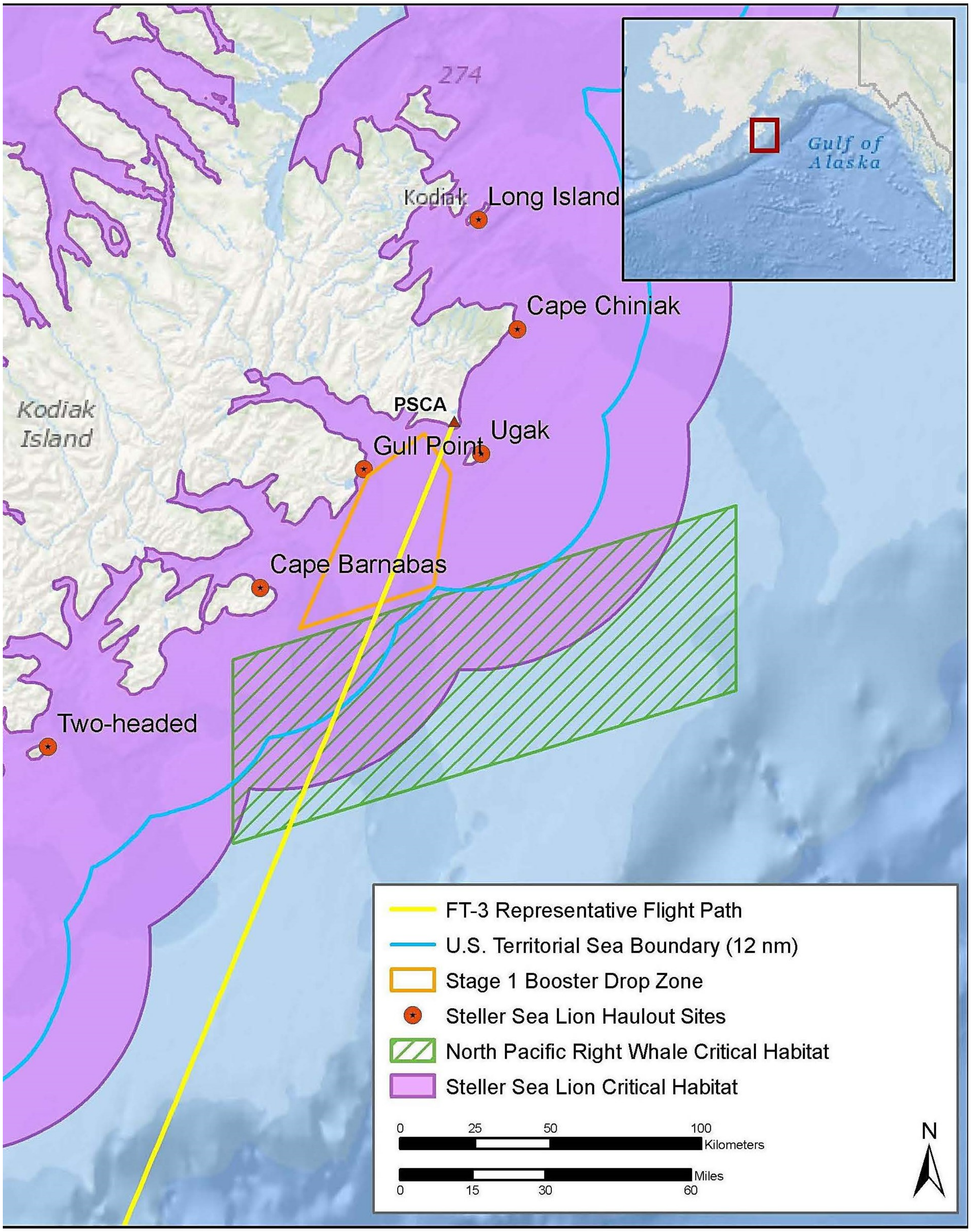


Figure 5. Representative Stage 1 Spent Motor Drop Zone near PSCA and designated Steller Sea Lion Critical Habitat (provided by U.S. Army).

For this project, designated critical habitat includes the following areas as described at 50 CFR 226.202:

- Terrestrial zones that extend 3,000 ft (0.9 km) landward from each major haulout and major rookery.
- Air zones that extend 3,000 ft (0.9 km) above the terrestrial zone of each major haulout and major rookery in Alaska.
- Aquatic zones that extend 20 nm (37 km) seaward of each major haulout and major rookery in Alaska that is west of 144° W longitude.
- Three special aquatic foraging areas: the Shelikof Strait area, the Bogoslof area, and the Seguam Pass area, as specified at 50 CFR 226.202(c).

The first stage booster drop overlaps with the 20-nm critical habitat areas around three Steller sea lion major haulouts (Ugak, Gull Point, and Cape Barnabas) from the project footprint (Figure 5).

Terrestrial Zones: The FT-3 launch and flight activities are not located in a terrestrial zone that is 3,000 ft (0.9 km) landward from a major haulout or rookery, and any noise effects are extremely unlikely to occur in those areas. Therefore effects to the terrestrial zones are discountable. Terrestrial species and those marine species under the jurisdiction of the USFWS are addressed in a separate evaluation.

Air Zones: FT-3 launch and flight activities are nearby, but not located in an air zone that is 3,000 ft (0.9 km) above a major haulout or rookery. Any effects to the air zones are extremely unlikely to occur in those areas, as well as any effects from the unlikely situation that the FT-3 vehicle deviates course, and therefore, are discountable.

Aquatic Zones: Although FT-3 flight and first booster drop zone overlaps with the aquatic zones of major haulouts, the project is located about 25 miles from a well-developed harbor in which Steller sea lions are habituated to disturbance and noise associated with human activity and vessel traffic. Hazardous materials within the missile, including unburnt propellant, may affect water quality in the immediate area around the splash-down of the first stage booster drop. However, as described above, hazardous materials within missile debris would sink quickly to the seafloor, likely to depths of up to 200 ft (Figure 6). Any hazardous materials leaked at the surface and in the water column as the debris sinks would be quickly diluted by the enormous relative volume of sea water, aided by the debris' movement through the water column and by ocean currents. The leaching rate of unburned solid propellant in ocean water is very low. That material would sink to the deep seafloor where it would be quickly diluted by ocean currents as it slowly dissolves over years. Therefore, based on the best available information, potential launch failures are expected to have insignificant effects on Steller sea lion critical habitat.

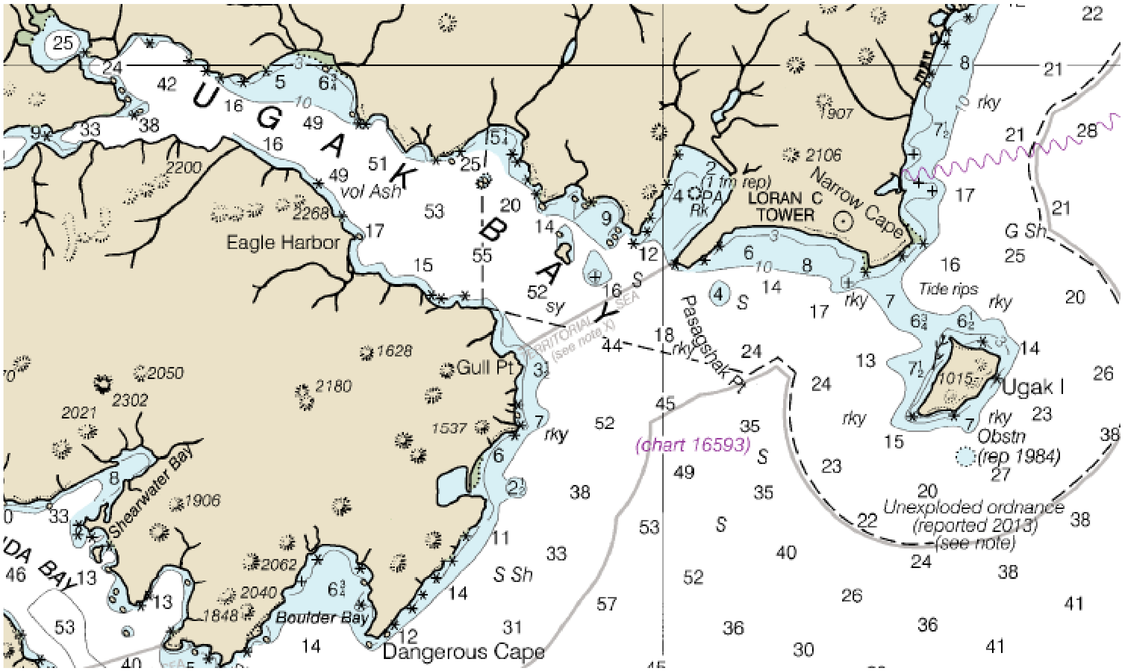


Figure 6. Water depths (measured in fathoms).

Aquatic Foraging Area: None of the flight activities associated with the proposed action will occur in or over any aquatic foraging areas. The closest foraging area is Shelikof Strait on the north side of Kodiak Island. Because the flight path stops prior to Shelikof Strait, this action will have no effect on this essential feature.

Considering the information presented above, and in the best scientific information available about the biology and expected behaviors of the marine species considered in this consultation, we agree that exposure to the proposed action would have insignificant effects, or the likelihood of exposure would be discountable for the consultation species identified in Table 1. Further, we have determined that the proposed action would have discountable or insignificant effects on designated critical habitat for the Steller sea lion. Therefore, we concur with your determination that conducting the proposed FT-3 is NLAA the consultation species identified in Table 1, and would have no effect on designated critical habitat in the RMI. We have also determined that the proposed FT-3 is NLAA. Steller sea lion critical habitat. Those species and critical habitats will not be considered further in this consultation.

4 STATUS OF THE SPECIES

This section presents biological or ecological information for the UES consultation species that the proposed action is likely to adversely affect. As stated above in Section 1, RCCTO/USASMDC determined that the proposed action was likely to adversely affect the 11 marine UES consultation species listed in Table 2 (including humphead wrasse).

As described above in the introduction, the jeopardy analyses in this Opinion considers the risk of reducing appreciably the likelihood of survival and recovery of UES-protected marine species within USAKA. As such, subsections 4.1 through 4.11 provide species-specific descriptions of distribution and abundance, life history characteristics (especially those affecting vulnerability to the proposed action), threats to the species, and other relevant information as they pertain to these animals within USAKA. Factors affecting these species within the action area are described in more detail in the Environmental Baseline (Section 5).

4.1 *Pocillopora meandrina* (Cauliflower coral)

Pocillopora meandrina is listed as a species of "least concern" by the IUCN (IUCN 2015). The Center for Biological Diversity petitioned the NMFS to list the cauliflower coral in Hawaii as endangered or threatened under the ESA in March 2018 (CBD 2018). In September 2018, NMFS found that *P. meandrina* may warrant listing under the ESA (83 FR 47592 [September 20, 2018]). On July 7, 2020 NMFS published a "Not Warranted" 12-month finding for the species (85 FR 40480). At this time, *P. meandrina* is still a UES consultation species.

Pocillopora meandrina is in the family Pocilloporidae. This hard coral species forms small upright bushes up to 30 cm in diameter that are cream, green, or pink in color (CBD 2018). Colonies form flattened branches that uniformly radiate out from the original growth point (CBD 2018). This species has a relatively fast growth rate with high recruitment; however, colonies may also be short lived due to recolonization by other coral species and high sensitivity to disturbance (CBD 2018).

4.1.1 Distribution and Abundance

Pocillopora meandrina is found throughout tropical and subtropical Indian and Pacific oceans in shallow reefs (CBD 2018). This range includes Hawaii, Johnston Atoll, American Samoa, the Marshall Islands, Micronesia, the Northern Mariana Islands, and Palau among other island groups (CBD 2018). *Pocillopora meandrina* occurs in shallow reef environments with high wave energy at depths of 1 to 27 m (CBD 2018). The abundance of this coral is still being determined through the status review process.

4.1.2 Life History Characteristics Affecting Vulnerability to Proposed Action

Pocillopora meandrina has been observed at all 11 of the surveyed Kwajalein Atoll islets since 2010 as well as in the Mid-Atoll Corridor. Overall, *P. meandrina* has been observed at 96% (120 of 125) survey sites in Kwajalein Atoll. This species was observed at 100% (5 of 5) of sites at Illeginni Islet since 2010 including in Illeginni harbor.

4.1.3 Threats to the Species

Major threats to *Pocillopora meandrina* include destruction and/or modification of habitat, harvest for the aquarium trade, disease, predation, and high susceptibility to bleaching due to thermal stress (CBD 2018). During a bleaching event in the coastal waters of West Hawaii in 2015, *P. meandrina* exhibited high post-bleaching mortality with approximately 96% of colonies exhibiting partial post-bleaching tissue loss (greater than 5%) and 78% of colonies exhibiting total post-bleaching mortality (CBD 2018). Other bleaching events in the Hawaiian Islands resulted in 1 to 10% mortality for this species (CBD 2018). NMFS is currently evaluating the threats to the species through its status review process.

4.1.4 Conservation of the Species

Pocillopora meandrina has been retained as a consultation species under the UES.

4.2 *Acropora microclados* (Coral)

A. microclados is broadly distributed across the Indo-Pacific region. As a candidate species for listing under the ESA, *A. microclados* became a consultation species under UES section 3-4.5.1 (a), and retained that status, per the wishes of the RMI Government, after we determined that listing under the ESA was not warranted.

4.2.1 Distribution and Abundance

The reported range of *A. microclados* is from the Red Sea and northern Madagascar, the Chagos Archipelago in the central Indian Ocean, through the Indo-Pacific region, and eastward to the central Pacific Ocean out to Pitcairn Island. It ranges as far north as the Ryukyu Islands of Japan, and to the south down along the eastern and western coasts of Australia. *A. microclados* is reported as uncommon to common (Veron 2014). Within the area potentially impacted at Illeginni, *A. microclados* is estimated to be scattered across submerged hard pavement reef areas, mostly below the intertidal zone and very shallow water habitats, at a density of up to 0.08 colonies/m^2. It has been observed at Illeginni, all of the other USAKA islands, and at 34 of 35 sites within the mid-atoll corridor (NMFS 2014a). In a recent survey conducted at the Minuteman III impact area *A. microclados* was observed in the study area and the density estimates are slightly less than what was predicted (NMFS 2017a).

4.2.2 Life History Characteristics Affecting Vulnerability to Proposed Action

A. microclados is a scleractinian (stony) coral. Stony corals are sessile, colonial, marine invertebrates. A living colony consists of a thin layer of live tissue over-lying an accumulated calcium carbonate skeleton. The individual unit of a coral colony is called a polyp. Polyps are typically cylindrical in shape, with a central mouth that is surrounded by numerous small tentacles armed with stinging cells (nematocysts) that are used for prey capture and defense. Individual polyps secrete a cup-like skeleton (corallite) over the skeletons of its predecessors, and each polyp is connected to adjacent polyps by a thin layer of interconnecting tissue. Scleractinian corals act as plants during the day and as animals at night, or in some combination of the two. The soft tissue of stony corals harbor mutualistic intracellular symbiotic dinoflagellates called zooxanthellae, which are photosynthetic. Corals also feed by consuming prey that is captured by the nematocysts (Brainard et al. 2011).

A. microclados colonies are typically corymbose plates that are attached to hard substrate, with short, uniform, evenly spaced tapered branchlets. It occurs on upper reef slopes and subtidal reef edges at depths of 5 to 20 m. Like other corals, *A. microclados* feeds on tiny free-floating prey that is captured by the tentacles of the individual coral polyps that comprise the colony. *A. microclados* is a hermaphroditic spawner; releasing gametes of both sexes. It also reproduces through fragmentation, where broken pieces continue to grow to form new colonies (Brainard et al. 2011).

4.2.3 Threats to the Species

Current threats include: thermal stress, acidification, disease, predation, pollution, and exploitation. Increased exposure to thermal stress is a potential effect of anthropogenic climate change. Little specific information is available to describe the susceptibility of *A. microclados* to these threats. However, the genus *Acropora* is ranked as one of the more susceptible to bleaching, where the coral expels its zooxanthellae. The physiological stress and reduced nutrition from bleaching are likely to have synergistic effects of lowered fecundity and increased susceptibility to disease. Bleaching can also result in mortality of the affected colony (Brainard et al. 2011). Acidification experiments have demonstrated negative effects on *Acropora* calcification, productivity, and impaired fertilization, larval settlement, and zooxanthellae acquisition rates in juveniles (Brainard et al. 2011). The susceptibility and impacts of disease on *A. microclados* are not well understood, but subacute dark spots disease has been reported in this species, and its genus is considered moderate to highly susceptible to disease. The crown of thorns seastar (*Acanthaster planci*) and corallivorous snails preferentially prey on *Acropora spp.*, and the dead areas of the coral are rapidly overgrown by algae. Land-based toxins and nutrients are reported to have deleterious effects on *Acropora spp.* depending on the substance, concentration, and duration of exposure. The genus *Acropora* has been heavily involved in international trade, and *A. microclados* is likely included in this trade (Brainard et al. 2011). As described above, *A. microclados* is likely highly susceptible to effects attributed to anthropogenic climate change, and is likely being adversely affected by those effects on a global level.

4.2.4 Conservation of the Species

A. microclados is listed in CITES Appendix II, and has been retained as a consultation species under the UES.

4.3 *Acropora polystoma* (Coral)

A. polystoma is broadly distributed across the Indo-Pacific region. As a candidate species for listing under the ESA, *A. polystoma* became a consultation species under UES section 3-4.5.1 (a), and retained that status, per the wishes of the RMI Government, after we determined that listing under the ESA was not warranted.

4.3.1 Distribution and Abundance

The reported range of *A. polystoma* is from the Red Sea to central Africa and Madagascar, and the Chagos Archipelago in the central Indian Ocean, through the Indo-Pacific region, eastward to the Tuamotus in the southeastern Pacific Ocean. It ranges as far north as the south of Taiwan, through the South China Sea and the Philippines, and to the south down along the northern coast of Australia and the Coral Sea. *A. polystoma* is reported as uncommon to common (Veron 2014). Within the area potentially impacted at Illeginni, *A. polystoma* is estimated to be scattered across submerged hard pavement reef areas, mostly below the intertidal zone and very shallow water habitats, at a density of up to 0.08 colonies/m^2. It has been observed at Illeginni, all of the other USAKA islands, and at 34 of 35 sites within the mid-atoll corridor (NMFS 2014a). In a recent survey conducted at the Minuteman III impact area *A. polystoma* was observed in the study area and the density estimates are slightly less than what was predicted (NMFS 2017a).

4.3.2 Life History Characteristics Affecting Vulnerability to Proposed Action

A. polystoma is a stony coral. *A. polystoma* colonies are typically clumps or corymbose plates that are attached to hard substrate, with tapered branches of similar length. It occurs in highly active intertidal to shallow subtidal reef tops and edges with strong wave action and/or high currents, at depths down to about 10 m. *A. polystoma* is a hermaphroditic spawner; releasing gametes of both sexes. It also reproduces through fragmentation, where broken pieces continue to grow to form new colonies (Brainard et al. 2011).

4.3.3 Threats to the Species

Current threats include: thermal stress, acidification, disease, predation, pollution, and exploitation. Increased exposure to thermal stress is occurring as part of the rising ocean temperatures being caused by anthropogenic climate change. Little specific information is available to describe the susceptibility of *A. polystoma* to these threats. However, the genus *Acropora* is ranked as one of the most severely susceptible to bleaching, where the coral expels its zooxanthellae. The physiological stress and reduced nutrition from bleaching are likely to have synergistic effects of lowered fecundity and increased susceptibility to disease. Bleaching can also result in mortality of the affected colony (Brainard et al. 2011). Acidification experiments have demonstrated negative effects on *Acropora* calcification, productivity, and impaired fertilization, larval settlement, and zooxanthellae acquisition rates in juveniles (Anthony et al. 2008). The genus *Acropora* is considered moderate to highly susceptible to disease, and *A. polystoma* has been reported to experience severe white-band/white plague disease. The crown of thorns seastar (*Acanthaster planci*) and corallivorous snails preferentially prey on *Acropora spp.*, and the dead areas of the coral are rapidly overgrown by algae. Land-based toxins and nutrients are reported to have deleterious effects on *Acropora spp.* depending on the substance, concentration, and duration of exposure. The genus *Acropora* has been heavily involved in international trade, and *A. polystoma* is likely included in this trade (Brainard et al. 2011). As described above, *A. polystoma* is likely highly susceptible to effects attributed to anthropogenic climate change, and is likely being adversely affected by those effects across its range.

4.3.4 Conservation of the Species

A. polystoma is listed in CITES Appendix II, and has been retained as a consultation species under the UES.

4.4 *Cyphastrea agassizi* (Coral)

C. agassizi is found primarily in the Indo-Pacific. As a candidate species for listing under the ESA, *C. agassizi* became a consultation species under UES section 3-4.5.1 (a), and retained that status, per the wishes of the RMI Government, after we determined that listing under the ESA was not warranted.

4.4.1 Distribution and Abundance

The reported range of *C. agassizi* is from Indonesia to the Hawaiian Islands in the central Pacific Ocean, and from southern Japan and the Northern Mariana Islands, south to Northeastern Australia. *C. agassizi* is reported as uncommon (Veron 2014). Within the area potentially impacted at Illeginni, *C. agassizi* is estimated to be scattered across submerged hard pavement reef areas, mostly below the intertidal zone and very shallow water habitats, at a density of up to 0.08 colonies/m^2. It has been observed at Illeginni, at six more of the 11 USAKA islands, and at 14 of 35 sites within the mid-atoll corridor (NMFS 2014a). In a recent survey conducted at the Minuteman III impact area *C. agassizi* was observed in the study area and the density estimates are slightly less than what was predicted (NMFS 2017a).

4.4.2 Life History Characteristics Affecting Vulnerability to Proposed Action

C. agassizi is a stony coral. *C. agassizi* typically forms deeply grooved massive colonies attached to hard substrate. It occurs in shallow reef environments of back- and fore-slopes, lagoons and outer reef channels at depths of about 2 to 20 m. Like other corals, *C. agassizi* feeds on tiny free-floating prey that is captured by the tentacles of the individual coral polyps that comprise the colony. The reproductive characteristics of *C. agassizi* are undetermined, but its congeners include a mix of hermaphroditic spawners and brooders (Brainard et al. 2011).

4.4.3 Threats to the Species

Current threats include: thermal stress, acidification, disease, predation, pollution, and exploitation. Increased exposure to thermal stress is a potential effect of anthropogenic climate change. *Cyphastrea* are considered generally resistant to bleaching, but elevated temperatures may still cause mortality within this genus (Brainard et al. 2011). The effects of increased ocean acidity are unknown for this genus, but in general, increased ocean acidity is thought to adversely affect fertilization, larval settlement, and zooxanthellae acquisition rates for many corals. It also can induce bleaching more so than thermal stress, and tends to decrease growth and calcification rates. The specific susceptibility and impacts of disease on *C. agassizi* are not known, but some of its congeners have been infected with various "band" diseases. As such, it appears that *C. agassizi* is susceptible (Brainard et al. 2011). The susceptibility of *C. agassizi* to predation is unknown. The effects of land-based pollution on *C. agassizi* are largely unknown, but it may pose significant threats at local scales. This coral is lightly to moderately exploited in trade at the genus level (Brainard et al. 2011). As described above, the genus *Cyphastrea* is considered generally resistant to bleaching, but mortality due to elevated temperatures, which may be attributable to anthropogenic climate change, may still occur. As such, this species may be currently adversely affected by those effects on a global level.

4.4.4 Conservation of the Species

C. agassizi is listed in CITES Appendix II, and has been retained as a consultation species under the UES.

4.5 Heliopora coerulea (Coral)

H. coerulea is a very broadly distributed Indo-Pacific coral. It is considered the oldest living coral species. *H. coerulea* became a consultation species under UES section 3-4.5.1 (a), and retained that status, per the wishes of the RMI Government, after we determined that listing under the ESA was not warranted.

4.5.1 Distribution and Abundance

The reported range of *H. coerulea* is from southern east Africa to the Red Sea, across the Indian Ocean to American Samoa in central Pacific Ocean, and from Japan, south to Australia (Brainard et al. 2011). Colonies of *H. coerulea* are often patchy in their distribution, but can dominate large areas. Within the area potentially impacted at Illeginni, *H. coerulea* is estimated to be scattered across submerged hard pavement reef areas, including intertidal and/or inshore rocky areas, at a density of up to 0.53 colonies/m^2. It has been observed at Illeginni, at all of the other USAKA islands, and at 32 of 35 sites within the mid-atoll corridor (NMFS 2014a). In a recent survey conducted at the Minuteman III impact area *H. coerulea* was observed in the study area and the density estimates are slightly less than what was predicted (NMFS 2017a).

4.5.2 Life History Characteristics Affecting Vulnerability to Proposed Action

H. coerulea is a non-scleractinian stony coral. Stony corals are sessile, colonial, marine invertebrates. Unlike the calcium carbonate skeleton of scleractinian corals, the skeleton of *H. coerulea* consists of aragonite, and it is blue instead of white. As with scleractinian corals, the individual unit of a coral colony is called a polyp, which is typically cylindrical in shape, with a central mouth that is surrounded by numerous small tentacles armed with stinging cells (nematocysts) that are used for prey capture and defense, but instead of living in "cups on the surface of the coral, *H. coerulea* polyps live in tubes within the skeleton. Each polyp is connected to adjacent polyps by a thin layer of interconnecting tissue called the coenenchyme. As with other corals, *H. coerulea* acts as a plant during the day and as an animal at night, or in some combination of the two. The soft tissue harbors mutualistic intracellular symbiotic dinoflagellates called zooxanthellae, which are photosynthetic. Corals also feed by consuming prey that is captured by the nematocysts (Brainard et al. 2011).

H. coerulea is a massive coral that typically forms castellate blades. It occurs in water depths from the intertidal zone down to about 60 m. It is most abundant from the shallow reef crest down to forereef slopes at 10 m, but is still common down to 20 m. Like other corals, *H. coerulea* feeds on tiny free-floating prey that is captured by the tentacles of the individual coral polyps that comprise the colony. *H. coerulea* colonies have separate sexes. Fertilization and early development of eggs begins internally, but the planula larvae are brooded externally under the polyp tentacles. Larvae are considered benthic, as they normally distribute themselves by crawling away and drifting in the plankton (Brainard et al. 2011).

4.5.3 Threats to the Species

Brainard et al. (2011) suggest that *H. coerulea* is a hardy species. They report that it is one of the most resistant corals to the effects of thermal stress and bleaching, and although there is no specific research to address the effects of acidification on this species, it seems to have survived the rapid acidification of the oceans during the Paleocene-Eocene Thermal Maximum acidification. They also report that disease does not appear to pose a substantial threat, and that adult colonies are avoided by most predators of coral. However, the externally brooded larvae are heavily preyed upon by several species of butterflyfish. Although *H. coerulea* tends to prefer clear water with low rates of sedimentation, Brainard et al. (2011) report that sediment appears to pose no significant threat to the species. Land-based sources of pollution may pose significant threats at local scales. Collection and trade appear to be the biggest threat to this species. *H. coerulea* has been reported as one of the top 10 species involved in international trade. Its morphology and natural color make it highly desirable (Brainard et al. 2011). As described above, *H. coerulea* does not appear to be particularly susceptible to effects attributed to anthropogenic climate change, but it is likely being adversely affected by international trade.

4.5.4 Conservation of the Species

H. coerulea is listed in CITES Appendix II, and has been retained as a consultation species under the UES.

4.6 *Pavona venosa* (Coral)

P. venosa is a broadly distributed Indo-Pacific. It became a consultation species under UES section 3-4.5.1 (a), and retained that status, per the wishes of the RMI Government, after we determined that listing under the ESA was not warranted.

4.6.1 Distribution and Abundance

The reported range of *P. venosa* extends down the eastern shore of Saudi Arabia, into the Red Sea, down to central Africa and Madagascar, across the Indian Ocean to include the Chagos Archipelago and Sri Lanka, through the Indo-Pacific region, eastward to the Tuamotus in the southeastern Pacific Ocean. It ranges as far north as the Ryukyu Islands, through the South China Sea and the Philippines, and to the south down along the east and west coasts of Australia and the Coral Sea. *P. venosa* has been reported as common. Within the area potentially impacted at Illeginni, *P. venosa* is estimated to be scattered across submerged hard pavement reef areas, mostly below the intertidal zone and very shallow water habitats, at a density of up to 0.08 colonies/m^2. It has been observed at Illeginni, all of the other USAKA islands, and at 16 of 35 sites within the mid-atoll corridor (NMFS 2014a). In a recent survey conducted at the Minuteman III impact area *P. venosa* was observed in the study area and the density estimates are slightly less than what was predicted (NMFS 2017a).

4.6.2 Life History Characteristics Affecting Vulnerability to Proposed Action

P. venosa is a stony coral. *P. venosa* typically forms massive to encrusting colonies attached to hard substrate. It occurs in shallow reef environments at depths of about 2 to 20 m. The reproductive characteristics of *P. venosa* are unknown, but six of its congeners are gonochoric (separate sexes) spawners; releasing gametes of both sexes that become fertilized in the water (Brainard et al. 2011).

4.6.3 Threats to the Species

Current threats include: thermal stress, acidification, disease, predation, pollution, and exploitation. Increased exposure to thermal stress is occurring as part of the rising ocean temperatures being caused by anthropogenic climate change. *P. venosa* has moderate to high susceptibility to thermal stress induced “bleaching” where the coral expels its zooxanthellae. The physiological stress and reduced nutrition from bleaching are likely to have synergistic effects of lowered fecundity and increased susceptibility to disease. Bleaching can also result in mortality of the affected colony (Brainard et al. 2011). In general, increased ocean acidity is thought to adversely affect fertilization, larval settlement, and zooxanthellae acquisition rates for many corals. It can increase the susceptibility to thermal stress, and tends to decrease growth and calcification rates (Anthony et al. 2008). No studies have examined the direct impacts of ocean acidification on *P. venosa*, but some evidence suggests that the genus *Pavona* has some degree of tolerance to acidification (Brainard et al. 2011). The specific susceptibility and impacts of disease on *P. venosa* are not known, but susceptibility is considered to be low (Brainard et al. 2011). There are a medium number of reports of acuter white disease for the genus *Pavona*. The susceptibility of *P. venosa* to predation is considered to be low, but there is no specific information. Members of the genus *Pavona* have varied susceptibility to predation by the crown of thorns seastar (*Acanthaster planci*). There is no specific information about the effects of land-based pollution on *P. venosa*, but it may pose significant threats at local scales. International trade includes the genus *Pavona*, but at relatively low levels (Brainard et al. 2011). As described above, *P. venosa* is susceptible to effects of thermal stress, which may be attributable to anthropogenic climate change. As such, this species is likely being adversely affected by those effects across its range.

4.6.4 Conservation of the Species

P. venosa is listed in CITES Appendix II, and has been retained as a consultation species under the UES.

4.7 Turbinaria reniformis (Coral)

T. reniformis is very broadly distributed across the Indo-Pacific region. *T. reniformis* became a consultation species under UES section 3-4.5.1 (a), and retained that status, per the wishes of the RMI Government, after we determined that listing under the ESA was not warranted.

4.7.1 Distribution and Abundance

The reported range of *T. reniformis* includes the Persian Gulf, the Red Sea, and most of the Indian Ocean basin, through the Indo-Pacific region, and eastward to the central Pacific Ocean out to Samoa and the Cook Islands. It ranges as far north as central Japan, down through the Philippines, around New Guinea, and down along the east and west coasts of Australia, and also down the Marianas, the Marshalls, and east to the Line Islands. It has been reported as common (Veron 2014). Within the area potentially impacted at Illeginni, *T. reniformis* is estimated to occur in small aggregations on submerged hard pavement reef areas, at a density of up to 0.16 colonies/m^2. It has been observed at Illeginni, at five more of the 11 USAKA islands, and at nine of 35 sites within the mid-atoll corridor (NMFS 2014a). In a recent survey conducted at the Minuteman III impact area *T. reniformis* was observed in the study area and the density estimates are slightly less than what was predicted (NMFS 2017a).

4.7.2 Life History Characteristics Affecting Vulnerability to Proposed Action

T. reniformis is a stony coral. *T. reniformis* colonies are attached to hard substrate and typically form large lettuce-like assemblages of plates. The plates tend to be very convoluted in shallow active water, whereas they are broad and flat in deeper calmer waters. It has been reported from the surface down to over 0 to 40 m, commonly on forereef slopes at 10 m and deeper, but it prefers turbid shallow protected waters where it forms massive and extensive stands. Like other corals, *T. reniformis* feeds on tiny free-floating prey that is captured by the tentacles of the individual coral polyps that comprise the colony. *T. reniformis* is a gonochoric (separate sexes) spawner; releasing gametes of one sex or the other that become fertilized in the water (Brainard et al. 2011).

4.7.3 Threats to the Species

Current threats include: thermal stress, acidification, disease, predation, pollution, and exploitation. Increased exposure to thermal stress is a potential effect of anthropogenic climate change. Susceptibility of *Turbinaria spp*. to thermal stress induced bleaching (where the coral expels its zooxanthellae) varies regionally, and among species, but ranges between low to moderate. The physiological stress and reduced nutrition from bleaching may have synergistic effects of lowered fecundity and increased susceptibility to disease. Bleaching can also result in mortality of the affected colony. However, *T. reniformis* has shown the potential to reduce bleaching impacts through increased heterotrophic feeding rates (Brainard et al. 2011). The susceptibility of *T. reniformis* to acidification appears to be lower than that of other genera of scleractinian corals tested. However, in most corals studied, acidification impaired growth, as well as impaired fertilization, larval settlement, and zooxanthellae acquisition rates in juveniles for some species (Brainard et al. 2011). Susceptibility and impacts of disease on *T. reniformis* are not known, but both white syndrome disease and black lesions have affected members of this genus. Adult colonies of *Turbinaria spp.* are rarely eaten by the crown of thorns seastar (*Acanthaster planci*), but the gastropod nudibranch (*Phestilla sibogae*) both feeds upon, and infects *Turbinaria spp.* with disease. *T. reniformis* appears to tolerate high turbidity and sedimentation, as well as low-salinity events, but land-based toxins and nutrients may have deleterious effects on a regional scale, depending on the substance, concentration, and duration of exposure. The genus *Turbinaria* has been heavily exploited in international trade, and *T. reniformis* is likely included in this trade (Brainard et al. 2011). As described above, *T. reniformis* may be susceptible to some effects attributed to anthropogenic climate change, and as such could be currently adversely affected by those effects on a global level.

4.7.4 Conservation of the Species

T. reniformis is listed in CITES Appendix II, and has been retained as a consultation species under the UES.

4.8 *Tectus niloticus* (Top Shell Snail)

The top shell snail is also sometime referred to as *Trochus niloticus*. It is a broadly distributed marine gastropod, and is a consultation species under UES section 3-4.5.1 (a).

4.8.1 Distribution and Abundance

The top shell snail is distributed in sub-tropical to tropical waters of the Indo-Pacific region. They are indigenous to Yap, Palau, and Helen Reef in Micronesia, but have been introduced to nearly every island group across the Indo-Pacific region (Smith 1987). Larvae recruit to shallow intertidal zones, typically along exposed (seaward) shores. Individuals migrate into deeper water as they grow (Heslinga et al. 1984) with maximum reported depth being 24 m (Smith 1987). Data are insufficient to determine current population levels and trends across its range, including in the RMI. Within the area potentially impacted at Illeginni, the top shell snail is estimated to be scattered across submerged hard pavement reef areas, including intertidal and/or inshore rocky areas, at a density of up to 0.09 individuals/m^2. It has been observed at Illeginni, at all of the other USAKA islands, and at 12 of 35 sites within the mid-atoll corridor (NMFS 2014a).

4.8.2 Life History Characteristics Affecting Vulnerability to Proposed Action

The top shell is a nocturnal, herbivorous, marine gastropod mollusk. It is normally found on the reef surface in the intertidal and subtidal zones. The life span is between 15 and 20 years, with sexual maturity occurring at about 2 years. It is a hardy species that is commonly relocated between island groups with high success. Dobson (2001), reports that top shell snails can survive out of the water for up to 36 hours when kept cool and damp. After being relocated on a new reef area and left undisturbed for a brief period, top shell snails typically resume normal behaviors with no measurable effects assuming the relocation site supports adequate forage and shelter.

4.8.3 Threats to the Species

The top shell is highly susceptible to over-exploitation. It is an edible species whose shells are also commercially important in the mother of pearl button industry (Heslinga et al. 1984). They are slow moving and are easily spotted by reef-walkers and snorkelers. Unregulated or poorly regulated harvesting has led to their depletion across their range. Although top shell snails are probably beginning to be affected by impacts associated with anthropogenic climate change (described in more detail in the Environmental Baseline section below), no significant climate change-related impacts to its populations have been observed to date.

4.8.4 Conservation of the Species

The top shell is afforded protection at USAKA as a consultation species under the UES (USAKA 2014).

4.9 *Hippopus hippopus* (giant clam)

H. hippopus is broadly distributed across the Indo-Pacific region. It is a candidate species for listing under the ESA, *H. hippopus* became a consultation species under UES section 3-4.5.1 (a).

4.9.1 Distribution and Abundance

H. hippopus are reported to be found in the eastern Indian Ocean at Myanmar and east to the Fiji and Tonga Islands, in the north as far as southern Japan and then south to the Great Barrier Reef, New Caledonia and Western Australia. Within the area potentially impacted at Illeginni, *H. hippopus* was found throughout the lagoon area but was rare on the ocean side in a recent survey conducted at the impact area. It has been observed at Illeginni, and at eight more of the 11 USAKA islands, and at nine of 35 sites within the mid-atoll corridor (NMFS 2017b).

4.9.2 Life History Characteristics Affecting Vulnerability to Proposed Action

H. hippopus is a giant clam which is markedly stenothermal (i.e., they are able to tolerate only a small range of temperature) and thus restricted to warm waters. Giant clams are typically found living on sand or attached to coral rock and rubble by byssal threads (Soo and Todd 2014), but they can be found in a wide variety of habitats, including live coral, dead coral rubble, boulders, sandy substrates, seagrass beds, macroalgae zones, etc. (Gilbert et al. 2006; Hernawan 2010). The exact lifespan of tridacnines has not been determined; although it is estimated to vary widely between 8 to several hundred years (Soo and Todd 2014). Little information exists on the size at maturity for giant clams, but size and age at maturity vary by species and geographical location (Ellis 1997). In general, giant clams appear to have relatively late sexual maturity, a sessile, exposed adult phase and broadcast spawning reproductive strategy, all of which can make giant clams vulnerable to depletion and exploitation (Neo et al. 2015). All giant clam species are classified as protandrous functional hermaphrodites, meaning they mature first as males and develop later to function as both male and female (Chambers 2007); but otherwise, giant clams follow the typical bivalve mollusk life cycle. At around 5 to 7 years of age (Kinch and Teitelbaum 2010), giant clams reproduce via broadcast spawning, in which several million sperm

and eggs are released into the water column where fertilization takes place. Giant clam spawning can be seasonal; for example, in the Central Pacific, giant clams can spawn year round but are likely to have better gonad maturation around the new or full moon (Kinch and Teitelbaum 2010). In the Southern Pacific, giant clam spawning patterns are seasonal and clams are likely to spawn in spring and throughout the austral summer months (Kinch and Teitelbaum 2010). Once fertilized, the eggs hatch into free-swimming trochophore larvae for around 8 to 15 days (according to the species and location) before settling on the substrate (Soo and Todd 2014; Kinch and Teitelbaum 2010). During the pediveliger larvae stage (the stage when the larvae is able to crawl using its foot), the larvae crawl on the substrate in search of suitable sites for settlement and metamorphose into early juveniles (or spats) within 2 weeks of spawning (Soo and Todd 2014).
According to Munro (1993), giant clams are facultative planktotrophs, in that they are essentially planktotrophic (i.e., they feed on plankton) but they can acquire all of the nutrition required for maintenance from their symbiotic algae, *Symbiodinium*.

4.9.3 Threats to the Species

Current threats include: thermal stress, acidification, disease, pollution, and exploitation. The harvest of giant clams is for both subsistence purposes (e.g., giant clam adductor, gonad, muscle, and mantle tissues are all used for food products and local consumption), as well as commercial purposes for global international trade (e.g., giant clam shells are used for a number of items, including jewelry, ornaments, soap dishes). The extent of each of these threats is largely unknown. Blidberg et al. (2000) studied the effect of increasing water temperature on *T. gigas, T. derasa,* and *H. hippopus* at a laboratory in the Philippines. *H. hippopus* experienced increased respiration and production of oxygen in elevated temperatures and was therefore more sensitive to higher temperature than the two other species tested. After 24 hours at ambient temperature plus 3°C, however, no bleaching was observed for any of the species. The susceptibility and impacts of disease on *H hippopus* are not known, but incidences of mortality from rickettsiales-like organisms in cultured clams in the western Pacific, one in the Philippines and one in Kosrae have been documented (Norton et al. 1993).

4.9.4 Conservation of the Species

H hippopus is listed in CITES Appendix II, is an ESA candidate species and is therefore a consultation species under the UES.

4.10 *Tridacna squamosa* (giant clam)

T. squamosa is broadly distributed across the Indo-Pacific region. It is a candidate species for listing under the ESA, therefore *T. squamosa* is a consultation species under UES section 3-4.5.1 (a).

4.10.1 Distribution and Abundance

T. squamosa has a widespread distribution across the Indo-Pacific. Its range extends from the Red Sea and East African coast across the Indo-Pacific to the Pitcairn Islands. It has also been introduced in Hawaii (CITES 2004). The species' range also extends north to southern Japan, and south to Australia and the Great Barrier Reef (bin Othman *et al*. 2010). This range description reflects the recent range extension of *T. squamosa* to French Polynesia as a result of observations by Gilbert et al. (2007). Within the area potentially impacted at Illeginni, *T. squamosa* was observed in the lagoon area but not on the ocean side in a recent survey conducted at the impact area. It has been observed at Illeginni, at five more of the 11 USAKA islands, and at 24 of 35 sites within the mid-atoll corridor (NMFS 2017b).

4.10.2 Life History Characteristics Affecting Vulnerability to Proposed Action

T. squamosa is a giant clam which are markedly stenothermal (i.e., they are able to tolerate only a small range of temperature) and thus restricted to warm waters. *T. squamosa* is usually recorded on reefs or sand; it is found attached by its byssus to the surface of coral reefs, usually in moderately protected localities such as reef moats in littoral and shallow water to a depth of 20 m (Kinch and Teitelbaum 2010). This species tends to prefer fairly sheltered lagoon environments next to high islands; however, *T. squamosa* appears to be excluded by *T. maxima* in the closed atoll lagoons of Polynesia (Munro 1992). Neo et al. (2009) found that *T. squamosa* larvae, like many reef invertebrates, prefer substrate with crustose coralline algae. *Tridacna squamosa* is also commonly found amongst branching corals (staghorn, *Acropora* spp.; CITES 2004).

The exact lifespan of tridacnines has not been determined; although it is estimated to vary widely between 8 to several hundred years (Soo and Todd 2014). Little information exists on the size at maturity for giant clams, but size and age at maturity vary by species and geographical location (Ellis 1997). In general, giant clams appear to have relatively late sexual maturity, a sessile, exposed adult phase and broadcast spawning reproductive strategy, all of which can make giant clams vulnerable to depletion and exploitation (Neo *et al.* 2015). All giant clam species are classified as protandrous functional hermaphrodites, meaning they mature first as males and develop later to function as both male and female (Chambers 2007); but otherwise, giant clams follow the typical bivalve mollusk life cycle. *T. squamosa* reaches sexual maturity at sizes of 6 to 16 cm, which equates to a first year of maturity at approximately four years old (CITES 2004). Giant clam spawning can be seasonal; for example, in the Central Pacific, giant clams can spawn year round but are likely to have better gonad maturation around the new or full moon (Kinch and Teitelbaum 2010). In the Southern Pacific, giant clam spawning patterns are seasonal and clams are likely to spawn in spring and throughout the austral summer months (Kinch and Teitelbaum 2010). Once fertilized, the eggs hatch into free-swimming trochophore larvae for around 8 to 15 days (according to the species and location) before settling on the substrate (Soo and Todd 2014; Kinch and Teitelbaum 2010). During the pediveliger larvae stage (the stage when the larvae is able to crawl using its foot), the larvae crawl on the substrate in search of suitable sites for settlement and metamorphose into early juveniles (or spats) within two weeks of spawning (Soo and Todd 2014).

According to Munro (1993), giant clams are facultative planktotrophs, in that they are essentially planktotrophic (i.e., they feed on plankton) but they can acquire all of the nutrition required for maintenance from their symbiotic algae, *Symbiodinium*.

4.10.3 Threats to the Species

Current threats include: thermal stress, acidification, disease, pollution, and exploitation. The harvest of giant clams is for both subsistence purposes (e.g., giant clam adductor, gonad, muscle, and mantle tissues are all used for food products and local consumption), as well as commercial purposes for global international trade (e.g., giant clam shells are used for a number of items, including jewelry, ornaments, soap dishes). The extent of each of these threats is largely unknown. Blidberg et al. (2000) studied the effect of increasing water temperature on *T. gigas, T. derasa,* and *H. hippopus* at a laboratory in the Philippines. *H. hippopus* experienced increased respiration and production of oxygen in elevated temperatures and was therefore more sensitive to higher temperature than the two other species tested. After 24 hours at ambient temperature plus 3°C, however, no bleaching was observed for any of the species. In a lab experiment, short-term temperature increases of 3 °C resulted in *T. squamosa* maintaining a high photosynthetic rate but displaying increased respiratory demands (Elfwing et al. 2001). Watson et al. (2012) showed that a combination of increased ocean CO_2 and temperature are likely to reduce the survival of *T. squamosa*. Specifically, in a lab experiment, *T. squamosa* juvenile survival rates decreased by up to 80 percent with increasing pCO_2 and decreased with increasing seawater temperature for a range of temperatures and pCO_2 combinations that mimic those expected in the next 50 to 100 years. The susceptibility and impacts of disease on *T. squamosa* are not known, but incidences of mortality from rickettsiales-like organisms in cultured clams in the western Pacific, one in the Philippines and one in Kosrae have been documented (Norton et al. 1993).

4.10.4 Conservation of the Species

T. squamosa is listed in CITES Appendix II, is an ESA candidate species and is therefore a consultation species under the UES.

4.11 Humphead wrasse

In October 2012, NMFS was petitioned to list the humphead wrasse as threatened or endangered under the ESA and to designate critical habitat for the species. In February 2013, in its 90-day finding, NMFS determined that this action may be warranted and initiated a status review to determine whether the species would be officially listed (78 FR 13614 [February 28, 2013]). In September 2014, NMFS determined that ESA listing of the humphead wrasse was not warranted (79 FR 57875 [September 26, 2014]). However, this species remains protected under the UES and is therefore a consultation species.

1.1.1 Distribution and Abundance

The humphead wrasse is widely distributed on coral reefs and nearshore habitats throughout much of the tropical Indo-Pacific Ocean. The biogeographic range of the humphead wrasse spans from 30° N to 23° S latitude and includes the Red Sea south to Mozambique in the Indian Ocean, from southern Japan in the northwest Pacific south to New Caledonia in the south Pacific and into the central Pacific Ocean including French Polynesia. The humphead wrasse has been recorded from many islands of Oceania including Kwajalein Atoll, but appears to be absent from the Hawaiian Islands, Johnston Island, Easter Island, Pitcairn, Rapa, and Lord Howe Island with the exception of occasional waifs (Randall et al. 1978).

Although humphead wrasses are widely distributed, natural densities are typically low, even in locations where habitats are presumably intact. Unfished or lightly fished areas have densities ranging from 2–27 individuals per 10,000 square meters of reef. At sites near human population centers or at fished areas, densities are typically lower by tenfold or more and in some locations humphead wrasse are rarely observed (Sadovy et al. 2003). Total abundance throughout its range is difficult to estimate because survey methods may not cover all habitable areas. Existing information suggests that humphead wrasse populations are most abundant and stable in the Indian Ocean.

The humphead wrasse is known to occur in the vicinity of Illeginni Islet. As was found in other studies (Donaldson and Sadovy 2001), the humphead wrasse appears to occur in low densities throughout the Kwajalein Atoll area in NMFS and USFWS biennial surveys. Occurrence records of humphead wrasse suggest a broad, but scattered distribution at USAKA with observations of the species at 26% (32 of 125) of sites at 10 of the 11 surveyed islets since 2010. Adult humphead wrasses have been recorded in seaward reef habitats at Illeginni Islet (shallowest depths approximately 5 m deep (USFWS and NMFS 2012; NMFS and USFWS 2018). Although encountered on numerous occasions at USAKA, direct density measures of humphead wrasse have not been obtained. The adults of this species may range very widely, with typically four or fewer individuals observed within a broad spatial reef area (Dr. R. Schroeder pers, comm.). Two neighboring seaward reef flat sites in 2008 were noted to have adult humphead wrasse present (USFWS 2011). Absent a direct physical or sound related impact, the adults might be expected to show temporary curiosity, altered feeding patterns, and/or displacement.

Shallow inshore branching coral areas with bushy macro-algae, such as those which may exist along the shallow lagoon reef flat at Illeginni Islet, have been noted as potential essential nursery habitat for juvenile humphead wrasse (Tupper 2007). Recent settler and juvenile numbers are presumed to greatly exceed 20 in such habitat (Tupper 2007) and might be grossly approximated to range from 0 to 100 within the lagoon-side waters of Illeginni (NMFS 2014a). A direct physical strike from a payload fragment, toppling or scattering of coral habitat and/or reef substrate, increased exposure to predation through displacement, and/or sound impacts may result in mortalities of juvenile humphead wrasse, assuming they are present within the impact area. Otherwise, loss of habitat may lead to simple displacement, but with a longer-term functional loss of nursery potential contingent both spatially and temporarily on habitat recovery potential (NMFS 2014b).

Humphead wrasse have been observed to aggregate at discrete seaward edges of deep slope drop-offs to broadcast spawn in the water column; they do not deposit their eggs on the substrate (Colin 2010). This type of behavior is not known at Illeginni Islet, but it may exist; however, similar habitat would occur in nearby waters. The flow dynamics of developing fish eggs and larvae around Illeginni Islet are not understood. Initial flow may be away from the islet, with future return or larval/adult source dynamics from another area. No information exists to support any reasonable estimation of potential Air-launched Rapid Response Weapon (ARRW) impacts to humphead wrasse eggs and developing larvae (NMFS 2014a).

1.1.2 Life History Characteristics Affecting Vulnerability to Proposed Action

The humphead wrasse is the largest member of the family Labridae. The humphead wrasse is distinguished from other coral reef fishes, including other wrasses, due primarily to its large size along with its fleshy lips in adults (Myers 1999), prominent bulbous hump that appears on the forehead in larger adults of both sexes, and intricate markings around the eyes (Marshall 1964; Bagnis et al. 1972; Sadovy et al. 2003).

Similar to other wrasses, humphead wrasses forage by turning over or crushing rocks and rubble to reach cryptic organisms (Pogonoski et al. 2002; Sadovy et al. 2003 citing P.S. Lobel, pers.

comm.). The thick fleshy lips of the species appear to absorb sea urchin spines, and the pharyngeal teeth easily crush heavy-shelled sea snails in the genera *Trochus* spp. and *Turbo* spp. The humphead wrasse is also one of the few predators of toxic animals such as boxfishes (*Ostraciidae*), sea hares (*Aplysiidae*), and crown-of-thorns starfish (*Acanthaster planci*) (Randall 1978; Myers 1989; Thaman 1998; Sadovy et al. 2003).

Both juveniles and adults utilize reef habitats. Juveniles inhabit denser coral reefs closer to shore and adults live in deeper, more open water at the edges of reefs in channels, channel slopes, and lagoon reef slopes (Donaldson and Sadovy 2001). While there is limited knowledge of their movements, it is believed that adults are largely sedentary over a patch of reef and during certain times of the year they move short distances to congregate at spawning sites (NMFS 2009). Humphead wrasse density increases with hard coral cover, where smaller fish are found in areas with greater hard coral cover (Sadovy et al. 2003).

Field reports reveal variable humphead wrasse spawning behavior, depending on location (Sadovy et al. 2003; Colin 2010). Spawning can occur between several and all months of the year, coinciding with certain phases of the tidal cycle (usually after high tide) and possibly lunar cycle (Sadovy et al. 2003; Colin 2010). Spawning can reportedly occur in small (< 10 individuals) or large (≤ 100 individuals) groupings, which can take place daily in a variety of reef types (Sadovy et al. 2003; Sadovy de Mitcheson et al. 2008; Colin 2010). Based on available information, it is suggested that the typical size of female sexual maturation for the humphead wrasse occurs at 40–50 cm TL (Sadovy de Mitcheson et al. 2010). Choat et al. (2006) estimated length at first maturity as 45–50 cm FL for females (6–7 years) and 70 cm FL (9 years) for males.

1.1.3 Threats to the Species

USAKA identified four major threats to humphead wrasse: 1) habitat destruction, modification, or curtailment; 2) overutilization for commercial, recreational, scientific or educational purposes; 3) disease or predation; 4) the inadequacy of existing regulatory mechanisms; and 5) natural and other man-made factors. Habitat destruction, overfishing, and inadequacy of existing regulatory mechanisms, and some man-made factors such as pollution are threats locally throughout portions of its range. However, the ERA team concluded that four of the five threats evaluated are not significant risks to extinction. Natural and man-made factors, namely climate change, were noted as a small to moderate effects on species risk of extinction.

1.1.4 Conservation of the Species

Humphead wrasse is listed in CITES Appendix II, and has been retained as a consultation species under the UES.

5 ENVIRONMENTAL BASELINE

The UES does not specifically describe the environmental baseline for a Biological Opinion. However, under the ESA, environmental baselines include the past and present impacts of all state, federal or private actions and other human activities in the Action Area, anticipated impacts of all proposed federal projects in the Action Area that have already undergone formal or early section 7 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02). The Consultation Handbook further clarifies that the environmental baseline is "an analysis of the effects of past and ongoing

human and natural factors leading to the current status of the species, its habitat (including designated critical habitat), and ecosystem, within the Action Area" (FWS and NMFS 1998). The purpose of describing the environmental baseline in this manner in a biological opinion is to provide context for effects of the proposed action on listed species. We apply the ESA standards consistent with the intent of the UES agreement in our effects analysis. As described in Sections 2 and 3 above, the action area where the proposed action may adversely affect consultation species consists of the marine waters adjacent to Illeginni Islet at Kwajalein Atoll, RMI (Figure 7)**.**

Figure 7. Illeginni Islet, RMI.

The Marshall Islands consist of 29 atolls and five islands aligned in two roughly parallel northwest-southeast chains: the northeastern Ratak Chain and the southwestern Ralik Chain. The total land area is about 70 square miles, and the total lagoon area is about 4,500 square miles. Kwajalein Atoll is located near the center of the island group, about eight degrees above the equator, and is one of the largest coral reef atolls in the world. The past and present impacts of human and natural factors leading to the status of UES-protected species within the action area include coastal development, armed conflict, direct take, fishing interactions, vessel strikes and groundings, marine debris, and climate change.

Kwajalein Atoll was the site of heavy fighting during World War II (1940s), when the U.S. took it from the Japanese. Many of the islets have been heavily modified by dredge and fill construction operations by both the Japanese and U.S. forces. More recently, the RMI has provided 11 islets around the rim of Kwajalein Atoll for the use by the U.S. Government as part of the RTS. Hundreds of U.S. personnel live on some of the islets, and Marshallese workers commute daily between the U.S. occupied islets and the ones on which they reside. Vessel traffic occurs regularly between the islets, and to and from the atoll. This includes fishing boats, personnel ferries, military service craft, visiting military ships, and cargo vessels that supply the peoples of Kwajalein Atoll. For more than 18 years, the USAKA has participated in testing hypersonic vehicles from ICBM and other flight tests launched from Vandenberg AFB and other locations. Vehicle impacts from such tests have occurred and continue to occur on and in the vicinity of Illeginni Islet and in adjacent ocean waters. In the Opinion on the Minuteman III operations through the year 2030 it was estimated that 49,645 colonies of the 15 species of UES corals and 117 top shell snails may be killed (NMFS 2015).

On May 16, 2005, we issued a letter of concurrence (LOC) with the USAF's "not likely to adversely affect" determination for sea turtles and marine mammals under our jurisdiction. It is important to note that sea turtles are under the jurisdiction of the FWS while in terrestrial habitats, whereas they are under our jurisdiction when in marine habitats. Therefore, any impacts on hauled-out or nesting adult turtles, eggs in nests, or hatchlings before they reach the water, were considered in the 2005 FWS Opinion, not in our LOC.

On March 2, 2017, the US Navy SSP consulted with NMFS on the effects of a near identical action, the Flight Experiment 1 (FE-1). NMFS concluded in a biological opinion dated May 12, 2017 that the FE-1 would not jeopardize 59 marine ESA/UES consultation species." (PIR-2017-10125; I-PI-17-1504-AG). In that opinion, NMFS estimated that the action could result in up to 10,417 colonies of UES consultation corals (as quantified in table 7) experiencing complete mortality, up to four top shell snails being killed, and up to 90 clams, and 108 humphead wrasses being injured or killed. The target site was the exact same as this proposed action and made an impact on land and not in water. No take was quantified for this action.

On February 12, 2019, USASMDC/ARSTRAT, consulted on the ARRW Flight Tests NMFS' Biological Opinion was dated July 30, 2019 (PIRO-2019-00639; I-PI-19-1751-AG). This missile test is expected to impact the same islet targeted in this proposed action. As with the FE-1 and FE-2, impact is expected to occur on land, but could occur in water. In that opinion, NMFS estimated that the action could result in up to 10,417 colonies of UES consultation corals experiencing complete mortality, up to four top shell snails being killed by the proposed action, and up to 90 clams, and 108 humphead wrasses being injured or killed by the proposed action.

On July 4, 2019, we completed informal consultation on the effects of launching a Terminal High Altitude Area Defense (THAAD) missile and subsequent intercept of a medium-range ballistic missile over the Pacific Ocean concluding the operation was not likely to adversely affect 44 species protected under the standards and procedures described in the Environmental Standards and Procedures for U.S. Army Kwajalein Atoll (PIRO-2019-01962; I-PI-19-1769-AG). This test is expected to launch from a neighboring islet within USAKA.

On June 14, 2018, USASMDC/ARSTRAT, on behalf of the U.S. Navy SSP, requested consultation on the effects of launching a single Flight Experiment-2 (FE-2) missile from the PMRF on Hawaii, across the Pacific, and impact at Kwajalein Atoll. NMFS concluded in a Biological Opinion dated September 27, 2019 that the FE-2 would not jeopardize any of the marine ESA/UES consultation species covered under that consultation (PIR-2019-02607; I-PI-19-1782-AG). In that opinion, NMFS estimated that the action could result in up to 10,404 colonies of UES consultation corals (as quantified in Table 10) experiencing complete mortality, and up to 4 top shell snails, 108 humphead wrasse, and up to 75 clams being killed. The target site was the exact same as this proposed action and made an impact on land and not in water.

On November 16, 2020, the USASMDC/U.S. Air Force requested consultation on the effects of launching multiple Ground Based Strategic Defense (GBSD) flight tests from Vandenberg Air Force Base, California, across the Pacific, and impact at Kwajalein Atoll. NMFS concluded in a Biological Opinion dated March 15, 2021 that the GBSD tests would not jeopardize any of the marine ESA/UES consultation species covered under that consultation (PIRO-2020-03355; I-PI-20-1884-AG). In that opinion, NMFS estimated that the action could result in up to 31,224 colonies of UES consultation corals (as quantified in Table 8) could experience complete mortality, up to nine top shell snail, up to 219 clams, and up to 324 humphead wrasse could be killed by the proposed action. The target sites included on land at Kwajalein Atoll, in the vicinity of the island, and/or in the KMISS.

These estimates are likely higher than what the total impacts will be due to the unlikely event of a shoreline impact and the data the estimates were based on. The estimates were based on surveys that have been conducted throughout the area but not in the impact zone. A survey was completed after these estimates were made and some of the corals that were predicted to be in the area were not observed and others were observed at densities lower than what had been estimated (NMFS 2017a). Additional surveys could show that they are indeed in the area but not at higher levels than estimated. Direct take through harvest continues in the RMI for several of the UES consultation species. For example, sea turtles, black lip pearl oysters, and top shell snails (all of which are UES consultation species) are considered a food source or of economic value by many RMI nationals. The harvest of these and other UES-protected marine species is believed to continue on most of the inhabited islands and islets of the RMI, with the possible exception of the USAKA-controlled islets, where access is limited and the UES prohibits those activities. However, the level of exploitation is unknown, and no concerted research or management effort has been made to conserve these species in the RMI. No information is currently available to quantify the level of impact direct take is having on consultation species in the Marshall Islands.

Despite the development, wartime impacts, and human utilization of marine resources mentioned above, the atoll's position at the center of the Pacific Ocean is far from highly industrialized areas, and its human population remains relatively low. Consequently, the water quality level of the lagoon and the surrounding ocean is very high, and the health of the reef communities, along with the overall marine environment of Kwajalein Atoll, borders on pristine.

Climate change may be affecting marine ecosystems at Kwajalein Atoll. Climate refers to average weather conditions within a certain range of variability. The term climate change refers to distinct long-term changes in measures of climate, such as temperature, rainfall, snow, or wind patterns lasting for decades or longer. Climate change may result from: natural factors, such as changes in the Sun’s energy or slow changes in the Earth’s orbit around the sun; natural processes within the climate system (e.g., changes in ocean circulation); and human activities that change the atmosphere’s makeup (e.g., burning fossil fuels) and the land surface (e.g., cutting down forests, planting trees, building developments in cities and suburbs, etc.), also known as anthropogenic climate change (U.S. Environmental Protection Agency). The global mean temperature has risen 0.76°C over the last 150 years, and the linear trend over the last 50 years is nearly twice that for the last 100 years (Solomon et al. 2007). Sea level rose approximately 17 cm during the 20th century (Solomon et al. 2007) and further increases are expected. Climate change is a global phenomenon so resultant impacts have likely been occurring in the action area. However, scientific data describing impacts in the action area are lacking, and no climate change-related impacts on UES-protected species within the action area have been reported to date.

Climate change-induced elevated water temperatures, altered oceanic chemistry, and rising sea level may be contributing to changes to coral reef ecosystems, and is likely beginning to affect corals and mollusks found in the action area. Globally, climate change is adversely affecting many species of corals. Increasing thermal stress due to rising water temperatures has already had significant effects on most coral reefs around the world. It has been linked to widespread and accelerated bleaching and mass mortalities of corals around the world over the past 25 years (Brainard et al. 2011). As the atmospheric concentration of CO_2 has increased, there has been a corresponding reduction in the pH of ocean waters (acidification). As ocean acidity increases, the calcium carbonate saturation state of the water decreases. Increased ocean acidity has the potential to lower the calcium carbonate saturation state enough to slow calcification in most corals and may increase bioerosion of coral reefs. It is thought to adversely affect fertilization, larval settlement, and zooxanthellae acquisition rates for corals, and can induce bleaching more so than thermal stress, and tends to decrease growth and calcification rates (Brainard et al. 2011). By the middle of this century, ocean acidity could lower calcium carbonate saturation to the point where the reefs may begin to dissolve (Brainard et al. 2011).

Attempting to determine whether recent biological trends are causally related to anthropogenic climate change is complicated because non-climatic influences dominate local, short-term biological changes. However, the meta-analyses of 334 species and the global analyses of 1,570 species show highly significant, nonrandom patterns of change in accord with observed climate warming in the twentieth century. In other words, it appears that these trends are being influenced by climate change-related phenomena, rather than being explained by natural variability or other factors (Parmesan and Yohe 2003). However, the implications of these changes are not clear in terms of population level impacts, and data specific to the action area are lacking. Over the long-term, climate change-related impacts could influence the biological trajectories of UES-protected species on a century scale (Parmesan and Yohe 2003). However, due to a lack of scientific data, the specific effects climate change could have on these species in the future are not predictable or quantifiable to any degree that would allow for more detailed analysis in this consultation (Hawkes et al. 2009).

6 EFFECTS OF THE ACTION

In this section of a biological opinion, we assess the probable effects of the proposed action on UES-protected species. In Effects of the Action sections of biological opinions, NMFS presents the results of its assessment of the probable effects of federal actions on threatened and endangered species and designated critical habitat that are the subject of a consultation. According to 50 CFR 402.02, Effects of the Action “are all consequences to listed species or 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.” Furthermore, 50 CFR 402.17 explains: “A conclusion of reasonably certain to occur must be based on clear and substantial information, using the best scientific and commercial data available." Factors to consider when evaluating whether activities caused by the proposed action (but not part of the proposed action) or activities reviewed under cumulative effects are reasonably certain to occur include, but are not limited to: (1) past experiences with activities that have resulted from actions that are similar in scope, nature, and magnitude to the proposed action;(2) existing plans for the activity; and (3) any remaining economic, administrative, and legal requirements necessary for the activity to go forward." (50 CFR 402.17). The effects of the action are considered within the context of the Status of the Species, together with the Environmental Baseline and Cumulative Effects sections of this Opinion to determine if the proposed action can be expected to have direct or indirect effects on UES-protected species that appreciably reduce their likelihood of surviving and recovering in the wild by reducing their reproduction, numbers, or distribution (50 CFR 402.02), otherwise known as the jeopardy determination. The actions are not expected to adversely affect any essential features of critical habitat that has been designated in the action area.

Approach. We determine the effects of the action using a sequence of steps. The first step identifies potential stressors associated with the proposed action with regard to listed species. We may determine that some potential stressors result in insignificant, discountable, or beneficial effects to listed species, in which case these potential stressors are considered not likely to adversely affect protected species, and subsequently are considered no further in this Opinion. Those stressors that are expected to result in significant negative (i.e., adverse) effects to listed species are analyzed via the second, third, and fourth steps described below.

The second step identifies the magnitude of the stressors (e.g., how many individuals of a particular species would be exposed to the stressors; *exposure analysis*). In this step of our analysis, we try to identify the number, age (or life stage), and gender of the individuals that are likely to be exposed to a proposed action's effects, and the populations or subpopulations those individuals represent.

The third step describes how the exposed individuals are likely to respond to the stressors (*response analysis*). In this step, we determine if the stressors are likely to result in any adverse effects on exposed individuals.

The final step in determining the effects of the action is to establish the risks those responses pose to listed resources (*risk analysis*). The risk analysis is different for listed species and designated critical habitat. However, as mentioned above, the action area includes no designated critical habitat, thus it is not considered in this Opinion. Our jeopardy determinations must be based on an action's effects on the continued existence of UES-protected species within USAKA. Because the continued existence of listed species depends on the fate of the populations that comprise them, the viability (probability of extinction or probability of persistence) of listed species depends on the viability of their populations.

6.1 Stressors

As described above in Section 3, we believe that the proposed action would cause five stressors that may affect the consultation species considered in this consultation: 1) exposure to elevated noise levels; 2) impact by falling missile components; 3) exposure to hazardous materials; 4) disturbance from human activity and equipment operation; and 5) collision with vessels. Of those stressors, impact by falling missile components, specifically for the payload that would target

Illeginni Islet, is the only stressor that is likely to adversely affect consultation species. The remaining stressors are expected to have insignificant effects (i.e. effects would not result in take) and/or exposure is discountable (extremely unlikely to occur), and those stressors are discussed no further in this Opinion. Similarly, Section 3 described why all of the species identified in Table 1 are unlikely to be adversely affected, and therefore considered no further in this Opinion. In summary, the 7 coral species, top shell snail, two giant clams and the humphead wrasse identified in Table 2 may be hit by the falling payload or by ejecta, or be significantly affected by concussive forces during the single planned payload on Illeginni Islet.

Note: Within the seven coral species that may be adversely affected by the proposed action, the effects are expected to be practically identical. Addressing the species individually would significantly increase the length of this Opinion with no discernible improvement in the evaluation. Therefore, all seven coral species are referred to together as “corals”, unless an individual species needs to be identified due to some unique sensitivity or response. The same is true for the two clam species.

6.2 Exposure to Impact by Falling Missile Components

This section analyzes the proposed action’s potential for exposing UES-consultation corals and top shell snails to being hit by the FT-3 payload or ejecta thereof planned to strike on Illeginni Islet. This analysis is based on the distribution and density report completed for the MM III proposed action, the follow-up survey post action, and on personal communication with the survey team (NMFS 2014b, NMFS 2017a, Kolinski pers. comm. 2015), and on the description of the effects of the FE-1 flight test (SSP 2017), a biological survey conducted at USAKA launch sites by NMFS in preparation for the THAAD operation (NMFS 2018), the recent THAAD test (MDA/USASMDC/ARSTRAT 2019), and the FE-2 flight test (SSP 2019). We believe that the distribution and density report represents the best available information to make those estimates.

The quantitative estimates of species distribution and abundance within the potentially affected areas at Illeginni are based on surveys of 136 sites around the 11 USAKA islets, including four sites around Illeginni (NMFS 2014b). Species observed to occur on reef flat, crest, and gently sloping substrates around USAKA islets at depths less than or equal to 35 feet water depth were considered as potentially being present within the MMIII, FE-1, THAAD, and FE-2 impact area and hence the FT-3 impact area. Because the available survey information also includes the observed distribution and abundance of the affected consultation species in numerous habitat types around the 11 USAKA islets and at 35 survey sites throughout the mid-atoll corridor (MAC), we believe that the existing information also serves as a reasonable foundation to estimate the distribution and abundance of these organisms throughout USAKA. Analyses of effect of MMIII reentry vehicles (USAFGSC and USASMDC/ARSTRAT 2015) and FE-1 and FE-2 payload impact (US Navy 2017; 2019) at Illeginni Islet were conducted based on coral, mollusk, and fish densities extrapolated from coral presence and abundance from similar reef habitats throughout USAKA. In 2017, NMFS-PIRO completed a report with revised density estimates for many consultation species based on 2014 assessments of the reefs adjacent to the impact area at Illeginni Islet (NMFS-PIRO 2017a and 2017b). The areas surveyed for this assessment encompassed all of the action area reef habitat on the lagoon side and 99% of the reef area on the ocean side (NMFS 2017a and 2017b). Additionally, NMFS-PIRO conducted a survey within USAKA at two launch sites in 2018 to provide data for the THAAD operation (NMFS

2018). Based on coverage area of this assessment, these data are considered the best available information for coral and mollusk species presence and density in the action area.

The humphead wrasse (*Cheilinus undulatus*) was not observed during the 2014 surveys for the most recent assessment of consultation organisms at Illeginni Islet (NMFS 2017a); however, this species has been recorded in both ocean-side and lagoon-side habitats adjacent to the impact area in other surveys. Since the humphead wrasse is a highly mobile species, the extrapolation methods for estimating density which were previously used for impact analysis are still considered the best available data for a conservative approach. Therefore, humphead wrasse densities were estimated by NMFS Pacific Islands Regional Office (NMFS-PIRO) based on quantitative data collected during the 2008 species inventory, recent impact assessments on natural substrates at USAKA and, for egg and fish recruit derivations, from the literature (NMFS 2014b). *Cheilinus undulatus* typically occurs in broadly distributed low numbers and has been seen near Illeginni islet. It is possible that and estimated 8 adults may occur within the entire potential ocean-side affected area, and 0 to 100 juveniles may occur within the entire potential lagoon-side affected area.

There is a chance that the FT-3 payload could strike the water's edge along the lagoon or ocean shore at Illeginni. Empirical observations of historical reentry vehicle impacts from MMIII tests in very shallow waters found that most debris was contained within the crater and ejecta were concentrated within 1.5 to 3 m of the crater rim (USAFGSC and USASMDC/ARSTRAT 2015). As with MMIII reentry vehicles, FE-1, FE-2, or THAAD test, we estimate that the payload land impact may produce ejecta and debris concentrated near the impact site and extending outward to 91 m. Empirical evidence from MMIII tests corroborates predictions of the propagation of shock waves associated with impact were approximately 37.5 m through the adjacent reef from the point of impact on the shoreline (USAFGSC and USASMDC/ARSTRAT 2015). Coral, and mollusk mortality or injury could occur from impact by shock/vibration. These reef impacts were based on observations of damaged corals, which can be affected by ground borne vibration.

Habitat suitability for consultation species is lowest along the water's edge and with the exception of sandy patches, typically increases with distance from shore. Based on the 2014 NMFS surveys and the best professional judgment of NMFS survey divers, approximately 80 percent of the lagoon-side survey area and 75 percent of the ocean-side survey area (Figure 8 below) are considered potentially viable habitat for consultation fish, coral, and mollusks (NMFS 2019; U.S. Army 2020). Using these estimates of suitable habitat and assuming the ejecta would be equally distributed on the lagoon and ocean sides of the islet (i.e., half of debris on each side); approximately 7.8 m^2 (9.3 yd^2) of lagoon-side suitable habitat and 7.3 m^2 (8.7 yd^2) of ocean-side suitable habitat may be impacted by debris. (Figure 8).

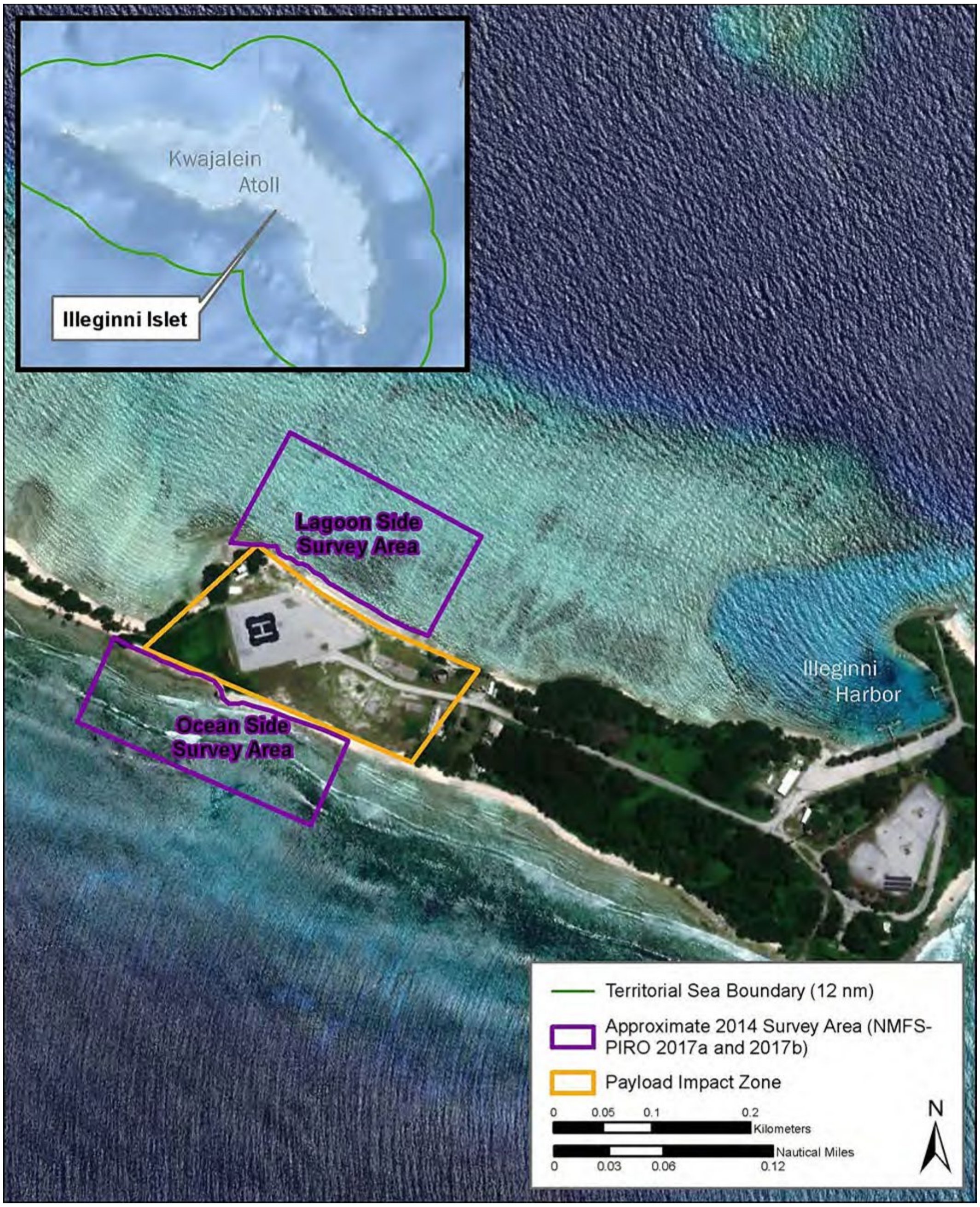


Figure 8. NMFS 2014 Marine Resource Survey Areas at Illeginni Islet, Kwajalein Atoll (provided by U.S. Army).

It is reasonable to assume that the effects of debris fall and shock waves would not occur evenly across an entire area of potentially viable habitat. Thus, the actual habitat area that would be affected is considered to be a proportion of the total estimated viable habitat. Since there are no data available to identify this unknown proportion or the actual amount of viable habitat that would be affected by debris fall or shock waves, these analyses should be regarded as an overestimate and those of maximum effect.

The effects of ejecta impact would not occur evenly across the affected area. Chunks of ejecta would be scattered across the area; impacting a small proportion of the suitable habitat. The U.S.

Army anticipates that only 1 percent of ejecta could reach the water's edge, while 99 percent of the ejecta is anticipated to fall on land.

Also, the area within the shock wave range of effect would be completely contained within the area at risk for ejecta impacts. The anticipated worst-case scenario of a payload land impact at Illeginni islet is a shoreline strike, which would result in effects that would extend outward from the point of strike. On both sides of Illeginni Islet, the area may potentially be affected by debris fall. Since these areas overlap and since harmed individuals should be counted only once in the effects of the Action, the affected habitat area with the largest estimated take was selected as the worst-case scenario. Although the exact shape of the affected area is impossible to estimate, the seaward portion of such an area is conceptually illustrated as a rough semi-circle on the lagoon and ocean sides of Illeginni Islet with a radius of 91 m (Figure 9).

Figure 9. Representative Maximum Direct Contact Affect Areas for a Shoreline Payload Impact at Illeginni Islet, Kwajalein Atoll.

It is reasonable to assume that the effects of debris fall and shock waves would not occur evenly across an entire area of potentially viable habitat. Thus, the actual habitat area that would be affected is considered to be a proportion of the total estimated viable habitat. Since there are no data available to identify this unknown proportion or the actual amount of viable habitat that would be affected by debris fall or shock waves, these analyses assume that the entire area will be affected and should be regarded as an overestimate and those of maximum effect.

The number of potential coral and mollusk exposures to direct contact was calculated based on the density of coral colonies and mollusks reported by NMFS in 2017 (NMFS-PIRO 2017a, 2017b). The 99% upper confidence level of the bootstrap mean densities for the potentially affected consultation species in the area was multiplied by the areal extent of potentially affected suitable habitat to estimate the number of coral colonies and top shell snails that may be adversely affected by ejecta and/or shock wave effects by a payload land impact at Illeginni Islet (Table 9). Based on new information available for the FT-3, the number of species anticipated to be adversely affected is slightly different than what was anticipated for the FE-2 test. To err on the side of the species, each fraction is rounded up to the next whole individual number.

Table 9 Estimated numbers of consultation coral colonies, and individual mollusks in affected habitat.

Scientific Name	Species	Colonies or Individuals Affected
	Corals	
Acropora microclados	No Common Name	<0.01 - 0.01 = 1
A. polystoma	No Common Name	<0.01 - 0.01 = 1
Cyphastrea agassizi	No Common Name	<0.01 - 0.01 = 1
Heliopora coerulea	No Common Name	1.25 - 3.51 = 4
Pavona venosa	No Common Name	<0.01 - 0.01 = 1
Turbinaria reniformis	No Common Name	<0.01 - 0.01 = 1
Pocillopora meandrina	Cauliflower coral	2.19 - 4.24 = 5
	Mollusks	
Tectus niloticus	Top Shell Snail	<0.01 = 1
Hippopus hippopus	Giant clam	0.02 – 0.05 = 1
Tridacna squamosa	Giant clam	<0.01 – 0.01 = 1
	Fish	
Cheilinus undulates	Humphead wrasse	108 (8 adults/100 juveniles)

6.3 Response to Falling Missile Components

This section analyzes the responses of UES-consultation corals, top shell snails, giant clams, and humphead wrasse that may be exposed to being hit by the FT-3 payload and/or ejecta.
The FT-3 payload would be traveling at hypersonic velocity when it impacts the islet. The kinetic energy released into the substrate would be similar to the detonation of high explosives. The payload will effectively “explode”, with some of its mass reduced to very fine particles (“aerosolized”) and the remainder reduced to an undescribed range of fragment sizes. The

substrate at the impact site would be blasted into a range of fragment sizes ranging from powder to larger rocks toward the outer edges of the crater. Some debris and substrate rubble would remain in the crater. The remainder would be thrown from the crater (ejecta). Initially, some of the ejecta would be moving at high velocity (bullet speeds). Some ejecta would move laterally, some would travel upward then fall back down up to 91 m from the impact site. The substrate immediately around the crater would be covered by larger chunks of ejecta from the outer edges of the crater as well as finer material that was thrown more vertically before falling back down. The movement of ejecta away from the crater would act to spread it out (scatter) over an increasing area, with decreasing available material being scattered over an increasing area. The velocity of the ejecta would also diminish with distance.

The intensity of the payload impact, and the uniformity of exposure to ejecta and the shock wave would decrease with distance from the point of impact. Any corals and top shell snails directly beneath the payload, or within the crater radius are expected to be instantly killed, with very little left of the organisms that would be recognizable. Beyond the crater, corals and top shell snails would be exposed to ejecta and the ground borne shock wave. Corals and top shell snails immediately beyond the crater would likely experience mortality from impact by high-velocity ejecta, from burial under mobilized crater material, or from exposure to the ground borne shock wave.

For corals, the USASMDC/RCCTO estimated that there could be up to 14 impacted coral colonies in the action area. The response of corals to ejecta and the ground borne shock wave would depend largely on the scale and intensity of the exposure. Impact by high-velocity dense ejecta (rock or metal), could fracture the hard structure of corals and would likely injure or destroy soft tissues. Fracturing would depend largely on the size and intensity of the impact and on morphology of the impacted coral. Plate-forming and branching corals are more easily broken than large massive or encrusting forms. Fractures due to payload impact are expected to range from pulverization of colonies in and close to the crater, to cracks and/or loss of branches in colonies toward the outer edge of effect. Additionally, exposure to the ground based shock wave could also fracture or dislodge coral colonies out to about 37.5 m from the payload impact. Because the coral skeletons are hard rock-like structures that are rigidly fixed to the hard substrate through which the shock wave would travel, much of the available energy in the substrate can be transferred directly into the coral's skeletal structure. If the shock wave is intense enough, the coral's structure may crack or fracture and/or it may become unattached from the substrate. At close ranges, impact by lower velocity and/or lower density ejecta could affect the soft tissues of corals, ranging from burial to scouring away all or most of the living polyps and interconnecting soft tissues from a colony. At greater ranges, localized damage of a small part of a colony is possible.

Pulverization of a colony's structure, deep burial, or loss of a large proportion of a colony's soft tissue would likely result in the mortality of the colony. Partial fracturing of a coral skeleton and/or dislodgement of a coral from the substrate due to ejecta impact or from exposure to the ground based shock wave would injure the soft tissues at and around the break. Re-growth of soft tissues has energetic costs that could slow other growth and reproduction. Exposed areas of coral skeleton are prone to bioerosion and overgrowth by algae and certain sponges. Large areas of damaged or dead tissue could result in the introduction of algae that may prevent the regeneration of healthy coral tissue, or that may overcome the whole colony. Damaged and stressed tissues may also be more susceptible to infection by coral diseases that may hinder or prevent healing to the point that the colony dies.

Fragmentation is a form of asexual reproduction in some branching corals, resulting in the development of new, but genetically identical colonies. Bothwell (1981) reports that several *Acropora* species successfully colonize through fragmentation and translocation of fragments by storm-driven waves. However, not all coral fragments, or dislodged colonies would be expected to survive. Survival would depend largely on where a fragment falls and how it is oriented after it settles to substrate. A fragment or colony is likely to die if the living tissue is on the underside of the fragment or if the fragment settles into fine sediments. Additionally, in areas that experience regular high surf, such as the ocean side reef at Illeginni, loose coral fragments and colonies could repeatedly become mobilized by the waves. This reduces the likelihood of their survival, and potentially injures additional coral colonies should the fragments be cast against them.

Based on the available information, we believe that the 14 coral colonies, identified above in Table 9, represent a conservative yet reasonable estimate of the corals that may be adversely affected by the proposed action. Further, this Opinion conservatively assumes that mortality would result for all exposed coral colonies. This approach is being taken to ensure a precautionary assessment is made of the jeopardy risk for the affected species.

In the case of the top shell snail, the USASMDC/RCCTO estimated that there will be up to one top shell snail in the area of impact pictured in Figure 9. The effects of exposure to ejecta and shock wave is expected to quickly diminish to insignificance with distance from the payload impact site. Impact by high-velocity dense ejecta (rock or metal) immediately around the crater could penetrate or fracture an exposed snail's shell, either killing the animal directly, or leaving it vulnerable to predation. Conversely, with movement away from the payload impact site, ejecta would become slower, and the ejecta would have to penetrate increasing water depth to impact the snails. Considering the conical shape and thickness of a top shell snail's shell, most ejecta that may strike one that is under water and at any distance from the payload impact site is likely to be deflected without imparting a significant proportion of its kinetic energy to the shell or the animal within.

Top shell snails immediately around the payload crater may also be buried by ejecta. The potential for burial, and the depth of the material under which a snail may be buried would likely decrease quickly with distance from the payload impact site. Mortality could result if the snail is crushed, smothered, or permanently pinned beneath rubble. Non-lethal effects could include energetic costs and/or foraging impacts.

Exposure to intense ground borne shock waves could injure the soft tissues of top shell snails. Mortality of the snail is possible if the injury is significant enough. The range to the onset of significant injuries for top shell snails exposed to a ground based payload impact shock wave is unknown, but it is likely much less than that estimated for corals (37.5 m). Top shell snails are not rigidly attached to the substrate as are corals. Instead, they adhere to the reef using a muscular foot. Whereas rigidly attached corals would be directly linked to the substrate such that the energy could readily travel into and along its skeletal structure, the muscular foot of the snail would act to isolate the snail's shell from the vibration, and to reduce the transfer of the energy to other soft tissues and organs. Non-lethal effects could include bruising of the foot and other tissues, which may have energetic costs and/or may have reproductive impacts.

As stated above, habitat suitability for the consultation species is lowest along the water's edge and typically increases with distance from shore. Therefore, top shell snail density would be lowest in the area immediately adjacent to the payload impact site, where ejecta effects and shock wave would be greatest. Conversely, in the areas where top shell snail density would be highest, ejecta would be slower, and it would have to penetrate several feet of water to impact the snails. Based on this, on the robust nature of snails (see Section 4), and the characteristics of its shell, most ejecta that may strike top shell snails is likely to be deflected without imparting any significant proportion of its kinetic energy to the shell or the animal within. In this situation, ejecta impact would result in little more than inducing the affected snail to briefly adhere more tightly to the substrate before resuming normal behaviors. The range to adverse effects from burial and shock waves would likely be similarly restricted to the area along the water's edge. Therefore, we expect that up to one top shell snail that may be exposed to the combined effects of a payload land strike (Table 9, above), would be adversely affected by the exposure.

In the case of the clams, the USASMDC/RCCTO estimated that there will be up to two clams impacted in the impact area pictured in figure 9. The effects of exposure to ejecta and shock wave is expected to quickly diminish to insignificance with distance from the payload impact site. Impact by high-velocity dense ejecta (rock or metal) immediately around the crater could penetrate or fracture an exposed clam shell, or damage soft tissue that is exposed possibly killing the animal. Conversely, with movement away from the payload impact site, ejecta would become slower, and the ejecta would have to penetrate increasing water depth to impact the clams. Considering the thickness of a clam shell, most ejecta that may strike one that is under water and at any distance from the payload impact site is likely to be deflected without imparting a significant proportion of its kinetic energy to the shell or the animal within unless it is able to lodge itself in the shell opening.

Clams immediately around the payload crater may also be buried by ejecta. The potential for burial, and the depth of the material under which a clam may be buried would likely decrease quickly with distance from the payload impact site. Mortality could result if the clam is crushed, smothered, or permanently pinned beneath rubble. Non-lethal effects could include foraging impacts if the clam is unable to filter feed due to debris.

Exposure to intense ground borne shock waves could injure the soft tissues of clams. Mortality is possible if the injury is significant enough. The range to the onset of significant injuries for clams exposed to a ground based payload impact shock wave is unknown. Clams can be buried in substrate or attached to corals which means they would be directly linked to the substrate such that the energy could readily travel into the shell and affect the soft tissue and organs. Non-lethal effects could include bruising of the tissues, which may have energetic costs and/or may have reproductive impacts.

As stated above, habitat suitability for the consultation species is lowest along the water's edge and typically increases with distance from shore. Therefore, clam density would be lowest in the area immediately adjacent to the payload impact site, where ejecta effects and shock wave would be greatest. Conversely, in the areas where clam density would be highest, ejecta would be slower, and it would have to penetrate several feet of water to impact the clams. Based on this, on the robust nature of clams, and the characteristics of its shell, most ejecta that may strike clams is likely to be deflected without imparting any significant proportion of its kinetic energy to the shell or the animal within. In this situation, ejecta impact would result in little more than inducing the affected clam to close before resuming normal behaviors. The range to adverse effects from burial and shock waves would likely be similarly restricted to the area along the water's edge. Therefore, we expect that up to two clams may be exposed to the combined effects of a payload land strike (Table 9, above), and would be adversely affected by the exposure.

In the case of the humphead wrasse, the USASMDC/RCCTO estimated that, based on estimated abundance, density, and survey data, there will be up to 100 juvenile, and eight adult humphead wrasses in the area of impact pictured in Figure 9 (MDA/USASMDC/ARSTRAT 2019; SSP 2019). An individual animal could be exposed to ejecta hitting and traveling through the water and from the shock wave produced from the main projectile's impact. An animal subjected to a direct impact, concussive shock waves from the impact, ejecta, or a near miss of ejecta would result in wounding or death. Potential injuries may include cuts, gashes, bruises, broken bones, rupture or hemorrhage of internal organs, amputation, or other broken body parts; any of which could result in an animal's death. Since the arcs (the affected area on the lagoon and the affected area on the ocean) were drawn and estimated based on shoreline strikes on each side, the model assumes mishits on every test, which is highly unlikely to occur. Furthermore, it assumes that ejecta will uniformly spread, especially to the outer extents of those circles (~100 m away). Humphead wrasses were observed beyond the reef crest near the edges of those arcs.

As mentioned in previous sections, the USASMDC/ARSTRAT observed the majority of ejecta stayed within a few meters of the impact area. The density of ejecta is expected to decrease with distance from the point of impact (USAFGSC and USASMDC/ARSTRAT 2015). Ejecta is also likely to lose velocity the further it travels from the source. The depth of the water in the 91 m radius is expected to be less than 3 m. Humphead wrasses are generally not surface-dwelling fish where they would be the most vulnerable to strikes. Graham et al. (2015) reports that humphead wrasse are most often encountered on outer reef slopes and reef passes/channels at depths of only a few meters to at least 60 m (Randall 1978); other reports document humphead wrasses to depths of up to 100 m (Russell 2004; Zgliczynski et al. 2013). Graham et al. (2015) further notes from personal observations from NMFS biologists familiar with the species and documented observations on deep dives that the species was caught at depths greater than 100 m and up to approximately 180 m by deep gillnet (G. Davis pers. comm. as cited in Graham et al. 2015). On impact, the parts of the payload and substrate will explode into numerous pieces from "aerosolized" bits to mid-sized rocks. The largest sized ejecta is likely to travel through the air slower than smaller and lighter pieces, and fall closer to the source. When ejecta hits the water, it slows down quickly before falling to the reef or substrate. Furthermore, ocean conditions are dynamic in the nearshore (i.e. waves, currents, etc.) and projectiles would lose the majority of their energy within a few inches of the surface. Humphead wrasse, even juveniles, are large and mobile and will likely flee from falling debris as it hits the water. We expect that up to 108 humphead wrasse may be exposed to the combined effects of a payload land strike (Table 9, above), and would be adversely affected by the exposure.

6.4 Risk

This section analyzes the risk posed by the proposed action for populations of UES-protected marine species at USAKA due to exposure to direct impact and removal from the water as described above. Because this Opinion assumes mortality for all exposed individuals, regardless of the stressor, the risk assessment below focuses on the species impacts from the direct impact.

6.4.1 Risk for coral populations due to expected levels of action-related mortality

As described in the exposure analyses above, up to 14 colonies of seven UES-consultation coral species (Table 9, above) could experience mortality from the payload strike on Illeginni Islet. This would be due to the combined exposure to direct payload impact, ejecta, and ground based shock wave. The RCCTO/USASMDC plans just one FT-3 so this represents the maximum possible impact associated with this action.

Based on the best information available, we believe that these corals are all widely distributed around the atoll, and that the potentially impacted area represents a very small fraction (not currently quantifiable) of coral-occupied habitat at Illeginni, and likely below 1% of coral-occupied habitat at USAKA. As described above at 7.2, we further believe that the distribution and abundance of these coral species in similar habitat areas outside of the potentially impacted zones would be similar to their estimated distribution and abundance within the impacted zones, and as such, these 14 colonies likely represent a tiny fraction of their species found at Illeginni and across USAKA. Therefore, based on the best available information, we consider the risk negligible that project-related effects from direct payload impact, ejecta, and ground based shock wave would eliminate any of these species at USAKA, or appreciably reduce the likelihood of their survival and recovery at USAKA and across their global range.

6.4.2 Risk for top shell snails due to expected levels of action-related mortality

As described in the exposure and response analyses above, we expect up to one top shell snail could experience mortality as the result of a single direct payload impact, ejecta, and ground based shock wave. We believe that top shell snails are widely distributed at all of the USAKA islets around the atoll, and that the potentially impacted area represents a very small fraction (not currently quantifiable) of top shell snail-occupied habitat at Illeginni, and likely below 1% of top shell snail-occupied habitat at USAKA. As described above at 7.2, we further believe that the distribution and abundance of these mollusks in similar habitat areas outside of the potentially impacted zones would be similar to their estimated distribution and abundance within the impacted zones, and as such, this one top shell snail likely represent a tiny fraction of their species found at Illeginni and across USAKA, and their loss would be virtually indistinguishable from natural mortality levels in the region. Therefore, based on the best available information, we consider the risk negligible that the effects of direct payload impact, ejecta, and ground based shock wave would eliminate this species at USAKA, or appreciably reduce the likelihood of its survival and recovery at USAKA and across their global range.

6.4.3 Risk for clams due to expected levels of action-related mortality

As described in the exposure and response analyses above, we expect up to one *H. hippopus* and one *T. squamosa* clam could experience mortality as the result of a single direct payload impact, ejecta, and ground based shock wave. We believe that both species of clams are widely distributed at all of the USAKA islets around the atoll, and that the potentially impacted area represents a very small fraction (not currently quantifiable) of clam-occupied habitat at Illeginni, and likely below 1% of clam-occupied habitat at USAKA. As described above at 7.2, we further believe that the distribution and abundance of these mollusks in similar habitat areas outside of the potentially impacted zones would be similar to their estimated distribution and abundance within the impacted zones, and as such, these two clams likely represent a tiny fraction of their species found at Illeginni and across USAKA, and their loss would be virtually indistinguishable from natural mortality levels in the region. Therefore, based on the best available information, we consider the risk negligible that the effects of direct payload impact, ejecta, and ground based shock wave would eliminate this species at USAKA, or appreciably reduce the likelihood of its survival and recovery at USAKA and across their global range.

6.4.4 Risk for humphead wrasses due to expected levels of action-related mortality

As described in the exposure and response analyses above, we expect up to 108 humphead wrasses could experience mortality as the result of direct payload impacts from all four payload strikes, ejecta, and ground-based shock wave, but more likely minor injury if any, will occur. We believe that humphead wrasse are widely distributed at all of the USAKA islets around the atoll, and that the potentially impacted area represents a very small fraction (not currently quantifiable) of habitat at Illeginni, and likely below 1% of humphead wrasse-occupied habitat at USAKA. As described above at 7.2, we further believe that the distribution and abundance of these fish in similar habitat areas outside of the potentially impacted zones would be similar to their estimated distribution and abundance within the impacted zones, and as such, these 108 humphead wrasse likely represent a tiny fraction of their species found at Illeginni and across USAKA, and their loss would be virtually indistinguishable from natural mortality levels in the region. Therefore, based on the best available information, we consider the risk negligible that the effects of direct payload impact, ejecta, and ground-based shock wave would eliminate this species at USAKA, or appreciably reduce the likelihood of its survival and recovery at USAKA and across their global range.

7 CUMULATIVE EFFECTS

The UES does not specifically describe “cumulative effects” for a biological opinion. However, Section 161 of the Compact provides that for U.S. Government activities requiring the preparation of an environmental impact statement (EIS) under NEPA, the U.S. Government shall comply with environmental standards that protect public health and safety and the environment that are comparable to the U.S. environmental statutes, including the Endangered Species Act. Although not all USAKA actions that require formal consultation also require the preparation of an EIS, such as this action, we analyze cumulative effects in all USAKA consultations as that term is defined in the ESA implementing regulations. Cumulative effects, as defined in the ESA, are limited to the effects of future State, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this Opinion (50 CFR 402.02). These effects do not include the continuation of actions described under the Environmental Baseline, and future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the ESA.

The impacts of RMI coastal development, fisheries interactions, vessel groundings, direct take, marine debris, and global climate change are not only expected to continue, they are likely to intensify over time. The intensification of those impacts is expected to cause cumulative effects on UES-protected marine species at USAKA. Continued growth of the human population at Kwajalein Atoll would likely result in increased coastal development, fishing pressure, vessel traffic, and pollution of the marine environment.

Anthropogenic release of CO_2 and other greenhouse gases is considered the largest contributor to global climate change, and it is expected that the release of those gases is not only likely to continue, but the rate of their release is expected to increase during the next century (Brainard et al. 2011). Therefore, global climate change is expected to continue to impact UES-protected marine species and their habitats, especially on those species that are dependent on shallow coastal reefs and shorelines, such corals and marine mollusks. There is uncertainty associated with the analysis of potential impacts of climate change on species and ecosystems (Barnett 2001). Effects of climate change will not be globally uniform (Walther et al. 2002) and information regarding the magnitude of future climate change is speculative and fraught with uncertainties (Nicholls and Mimura 1998). In particular, there is no comprehensive assessment of the potential impacts of climate change within the action area or specific to UES-protected marine species.

In addition to the uncertainty of the rate, magnitude, and distribution of future climate change and its associated impacts on temporal and spatial scales, the adaptability of species and ecosystems are also unknown. Impact assessment models that include adaptation often base assumptions (about when, how, and to what conditions adaptations might occur) on theoretical principles, inference from observed observations, and arbitrary selection, speculation, or hypothesis (see review in Smit *et al.* 2000). Impacts of climate change and hence its 'seriousness' can be modified by adaptations of various kinds (Tol et al. 1998). Ecological systems evolve in an ongoing fashion in response to stimuli of all kinds, including climatic stimuli (Smit et al. 2000).The effects of global climate change, the most significant of which for corals are the combined direct and indirect effects of rising sea surface temperatures and ocean acidification, are currently affecting corals on a global scale, particularly in parts of the Caribbean. The return frequency of thermal stress-induced bleaching events has exceeded the ability of many reefs and coral species to recover there. Brainard et al. (2011) report that those effects likely represent the greatest risk of extinction to ESA-candidate corals over the next century. Field observation and models both predict increasing frequency and severity of bleaching events, causing greater coral mortality and allowing less time to recover between events. However, predicting how global climate change may impact particular species remains poorly understood, especially in understudied areas such as USAKA.

The effects of global climate change could act synergistically on corals affected by the proposed action. The ability of impacted corals to respond to the effects of the proposed action could be reduced due to the effects of elevated temperatures and increased ocean acidity, and the longer it takes for impacted corals to recover from the effects of the proposed action, the more likely it becomes that the effects of climate change would synergistically impact those corals. However, the degree to which those synergistic impacts may affect corals over the time required for them to recover from project impacts is unknown.

The effects of global climate change could also act synergistically on mollusks affected by the proposed action. However, no specific information is currently available to assess the impacts. Changes in ocean temperature and chemistry, and rising sea level may be affecting these species because they depend on an exoskeleton that is comprised primarily of calcium carbonate. We expect that minimally, increased acidity could have effects that parallel those described for corals above.

Given the small area and low numbers of individuals expected to be adversely affected by the proposed action, the possible synergistic impacts of climate change combined with the effects of the proposed action are not expected to be significant for the corals and mollusk considered in this Opinion.

8 INTEGRATION AND SYNTHESIS OF EFFECTS

The purpose of this Opinion is to determine if the proposed action is likely to jeopardize the continued existence of UES-protected marine species at USAKA. “Jeopardize the continued existence of” means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a UES-protected marine species at USAKA by reducing the reproduction, numbers, or distribution of that species. *See* 50 CFR 402.02 This Opinion considers the Effects of the Action within the context of the Status of the Species, the Environmental Baseline, and Cumulative Effects as described in Section 7 under “Approach”.

We determine if reduction in fitness to individuals of marine consultation species that may result from the proposed action are sufficient to reduce the viability of the populations those individuals represent (measured using changes in the populations’ abundance, reproduction, spatial structure and connectivity, growth rates, or variance in these measures to make inferences about the risk of reducing the likelihood of survival and recovery of UES-protected species). In order to make that determination, we use the population’s base condition (established in the Status of Listed Species and Environmental Baseline sections of this Opinion), considered together with Cumulative Effects, as the context for the overall effects of the action on the affected populations at USAKA. The following discussion summarizes the probable risks the proposed action poses to corals, top shell snails, giant clams, and the humphead wrasse identified in Section 6.

8.1 Corals

As described in the Effects of the Action section, a total of up to 14 colonies of UES-consultation corals (7 species) could be killed through some combination of exposure to direct payload impact, ejecta, and ground based shock wave. Over 99% of the colonies are from two highly abundant and widely distributed species within USAKA; *P. meandrina* and *H. coerulea*.

As discussed in the Status of Listed Species, abundance and trend data are lacking for these corals at USAKA. However, they are all widely distributed around the atoll, with four of the seven corals being known to occur at all USAKA islets. Others are known to occur on at least half of the USAKA islets. All seven species have also been observed at survey sites in the MAC, with three found at over 30 of the 35 sites. It is important to recognize that survey data for USAKA is far from complete. Only a small portion of the total reef area around the USAKA islets and MAC has been surveyed, and surveys to specifically identify and quantify these species are yet to be done. A recent survey was completed at Illeginni Islet in the MM III reef impact area, which is also the area that has been analyzed for impacts from the ARRW payload and the results suggest that the estimate for corals in the area may be lower than what has been estimated (NMFS 2017a). Additionally, NMFS conducted a survey in 2018 at two launch sites in preparation of the THAAD test (NMFS 2018).

As discussed more fully in the Environmental Baseline and Cumulative Effects sections, the effects of continued flight testing, fisheries interactions, direct take, and climate change are expected to continue and likely worsen in the future for these corals. Although many actions at

USAKA beyond what are described in the Environmental Baseline and Cumulative Effects sections are uncertain, we do have expected estimates (worst-case scenarios) for the actions described above in those sections, and we acknowledge that there are other federal actions occurring in the Atoll (previous, ongoing and known future actions) impacting these species. For example, the FE-1 testing will remove up to 10,417 coral colonies, the ARRW testing will remove up to 10,417 colonies, the FE-2 testing will remove up to 10,404 colonies, and the GBSD testing will remove up to 31, 224 colonies (for a total of up to 62,462 colonies cumulatively). PRD has considered the action's impacts with the other threats incurring on the species, and even with the worst-case scenario (loss of individuals due to this action) added to other losses discussed in the Environmental Baseline and Cumulative Effects sections, we do not expect these actions to result in appreciable reduction of the species.

The proposed action is anticipated to result in the mortality of up to 14 coral colonies at Illeginni Islet. These coral colonies represent an extremely small fraction of the total number of colonies found at Illeginni, and even less around USAKA. In the context of this action, the potential loss of these coral colonies is not expected to significantly impact reproduction or to impede the recovery of their species across USAKA and the MAC. Therefore, when taken in context with the status of these species, the environmental baseline, cumulative impacts and effects, the proposed action is not likely to eliminate any of the seven UES consultation corals considered in this Opinion from Illeginni, or appreciably reduce the likelihood of their survival and recovery across USAKA including the MAC.

8.2 Top Shell Snail

As described in the Effects of the Action section, a total of up to one top shell snail could be killed through some combination of exposure to direct payload impact, ejecta, and ground based shock wave.

As discussed in the Status of Listed Species, top shell snails have been reported at all of the 11 USAKA islets as well as at 59 of 103 survey sites throughout Kwajalein Atoll including all four survey sites on Illeginni. It is important to recognize that survey data for USAKA is far from complete. Only a small portion of the total reef area around the USAKA islets has been surveyed, and surveys to specifically identify and quantify this species are yet to be done. As such, it is possible that the distribution and abundance of top shell snails at USAKA is higher than the current information can confirm.

As discussed more fully in the Environmental Baseline and Cumulative Effects sections, the effects of continued flight testing, coastal development, direct take, and climate change are expected to continue and likely worsen in the future for this species. Although many actions at USAKA beyond what are described in the Environmental Baseline and Cumulative Effects sections are uncertain, we do have expected estimates (worst-case scenarios) for the actions described above in those sections, and we acknowledge that there are other federal actions occurring in the Atoll (previous, ongoing and known future actions) impacting these species. For example, the FE-1, ARRW, andFE-2 testing will remove up to four top shell snails for each project, and the GBSD testing will remove up to nine top shell snails(for a total of up to 21 top shell snails cumulatively). PRD has considered the action's impacts with the other threats incurring on the species, and even with the worst case scenario (loss of individuals due to this action) added to other losses discussed in the Environmental Baseline and Cumulative Effects sections, we do not expect these actions to result in appreciable reduction of the species.

The proposed action is anticipated to result in death of up to one top shell snail at Illeginni. The affected snail would represent a small fraction of the total number of top shell snails found at Illeginni, and an even smaller proportion of the population across USAKA. In the context of this action, the potential loss of one top shell snails across the area is not expected to significantly impact reproduction or to impede the recovery of this species across USAKA and the MAC. Therefore, when taken in context with the status of the species, the environmental baseline, cumulative impacts and effects, the proposed action is not likely to eliminate top shell snails at Illeginni, or appreciably reduce the likelihood of their survival and recovery across USAKA including the MAC.

8.3 Giant Clams

As described in the Effects of the Action section, a total of up to two giant clams could be harassed, injured, or killed through some combination of exposure to direct payload impact, ejecta, and ground-based shock wave.

As discussed in the Status of Listed Species, the two clam species have been reported at most of the 11 USAKA islets, (9 for *H. hippopus* and 6 for *T. squamosa*) as well as at 9 and 24 respectively of 35 survey sites in the mid-atoll corridor. It is important to recognize that survey data for USAKA is far from complete. Only a small portion of the total reef area around the USAKA islets has been surveyed, and surveys to specifically identify and quantify this species are yet to be done.

As discussed more fully in the Environmental Baseline and Cumulative Effects sections, the effects of continued flight testing, coastal development, direct take, and climate change are expected to continue and likely worsen in the future for this species. Although many actions at USAKA beyond what are described in the Environmental Baseline and Cumulative Effects sections are uncertain, we do have expected estimates (worst-case scenarios) for the actions described above in those sections, and we acknowledge that there are other federal actions occurring in the Atoll (previous, ongoing and known future actions) impacting these species. For example, the FE-1 testing will remove up to 90 giant clams, the ARRW testing will remove up to 90 giant clams, the FE-2 testing will remove up to 75 giant clams, and the GBSD tests will remove up to 219 clams (for a total of up to 474 giant clams cumulatively). PRD has considered the action's impacts with the other threats incurring on the species, and even with the worst-case scenario (loss of individuals due to this action) added to other losses discussed in the Environmental Baseline and Cumulative Effects sections, we do not expect these actions to result in appreciable reduction of the species.

The proposed action is anticipated to result in the death of up to two giant clams (one *H. hippopus* and one *T. squamosa*) at Illeginni. The affected clams would represent a small fraction of the total number of clams found at Illeginni, and an even smaller proportion of the population across USAKA. In the context of this action, the potential loss of giant clams across the area is not expected to significantly impact reproduction or to impede the recovery of this species across USAKA and the mid-atoll corridor. Therefore, when taken in context with the status of the species, the environmental baseline, cumulative impacts and effects, the proposed action is not likely to eliminate giant clams at Illeginni, or appreciably reduce the likelihood of their survival and recovery across USAKA including the mid-atoll corridor.

1.1 Humphead Wrasse

As described in the Effects of the Action section, a total of up to 108 humphead wrasses could be harassed, injured, or killed through some combination of exposure to direct payload impact, ejecta, and ground-based shock wave.

As discussed in the Status of Listed Species section, humphead wrasses are commonly observed at Kwajalein Atoll, and have been observed at 10 of the 11 surveyed islets since 2010. Observations suggest a broad but scattered distribution. It is important to recognize that survey data for USAKA is incomplete. Only a small portion of the total reef area around the USAKA islets have been surveyed, especially in deeper waters where humphead wrasse could live.

As discussed in the Environmental Baseline and Cumulative Effects section, the effects of continued flight testing, coastal development, direct take, and climate change are expected to continue and for climate change in particular expect to worsen in the future. Although many actions at USAKA beyond what are described in the Environmental Baseline and Cumulative Effects sections are uncertain, we do have expected estimates (worst-case scenarios) for the actions described above in those sections, and we acknowledge that there are other federal actions occurring in the Atoll (previous, ongoing and known future actions) impacting these species. For example, the FE-1, ARRW, and FE-2 testing will remove up to 108 humphead wrasse for each project, and the GBSD tests will remove up to 324 humphead wrasse (for a total of up to 648 humphead wrasse cumulatively). PRD has considered the action's impacts with the other threats incurring on the species, and even with the worst-case scenario (loss of individuals due to this action) added to other losses discussed in the Environmental Baseline and Cumulative Effects sections, we do not expect these actions to result in appreciable reduction of the species.

The proposed action is anticipated to result in the injury or death of up to 108 humphead wrasse (100 juveniles and 8 adults) at Illeginni. The affected individuals would represent a small portion of the total number of humphead wrasse found at Illeginni, and an even smaller proportion of the population across USAKA. In the context of this action, the potential loss of humphead wrasses by the action is not expected to significantly impact reproduction or to impede the recovery of this species across USAKA and the MAC. Therefore, when taken in context with the status of the species, the environmental baseline, cumulative impacts and effects, the proposed action is not likely to eliminate humphead wrasses at Illeginni, or appreciably reduce the likelihood of their survival and recovery across USAKA including the MAC.

2 CONCLUSION

After reviewing the current status of UES-protected marine species, the environmental baseline for the action area, the effects of the proposed action, and the cumulative effects, it is our Opinion that the RCCTO/USASMDC's implementation of the FT-3 at the Reagan Test Site, USAKA, RMI is not likely to jeopardize the continued existence of any of the UES-protected corals considered in this Opinion, the top shell snail, humphead wrasse, or two species of giant clams. No critical habitat has been designated or proposed for designation for any UES-protected marine species in the BOA or elsewhere in the RMI. Therefore, the proposed action would have no effect on designated or proposed critical habitat in the RMI. As described in Section 3, designated critical habitat has been identified near the launch site in the MHI for Steller sea lions. NMFS concludes the proposed action may affect, but is not likely to adversely affect or modify designated critical habitat for the Steller sea lion.

3 INCIDENTAL TAKE STATEMENT

The UES does not specifically describe “take” for a biological opinion. However, under the ESA “take” is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct. 16 USC 1532. “Incidental take” is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. 50 CFR 402.02. Under the terms of Section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the reasonable and prudent measures and terms and conditions of the Incidental Take Statement (ITS). Although the ESA does not specifically apply to actions taken at USAKA, under section 161 of the Compact and the UES, the ESA provides the basis for determining the level of incidental take, so the ESA definitions will be used for this Opinion.

3.1 Anticipated Amount or Extent of Incidental Take

Based on the analysis in the accompanying Opinion we conclude that the FT-3 flight test at the USAKA RTS, may result in the take of seven species of UES consultation corals, top shell snails, humphead wrasse, and two clam species. As described above in the exposure and response analyses, we expect that up to 14 colonies of UES consultation corals (as quantified in Table 10, below) could experience complete mortality, up to one top shell snail, up to two clams, and up to 108 humphead wrasse could be killed by the proposed action.

Table 10. Expected Take of Marine UES consultation species due to FT-3 flight test

Scientific Name	**Species**	**Colonies or Individuals Affected**
	Corals	
Acropora microclados	No Common Name	<0.01 - 0.01 = 1
A. polystoma	No Common Name	<0.01 - 0.01 = 1
Cyphastrea agassizi	No Common Name	<0.01 - 0.01 = 1
Heliopora coerulea	No Common Name	1.25 - 3.51 = 4
Pavona venosa	No Common Name	<0.01 - 0.01 = 1
Turbinaria reniformis	No Common Name	<0.01 - 0.01 = 1
Pocillopora meandrina	Cauliflower coral	2.19 - 4.24 = 5
	Mollusks	
Tectus niloticus	Top Shell Snail	<0.01 = 1
Hippopus hippopus	Giant clam	0.02 – 0.05 = 1
Tridacna squamosa	Giant clam	<0.01 – 0.01 = 1

Scientific Name	Species	Colonies or Individuals Affected
	Fish	
Cheilinus undulates	Humphead wrasse	108 (8 adults/100 juveniles)

3.2 Effect of Impact of the Take

In the accompanying Opinion, we determined that this level of anticipated take is not likely to result in the jeopardy of any of the UES consultation species expected to be taken by the proposed action.

3.3 Reasonable and Prudent Measures

We believe the following reasonable and prudent measures, as implemented by the terms and conditions, are necessary and appropriate to minimize impacts of the proposed action and monitor levels of incidental take. The measures described below are non-discretionary and must be undertaken in order for the ITS to apply.

1. The RCCTO/USASMDC shall reduce impacts on UES-protected corals, top shell snails, clams and their habitats through the employment of conservation measures.
2. The RCCTO/USASMDC shall record and report all action-related take of UES-consultation species.

3.4 Terms and Conditions

The RCCTO/USASMDC must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and outline required reporting/monitoring requirements. These terms and conditions are non-discretionary.

1. To meet reasonable and prudent measure 1 above, the RCCTO/USASMDC shall ensure that their personnel comply fully with the conservation measures identified below.
    a. The RCCTO/USASMDC shall ensure that all relevant personnel associated with this project are fully briefed on the best management practices and the requirement to adhere to them for the duration of this project.
    b. In the event the payload land impact affects the reef at Illeginni, the RCCTO/USASMDC shall require its personnel to secure or remove from the water any substrate or coral rubble from the ejecta impact zone that may become mobilized by wave action as soon as possible.
        i. Ejecta greater than six inches in any dimension shall be removed from the water or positioned such that it would not become mobilized by expected wave action, including replacement in the payload crater.
        ii. If possible, coral fragments greater than six inches in any dimension shall be positioned on the reef such that they would not become mobilized by expected wave action, and in a manner that would enhance its survival;

away from fine sediments with the majority of the living tissue (polyps) facing up.

iii. UES consultation coral fragments that cannot be secured in-place should be relocated to suitable habitat where it is not likely to become mobilized.

c. In the event the payload land impact affects the reef at Illeginni, the RCCTO/USASMDC shall require its personnel to reduce impacts on top shell snails.

i. Rescue and reposition any living top shell snails that are buried or trapped by rubble.

ii. Relocate to suitable habitat, any living top shell snails that are in the path of any heavy equipment that must be used in the marine environment.

d. In the event the payload land impact affects the reef at Illeginni, the RCCTO/USASMDC shall require its personnel to reduce impacts on clams.

i. Rescue and reposition any living clams that are buried or trapped by rubble.

ii. Relocate to suitable habitat, any living clams that are in the path of any heavy equipment that must be used in the marine environment.

2. To meet reasonable and prudent measure 2 above:

a. The RCCTO/USASMDC shall assign appropriately qualified personnel to record all suspected incidences of take of any UES-consultation species.

b. The RCCTO/USASMDC shall utilize digital photography to record any UES-consultation species found injured or killed in or near the ocean target areas and/or at Illeginni. As practicable: 1) Photograph all damaged corals and/or other UES-consultation species that may be observed injured or dead; 2) Include a scaling device (such as a ruler) in photographs to aid in the determination of size; and 3) Record the location of the photograph.

c. In the event the payload impact affects the reef at Illeginni, the RCCTO/USASMDC shall require its personnel to survey the ejecta field for impacted corals, top shell snails, and clams. Also be mindful for any other UES-consultation species that may have been affected.

d. Within 60 days of completing post-test clean-up and restoration, provide photographs and records to the USAKA environmental office. USAKA and our biologists will review the photographs and records to identify the organisms to the lowest taxonomic level accurately possible to assess impacts on consultation species.

e. Within 6 months of completion of the action, USAKA will provide a report to us. The report shall identify: 1) The flight test and date; 2) The target area; 3) The results of the pre- and post-flight surveys; 4) The identity and quantity of affected resources (include photographs and videos as applicable); and 5) The disposition of any relocation efforts.

4 CONSERVATION RECOMMENDATIONS

The following conservation recommendations are discretionary agency activities provided to minimize or avoid adverse effects of a proposed action on UES-protected marine species or critical habitat, to help implement recovery plans, or develop information.

1. We recommend that the RCCTO/USASMDC continue to work with NMFS staff to conduct additional marine surveys around Illeginni Islet to develop a comprehensive understanding of the distribution and abundance of species that are there.
2. We recommend that the RCCTO/USASMDC consider constructing a berm, artificial Hesco Bastion ("Concertainer"), or Bremer wall, around the perimeter of the island above the beach line (see start of grass line in Figure 2 for example) at the impact site in order to reduce the amount of potential ejecta material which can enter the ocean from an impacting projectile. We understand that depending on impact characteristics ejecta may arch at a higher angle than a berm's height. Additionally, consultation may be required with the USFWS for landbased activities. However, we believe it should be considered. This would reduce the risk to UES/ESA-listed species in the nearshore, allow for more precise definition of the target, and aid in the recovery of munition materials after impact.
3. We recommend the RCCTO/USASMDC equip USAG-KA personnel with metal detectors for recovery of projectile materials in the nearshore environment, if not already doing so. Furthermore, we recommend the RCCTO/USASMDC attempt to quantify the amount of recovered materials to determine the amount of tungsten that remains in the nearby environment.
4. We recommend that the RCCTO/USASMDC continue to work with NMFS staff to conduct marine surveys at additional sites around all of the USAKA islets and in the mid-atoll corridor to develop a more comprehensive understanding of the distribution and abundance of species and habitats at USAKA.
5. We recommend that the USAKA develop capacity and procedures for responding to marine mammal and turtle strandings by:
   a. Acquiring required permits and training to perform necropsies and/or to take and transport tissue samples.
   b. Developing professional relations with qualified federal agencies and universities to capitalize on samples and information gained at USAKA.
   c. Developing mechanisms to collect and disseminate the information.

4.1 Reinitiation Notice

This concludes formal consultation on the implementation of the FT-3 program at the USAKA RTS, RMI. Reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained or is authorized by law, and if:

1. The amount or extent of anticipated incidental take is exceeded;
2. New information reveals that the action may affect UES-protected marine species or critical habitat in a manner or to an extent not considered in this Opinion;

3. The action is subsequently modified in a manner that may affect UES-protected marine species or critical habitat to an extent, or in a manner not considered in this Opinion; or
4. A new species is listed or critical habitat designated that may be affected by the action.

5 DATA QUALITY ACT DOCUMENTATION

The Data Quality Act (DQA) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the Opinion addresses these DQA components, documents compliance with the DQA, and certifies that this Supplement has undergone pre-dissemination review.

5.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this Opinion are the SSP, and RCCTO/USASMDC. Other interested users could include the citizens of RMI, USFWS, and NOAA. Individual copies of this Opinion were provided to the RCCTO/USASMDC. The format and naming adheres to conventional standards for style.

5.2 Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, ‘Security of Automated Information Resources,’ Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

5.3 Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 et seq.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this Opinion contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and reviewed in accordance with Pacific Islands Region ESA quality control and assurance processes.

6 LITERATURE CITED

AAC (Alaska Aerospace Corporation). 2016. Application for a Five-Year Programmatic Permit for Small Takes of Marine Mammals Incidental to Launching of Space Launch Vehicles, Long Range Ballistic Target Missiles, and Smaller Missile Systems at Pacific Spaceport Complex Alaska, Kodiak Island, Alaska. Submitted to the National Marine Fisheries Service, Office of Protected Resources.

Anthony, K.R.N., D.I. Kline, G. Diaz-Pulido, S. Dove, and O. Hoegh-Guldberg. 2008. Ocean acidification causes bleaching and productivity loss in coral reef builders. Proceedings of the National Academy of Sciences 105:17442-17446.

Bagnis, R., P. Mazellier, J. Bennett, and E. Christian. 1972. Fishes of Polynesia. Les editions du Pacifique, Papeete, Tahiti. 368 p.

Barnett, Tim P., D.W. Pierce, and R. Schnur. "Detection of anthropogenic climate change in the world's oceans." Science 292.5515 (2001): 270-274.

Blidberg, E., Elfwing, T., Plantman, P., & Tedengren, M. (2000). Water temperature influences on physiological behaviour in three species of giant earns (Tridacnidae).

Bothwell, A. M. 1981. Fragmentation, a means of asexual reproduction and dispersal in the coral genus *Acropora* (Scleractinia: Astrocoeniida: Acroporidae) – A preliminary report. Proceedings of the Fourth International Coral Reef Symposium, Manila, 1981, Vol. 2: 137-144.

Bradley, D. L., and R. Stern. 2008. Underwater Sound and the Marine Mammal Acoustic Environment – A Guide to Fundamental Principles. Prepared for the U. S. Marine Mammal Commission. Spectrum Printing and Graphics, Rockville, Maryland. 67 pp.

Brainard, R. E., C. Birkeland, C. M. Eakin, P. McElhany, M. W. Miller, M. Patterson, and G. A. Piniak. 2011. Status Review Report of 82 Candidate Coral Species Petitioned Under the U.S. Endangered Species Act. NOAA Technical Memorandum NMFS-PIFSC-27. September 2011.

CBD (Center for Biological Diversity). 2018. Petition to list the cauliflower coral (Pocillopora meandrina) in Hawaii as endangered or threatened under the Endangered Species Act. Center for Biological Diversity, 52 pp.

Chambers, C.N.L. "Pasua (*Tridacna maxima*) size and abundance in Tongareva Lagoon, Cook Islands." SPC Trochus Information Bulletin 13 (2007): 7-12.

CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora). 2004. *Tridacna squamosa*. AC22 Doc. 10.2 Annex 8g. URL:www.cites.org/eng/com/AC/22/E22-10-2-A8g.pdf.

CITES. 2019. Internet website: http://www.cites.org/.

Colin, P. L. 2010. Aggregation and spawning of the humphead wrasse *Cheilinus undulatus* (Pisces: Labridae): general aspects of spawning behavior. Journal of Fish Biology 76(4):987-1007.

Donaldson, T. J. and Y. Sadovy. 2001. Threatened fishes of the world: *Cheilinus undulatus* Ruppell, 1835 (Labridae). Environmental Biology of Fishes 62:428.

Elfwing, T., Plantman, P., Tedengren, M., & Wijnbladh, E. (2001). Responses to temperature, heavy metal and sediment stress by the giant clam *Tridacna squamosa*. Marine & Freshwater Behaviour & Phy, 34(4), 239-248.

Ellis, S. 1997. Spawning and Early Larval Rearing of Giant Clams (Bivalvia: Tridacnidae) Center for Tropical and Subtropical Aquaculture, Publication No. 130.

Finneran, J.J. and A.K. Jenkins. 2012. Criteria and thresholds for U.S. Navy acoustic and explosive effects analysis. San Diego, California: SPAWAR Systems Center Pacific. http://www.dtic.mil/dtic/tr/fulltext/u2/a561707.pdf

Gilbert, A., et al. 2006. The giant clam *Tridacna maxima* communities of three French Polynesia islands: comparison of their population sizes and structures at early stages of their exploitation. ICES Journal of Marine Sciences 63:1573-1589.

Gilbert, A., et al. 2007. First observation of the giant clam *Tridacna squamosa* in French Polynesia: a species range extension. Coral Reefs 26:229.

Graham, K. S., C. H. Boggs, E. E. DeMartini, R. E. Schroeder, and M. S. Trianni. 2015. Status review report: humphead wrasse (*Cheilinus Undulatus*). U.S. Dep. Commer., NOAA Tech. Memo., NOAA-TM-NMFS-PIFSC-48, 126 p. + Appendices.

Hanser, S., E. Becker, L. Wolski, and A. Kumar. 2013. Pacific Navy Marine Species Density Database Technical Report. US Department of the Navy, Naval Facilities Engineering Command, US Department of the Navy, Naval Facilities Engineering Command.

Hastings, M.C., and A. N. Popper. 2005. Effects of sound on fish. Report prepared by Jones & Stokes for California Department of Transportation, Contract No. 43A0139, Task Order 1.

Hawkes, L.A., A.C. Broderick, M.H. Godfrey, and B.J. Godley. 2009. Climate change and marine turtles. Endangered Species Research 7: 137-154.

Heslinga, G. A., O. Orak, and M. Ngiramengior. 1984. Coral reef sanctuaries for trochus shells. Mar. Fish. Rev., 46: 73–80 (1984).

Hernawan, U. 2010. Study on giant clams (Cardiidae) population in Kei Kecil waters, Southeast-Maluku. Widyariset 13:101-108.

IUCN (International Union for the Conservation of Nature and Natural Resources). 2015. The IUCN Redlist of Threatened Species. Version 2015. Internet website: http://www.iucnredlist.org/.

Jung, M.R., G.H. Balazs, T.M. Work, T.T. Jones, S.V. Orski, V. Rodriguez C., K.L. Beers, K.C. Brignac, K.D. Hyrenbach, B.A. Jensen, and J.M. Lynch. 2018. Polymer Identification of Plastic Debris Ingested by Pelagic-Phase Sea Turtles in the Central Pacific. Environ Sci Technol. 2018; 52: (20), 11535-11544. DOI: 10.1021/acs.est.8b03118

Kahle, W. J., and P. S. Bhandari. 2019. Analysis of FE-2 Sonic-boom and stage drop acoustics. Appendix A of the Biological Assessment for Flight Experiment-2.

Kinch, J., and A. Teitelbaum. (2010). Proceedings of the regional workshop on the management of sustainable fisheries for giant clams (Tridacnidae) and CITIES capacity building.

Kolinski, S. P. 2015. Electronic mail to summarize personal communication to discuss the likelihood of humphead wrasse occurring close to shore around Illeginni Islet, RMI. June 12, 2015.

Laney, H. and R.C. Cavanagh. 2000. Supersonic Aircraft Noise at and Beneath the Ocean Surface: Estimation of Risk for Effects on Marine Mammals. Interim Report for the period October 1996 to April 2000. Science Applications International Corp. 1710 Goodridge Drive, McLean VA. 22102 for the United States Air Force Research Laboratory. June 2000. 46 pp.

Marshall, T. C. 1964. Fishes of the Great Barrier Reef and coastal waters of Queensland. Angus and Robertson, Sydney, 576 p.

MDA (Missile Defense Agency). 2007. Flexible Target Family Environmental Assessment. October 2007.

MDA (Missile Defense Agency) 2019a. Mechanical Engineering SMDC TIM4. July 2019.

MDA (Missile Defense Agency) 2019b. Program Requirements Document Flight Test Other – 43 (FTX-43) Pacific Spaceport Complex-Alaska. November 2019.

Missile Defense Agency (MDA) and USASMDC/ARSTRAT. 2019. Flight Test THAAD (FTT)-23 at Roi-Namur Islet US Army Garrison – Kwajalein Atoll Republic of the Marshall Islands. 128 p.

Munro, J.L. 1993. Giant clams. Suva, Fiji. Institute of Pacific Studies, University of the South Pacific. In A. Wright and L. Hill (eds.) Nearshore marine resources of the South Pacific: information for fisheries development and management. p. 431-449.

Myers, R. F. 1999. Micronesian Reef Fishes. 3rd Ed. Coral Graphics, Guam. 330 p.

NMFS (National Marine Fisheries Service). 2011. Endangered Species Act -Section 7 Consultation Biological Opinion for Issuance of Regulations and Letters of Authorization Under the Marine Mammal Protection Act to Authorize Incidental Take of Marine Mammals by U.S. Citizens Engaged in Space Vehicle and Missile Launch Operations at the Kodiak Launch Complex on Kodiak Island, Alaska. March 18, 2011.

NMFS. 2014a. Preliminary Estimates of UES Consultation Reef Fish Species Densities in Support of a Biological Assessment of Potential Minuteman III Reentry Vehicle Impacts at Illeginni Islet, [USAKA, RMI] – Final Report. July 28, 2014. 16 pp.

NMFS. 2014b. Preliminary Estimates of UES Consultation Coral and Mollusk Distribution Densities in Support of a Biological Assessment of Potential Minuteman III Reentry Vehicle Impacts at Illeginni Islet, [USAKA, RMI] – Final Report. September 3, 2014. 9 pp.

NMFS. 2015. Formal Consultation under the Environmental Standards for the United States Army Kwajalein Atoll Activities in the Republic of the Marshall Islands Biological Opinion for Continued Implementation of the Minuteman III Intercontinental Ballistic Missile Testing Program. 29 July 2015.

NMFS. 2016. Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing: Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts. U.S. Dept. of Commerce, NOAA. NOAA Technical Memorandum NMFS-OPR-55, 178 p.

NMFS. 2017a. Biological Assessment of Coral Reef Resources at Risk when Targeting Illeginni Islet using Missile Reentry Vehicles, United States Army Kwajalein Atoll, Republic of the Marshall Islands. May 2017. 30 p.

NMFS. 2017b. Biological Assessment of Giant Clam Species at Risk when Targeting Illeginni Islet using Missile Reentry Vehicles, United States Army Kwajalein Atoll, Republic of the Marshall Islands. May 2017. 14 p.

NMFS. 2017c. Formal Consultation under the Environmental Standards for United States Army Kwajalein Atoll Activities in the Republic of the Marshall Islands Biological Opinion And Informal Consultation under Section 7 of the Endangered Species Act - Single Flight Experiment-1 (FE-1). 85 p.

NMFS. 2018. An Assessment of Coral Reef Resources in the Vicinity of Two Proposed Terminal High Altitude Area Defense System Launch Sites at Roi-Namur Islet, United States Army Kwajalein Atoll, Republic of the Marshall Islands. 24 p.

NMFS. 2019. Formal Consultation under the Environmental Standards for United States Arm Kwajalein Atoll Activities in the Republic of the Marshall Islands Biological Opinion and Formal Consultation under Section 7 of the Endangered Species Act for Flight Experiment-2 (FE-2). NMFS File No.: PIRO-2019-02607.

NMFS. 2019. Informal Consultation under the Environmental Standards and Procedures for U.S. Army Kwajalein Atoll Activities in the Republic of Marshall Islands on the effects of launching a Terminal High Altitude Area Defense (THAAD) missile and subsequent intercept of a medium-range ballistic missile over the Pacific Ocean. 26 p.

NMFS-PIRO (National Marine Fisheries Service – Pacific Islands Regional Office). 2017a. Biological Assessment of Coral Reef Resources at Risk when Targeting Illeginni Islet using Missile Reentry Vehicles, United States Army Kwajalein Atoll, Republic of the Marshall Islands. Final Report. May 26, 2017.

NMFS-PIRO. 2017b. Biological Assessment of Giant Clam Species at Risk when Targeting Illeginni Islet using Missile Reentry Vehicles, United States Army Kwajalein Atoll, Republic of the Marshall Islands. Final Report. May 26, 2017.

National Oceanic and Atmospheric Administration (NOAA). 2013. Draft Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammals – Acoustic Threshold Levels for Onset of Permanent and Temporary Threshold Shifts. December 23, 2013. 76 pp.
Neo, M. L., W. Eckman, K. Vicentuan, S. L. M. Teo and P. A. Todd. 2015. The ecological significance of giant clams in coral reef ecosystems. Biol. Cons. 181: 111-123.

Neo, M.L., Todd, P.A., Teo, S.L.M. and L. M. Chou. 2009. Can artificial substrates enriched with crustose coralline algae enhance larval settlement and recruitment in the fluted giant clam (Tridacna squamosa)? Hydrobiologia *625*(1): 83-90.

Nicholls, R.J. and N. Mimura. 1998. Regional issues raised by sea level rise and their policy implications. Climate Research 11:5-18.

Norton, J.H., et al. 1993. Mortalities in the Giant Clam *Hippopus* Associated with Rickettsiales-like Organisms. Journal of Invert. Path. 62:207-209.

Parmesan, C. and G. Yohe. 2003. A globally coherent fingerprint of climate change impacts across natural systems. Nature 421: 37-42.

Pogonoski, J. J., D. A. Pollard, and J. R. Paxton. 2002. Conservation overview and action plan for Australian threatened and potentially threatened marine and estuarine fishes. Environment Australia. Canberra. 373 p. Available at: http://www.environment.gov.au/coasts/publications/marine-fishaction/pubs/marine -fish.pdf

Popper, A. N., A. D. Hawkins, R. R. Fay, D. A. Mann, S. Bartol, T. J. Carlson, S. Coombs, W. T. Ellison, R. L. Gentry, M. B. Halvorsen, S. Lokkeborg, P. H. Rogers, B. L. Southall, D. G. Zeddies, and W. N. Tavolga. 2014, Sound exposure guidelines for fish and sea turtles: a technical report prepared by ANSI-Accredited Standards Committee S3/SC1 and registered with ANSI. April 20, 2014.

Radford CA, Jeffs AG, Tindle CT, Cole RG, Montgomery JC. 2005. Bubbled waters: The noise generated by underwater breathing apparatus. Marine and Freshwater Behaviour and Physiology, 38(4), 259-267.

Randall, J.E., Head, S.M. and A. P. Sanders. 1978. Food habits of the giant humphead wrasse, *Cheilinus undulatus* (Labridae). Environmental Biology of Fishes *3*(2):235-238.

Russell, B. (Grouper & Wrasse Specialist Group). 2004. Cheilinus undulatus. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.1. Downloaded on 25 July 2019. Available at: http://www.iucnredlist.org/details/4592/0

RGNext. 2020. Illeginni Environmental & Biological Activity Survey & Sampling Report, FE-2 Pre & Post Test Activity. Prepared for United States Air Force. 29 July 2020.

Rone, B. K., A. N. Zerbini, A. B. Douglas, D. W. Weller, and P. J. Clapham. 2017. Abundance and distribution of cetaceans in the Gulf of Alaska. Marine Biology 164:23.

Russell, B. (Grouper & Wrasse Specialist Group). 2004. *Cheilinus undulatus*. In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.1. Downloaded on 25 July 2019. Available at: http://www.iucnredlist.org/details/4592/0

Sadovy, Y., M. Kulbicki, P. Labrosse, Y. Letourneur, P. Lokani, and T. J. Donaldson. 2003. The humphead wrasse, *Cheilinus undulatus*: synopsis of a threatened and poorly known giant coral reef fish. Reviews in Fish Biology and Fisheries 13:327-364.

Sadovy de Mitcheson, Y., A. Cornish, M. Domeier, P.L. Colin, M. Russell, K.C. Lindeman. 2008. A global baseline for spawning aggregations of reef fishes. Conservation Biology 22(5): 1233-1244.

Smit, B., I. Burton, R.J.T. Klein, and J. Wandel. 2000. An anatomy of adaptation to climate change and variability. Climatic Change 45: 223-251.

Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Avery, M. Tignor and H. L. Miller (eds.). 2007. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdon and New York, NY, USA.

Soo, P. and R. A. Todd. 2014. The behavior of giant clams (Bivalvia: Cardiidae: Tridacninae). Marine Biology 161: 2699-2717.

Southall, B.L., A.E. Bowles, W.T. Ellison, J.J. Finneran, R.L. Gentry, C.R. Greene Jr., D. Kastak, D.R. Ketten, J.H. Miller, P.E. Nachtigall, W.J. Richardson, J.A. Thomas, & P.L. Tyack. 2007. Marine Mammal Noise Exposure Criteria: Initial Scientific Recommendations. Aquatic Mammals 33(4): 411-521.

Thaman, R. 1998. Our endangered variivoce. Fiji Times, January 10, pp. 4 and 7.

Tol, R.S.J., S. Fankhauser, and J.B. Smith. 1998. The scope for adaptation to climate change: what can we learn from impact literature? Global Environmental Change 8(2):109-123.

Tupper, M. 2007. Identification of Nursery Habitats for Commercially Valuable Humphead Wrasse (*Cheilinus undulatus*) and Large Groupers (Pisces: Serranidae) in Palau. Marine Ecology Progressive Series. 332:189-199.

U.S. Army (United States Army). 2020. Draft Environmental Assessment/Overseas Environmental Assessment for Hypersonic Flight Test 3 (FT-3). September 2020.

USASMDC/ARSTRAT. 2014. Advanced Hypersonic Weapon Flight Test 2, Hypersonic Technology Test Environmental Assessment. July 2014.

USASMDC/ARSTRAT. 2015. United States Air Force Minuteman III Modification Biological Assessment. Prepared for US Air Force Global Strike Command, Barksdale Air Force base, LA and US Army Space and Missile Defense Command/Army Forces Strategic Command, Huntsville, AL. Teledyne Brown Engineering, Inc., Huntsville, AL; Tetra Tech, San Francisco, CA; and LPES, Inc., Smithfield, VA. March 2, 2015. 148 pp.

USASMDC/ARSTRAT. 2017. Flight Experiment 1 (FE-1) Biological Assessment. Prepared for Department of the Navy Director, United States Navy Strategic Systems Programs and US Army Space and Missile Defense Command/Army Forces Strategic Command, Huntsville, AL. Teledyne Brown Engineering, Inc., Huntsville, AL. March 1, 2017. 174 pp.

USAFGSC and USASMDC/ARSTRAT (United States Air Force Global Strike Command and United States Army Space and Missile Defense Command/Army Forces Strategic Command). 2015. United States Air Force Minuteman III Modification Biological Assessment. March 2015.

USFWS and NMFS. 1998. Endangered species consultation handbook: procedures for conducting consultation and conference activities under section 7 of the Endangered Species Act.

U.S. Navy (United States Department of the Navy). 2014. Commander Task Force 3rd and 7th Fleet Navy Marine Species Density Database. NAVFAC Pacific Technical Report. Naval Facilities Engineering Command Pacific, Pearl Harbor, HI. 486 pgs.

U.S. Navy (US Department of the Navy) Strategic Systems Programs (SSP). 2017. Biological Assessment for Flight Experiment-1. 174 p.

US Navy (US Department of the Navy). 2017b. Final Environmental Assessment/Overseas Environmental Assessment for Flight Experiment-1 (FE-1). August 2017.

U.S. Navy Strategic Systems Programs (SSP). 2019. Biological Assessment for Flight Experiment-2. 201 p.

USFWS (United States Fish and Wildlife Service). 2011. Final 2008 Inventory Endangered Species and Other Wildlife Resources Ronald Reagan Ballistic Missile Defense Test Site US Army Kwajalein Atoll, Republic of the Marshall Islands.

USFWS and NMFS. 1998. Endangered species consultation handbook: procedures for conducting consultation and conference activities under section 7 of the Endangered Species Act.

USFWS and NMFS. 2012. Final 2010 Inventory Report Endangered Species and Other Wildlife Resources Ronald Reagan Ballistic Missile Defense Test Site US Army Kwajalein Atoll, Republic of the Marshall Islands.

Veron, J.E.N. 2014. Results of an update of the Corals of the World Information Base for the Listing Determination of 66 Coral Species under the Endangered Species Act. Report to the Western Pacific Regional Fishery Management Council. Honolulu: Western Pacific Regional Fishery Management Council. 11pp. + Appendices.

Walther, G. R, E. Post, P. Convey, A. Menzel, C. Parmesan, T.J.C. Beebee, J. M. Fromentin, O. Hoegh–Guldberg, and F. Bairlein. 2002. Ecological responses to climate change. Nature 416:389-395.

Watson, S. A., Southgate, P. C., Miller, G. M., Moorhead, J. A., & Knauer, J. (2012). Ocean acidification and warming reduce juvenile survival of the fluted giant clam, *Tridacna squamosa*. Molluscan Research, 32, 177-180.

White, E.M., S. Clark, C.A. Manire, B. Crawford, S. Wang, J. Locklin, and B.W. Ritchie. 2018. Ingested Micronizing Plastic Particle Compositions and Size Distributions within Stranded Post-Hatchling Sea Turtles. Environmental Science & Technology 2018 52 (18), 10307-10316. DOI: 10.1021/acs.est.8b02776

Zgliczynski, B. J., I. D. Williams, R. E. Schroeder, M. O. Nadon, B. L. Richards, and S. A. Sandin. 2013. The IUCN Red List of Threatened Species: an assessment of coral reef fishes in the US Pacific Islands. Coral Reefs. 32(3):637-650.