U.S. DEPARTMENT OF THE AIR FORCE
UNITED STATES SPACE FORCE

As lead Federal Agency pursuant to the National Environmental Policy Act of 1969

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

As a Cooperating Agency pursuant to 40 CFR § 1501.6(a)(1)[2020]

U.S. DEPARTMENT OF THE NAVY

As a Cooperating Agency pursuant to 40 CFR § 1501.6(a)(1)[2020]

Draft

Environmental Assessment

Test and Operation of the Stratolaunch Talon-A Hypersonic Research Testbed Vehicle

Vandenberg Space Force Base, California

Prepared for

Vandenberg Space Force Base

Space Launch Delta 30, Installation Management Flight

1028 Iceland Avenue, Building 11146

Vandenberg Space Force Base, California 93437

August 2022

UNITED STATES SPACE FORCE
DRAFT FINDING OF NO SIGNIFICANT IMPACT

TEST AND OPERATION OF THE STRATOLAUNCH TALON-A HYPERSONIC RESEARCH TESTBED VEHICLE, VANDENBERG SPACE FORCE BASE, CALIFORNIA

This Finding of No Significant Impact (FONSI) hereby incorporates by reference and attaches hereto the Environmental Assessment (EA), Test and Operation of the Stratolaunch LLC (Stratolaunch) Talon-A Hypersonic Research Test Vehicle, Vandenberg Space Force Base (VSFB), California. This EA considered all potential environmental impacts of the Proposed Action and the No Action Alternative and identified environmental protection measures to avoid and/or minimize environmental impacts.

PROPOSED ACTION

The "Proposed Action" refers to the federal actions that the lead agency, U.S. Space Force (USSF), and the cooperating agencies, Federal Aviation Administration (FAA) and U.S. Department of the Navy (DoN), would perform in support of Stratolaunch's Proposed Project. Stratolaunch, operating from the Mojave Air and Space Port (MHV) in southern California, proposes to perform launch and non-launch operations as part of this project, utilizing a Carrier Aircraft to transport the Talon-A vehicle to the required altitude and location for each test or operational mission. The USSF will serve as the launch control authority for Stratolaunch's tests and operations. The FAA will license launch operations and approve related airspace closures for launch operations. The DoN will authorize the use of facilities at Naval Base Ventura County (NBVC), San Nicolas Island (SNI) in the event that an alternate landing of the Talon-A is necessary. The Proposed Project would include activities at MHV; VSFB; SNI; and the Broad Ocean Area (BOA) off the coast of California.

The Stratolaunch Talon-A launch system is comprised of two air vehicles: the Stratolaunch Carrier Aircraft and the Talon-A research testbed vehicle. The Talon-A vehicle is an autonomous aircraft that generates thrust via a liquid fueled rocket engine that uses Jet-A as fuel and liquid oxygen (LOX) as its oxidizer. A safety Chase Aircraft (a Cessna Citation 550 Jet) and photograph Chase Aircraft (such as a Gulfstream III or an F-18) support the launch system and remain in formation with the Carrier Aircraft. The Proposed Project has an anticipated start in the third quarter of calendar year 2022 and would continue until the Talon-A is retired from flight operations. Stratolaunch would apply to renew its launch license with the FAA for any proposed operations extending beyond the initial license period.

Non-launch operations would include captive carry events of the Talon-A vehicle, which would not release the Talon-A from the Carrier Aircraft but would release propellant and ballast at altitudes greater than 5,000 feet (ft) (1,524 meters [m]). In addition, non-launch operations would include up to two separation tests of a Talon-A test article (a simulation of the Talon-A test vehicle) that would test the release mechanism on the Carrier Aircraft and drop a simulated Talon-A structure into the ocean. As part of this action, the Talon-A test article would be recovered from the ocean to the extent possible by an ocean-going vessel. Glide flights would also be included in non-launch (non-FAA licensed) operations where the Talon-A vehicle would be released from the Carrier Aircraft but the engine on the Talon-A would not power the vehicle and the vehicle would land at VSFB's Runway 12-30. To summarize, the following distinct events are part of the non-launch operations included in the Proposed Project:

1. Carrier Aircraft transit flights,
2. Captive carry of Talon-A,
3. Talon-A separation test, and
4. Talon-A glide flights.

Launch operations would include powered flight of the reusable Talon-A over the BOA off the coast of California with runway landings at VSFB in addition to an alternate landing site at SNI. Up to two hypersonic test flights of the expendable Talon-A would occur that would impact the ocean off the coast of VSFB and would include attempted vehicle recovery by an ocean-going vessel. The proposed impact area for the Talon-A separation test and the expendable hypersonic flight test is within the Western Missile Test Range managed by the Space Launch Delta 30 (SLD 30), VSFB. To summarize, the following distinct events are part of the launch operations included in the Proposed Project:

1. Pre-flight activities at MHV,
2. Recovery of Talon-A test article,
3. Expendable Talon-A hypersonic flight,
4. Recovery of the expendable Talon-A hypersonic test vehicle,
5. Reusable Talon-A launch operations over BOA with runway landings,
6. Alternate landing at SNI runway, and
7. Post-flight activities at VSFB, SNI, and MHV.

All non-launch and launch operations would occur during daytime hours.

NO ACTION

No action means that an action would not take place, and the resulting environmental effects from taking no action would be compared with the effects of allowing the proposed activity to go forward. Under the No Action Alternative, the FAA would not issue a Vehicle Operator License to Stratolaunch to conduct licensed operations, and FAA would not enter into a Letter of Authorization for the proposed closure of airspace for Talon-A launch activities and operations because the proposed testing and operations of the Talon-A hypersonic research testbed vehicle would not be conducted. This would not allow Stratolaunch to achieve its goal of testing hypersonic capabilities for the future development of hypersonic technologies and warfare capabilities. Stratolaunch would not meet the DoD's goal to prototype, demonstrate, test, and field warfighting capability more quickly utilizing a cost effective and reusable flight vehicle model. The No Action Alternative would not meet the Proposed Action's purpose and need.

SUMMARY OF FINDINGS

Potentially affected environmental resources were identified through communications with federal, state, and local agencies and review of past environmental documentation. Specific environmental resources with the potential for environmental consequences include air quality, climate, biological resources, hazardous materials and waste management, occupational safety and health, noise, socioeconomics, solid waste management, transportation, and water resources. While the No Action Alternative would result in impacts less than the Proposed Action, it would not meet the Proposed Action's purpose and need. Environmental protection measures that are incorporated into the Proposed Action (identified as mandatory in the EA) would be implemented to avoid and/or minimize the potential adverse impacts. Discretionary environmental protection measures may further reduce potential impacts of the Proposed Action.

PUBLIC REVIEW AND COMMENT

The Draft EA and FONSI were made available for public review and comment for 30 days following the publication of the Notice of Availability (NOA) in the *Lompoc Record*, *Santa Maria*

Times, *Ventura County Star*, and *Vida*. The Draft EA and FONSI were also distributed per the current National Environmental Policy Act (NEPA) distribution list, including the State Clearinghouse. The current NEPA distribution list is included in Chapter 6 of the EA. A copy of the NOA, proof of publication, proof of library deliveries, and public comments received on the Draft EA, including VSFB responses, will be included in the Final EA.

FINDING OF NO SIGNIFICANT IMPACT

Based on my review of the facts and analyses contained in the attached EA conducted in accordance with the NEPA, 42 U.S. Code 4321 *et seq.*, implementing CEQ Regulations, 40 CFR 1500-1508, and 32 CFR Part 989, Environmental Impact Analysis Process, I conclude that implementing the Proposed Action (Preferred Alternative) will not have a significant effect on the human environment. Therefore, further analysis in the form of an Environmental Impact Statement is not required and a FONSI is appropriate. This decision has been made after considering all submitted information, including a review of public and agency comments submitted during the 30-day public comment period, and considering a full range of practical alternatives that meet project requirements and are within the legal authority of the U.S. Air Force (USAF).

B. CHANCE SALTZMAN
Lieutenant General, USSF
Chief Operations Officer

Date

Attachment: Final EA for the Test and Operation of the Stratolaunch Talon-A Hypersonic Research Testbed Vehicle, Vandenberg Space Force Base, California

PRIVACY ADVISORY

This Environmental Assessment (EA) is provided for public comment in accordance with the National Environmental Policy Act (NEPA), the President's Council on Environmental Quality NEPA Regulations (40 Code of Federal Regulations [CFR] Parts 1500-1508) and 32 CFR Part 989, Environmental Impact Analysis Process (EIAP).

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

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

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Acronyms and Abbreviations

°C	Degrees Celsius
°F	Degrees Fahrenheit
ACAM	Air Conformity Applicability Model
ADT	average daily traffic
AFI	Air Force Instruction
AFMAN	Air Force Manual
AHA	Aircraft Hazard Area
ALTRV	Altitude Reservation
ANSI	American National Standard Institute
ARTCC	Air Route Traffic Control Center
BIA	Biologically Important Area
BOA	Broad Ocean Area
CAA	Clean Air Act Amendments of 1990
CAAQS	California Ambient Air Quality Standards
CALCOFI	California Cooperative Fisheries Investigation
Caltrans	California Department of Transportation
CARB	California Air Resources Board
C&D	construction and demolition
CCC	California Coastal Commission
CDFW	California Department of Fish and Wildlife
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
CH_4	methane
CHP	California Highway Patrol
CINMS	Channel Islands National Marine Sanctuary
CNDDB	California Natural Diversity Database
CNEL	Community Noise Equivalent Level
CNPS	California Native Plant Society
CNRSW	Commander, Navy Region Southwest
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COPV	Composite overwrapped pressure vessel
CPS	Coastal Pelagic Species
CRLF	California red-legged frog
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
DAF	Department of the Air Force
dB	decibel
dBA	A-weighted decibel
dBP	Peak sound level
DNL	Day-night Sound Level
DoD	Department of Defense
DoDI	Department of Defense Instruction
DoN	Department of the Navy
DOPAA	Description of Proposed Action and Alternatives
DOT	Department of Transportation

DTSC	Department of Toxic Substances Control
EA	Environmental Assessment
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIAP	Environmental Impact Analysis Process
EIS	Environmental Impact Statement
EKAPCD	Eastern Kern Air Pollution Control District
EO	Executive Order
EPM	environmental protection measure
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FMP	Fishery Management Plan
FMP/FEIS	Final Management Plan/Final Environmental Impact Statement
FONSI	Finding of No Significant Impact
FR	Federal Register
ft	feet
ft^2	square feet
FTS	Flight Termination System
GHG	greenhouse gas
GIS	geographic information system
GWP	global warming potential
HAPC	Habitat Area of Particular Concern
HFC	hydrofluorocarbon
hp	horsepower
Hz	hertz
IHA	Incidental Harassment Authorization
IICEP	Intergovernmental Coordination for Environmental Planning
INRMP	Integrated Natural Resource Management Plan
ISO	International Organization for Standardization
ISWMP	Integrated Solid Waste Management Plan
km	kilometer(s)
km^2	square kilometer(s)
L_{eq}	Equivalent Sound Level
LOA	Letter of Agreement
LLC	Limited Liability Company
L_{max}	Maximum Sound Level
L/S	line-of-sight
LOX	liquid oxygen
lbs	pounds
LSOL	Launch Site Operators License
m/s	meter(s) per second
m	meter(s)
m^2	square meter(s)
m^3	cubic meter(s)
MBTA	Migratory Bird Treaty Act
MCC	Mojave Control Center
MDAB	Mojave Desert Air Basin
MHHW	mean higher high water
MHV	Mojave Air and Space Port
µg	microgram
mg	milligram

MMPA	Marine Mammal Protection Act
MMT	million metric tons
mph	miles per hour
MT	metric ton(s)
$MTCO_2e$	metric tons of CO_2-equivalents
N_2O	nitrous oxide
N/A	not applicable
NAAQS	National Ambient Air Quality Standards
NAVAIR	Naval Air Systems Command
NAVFAC EXWC	Naval Facilities Engineering and Expeditionary Warfare Center
NAWS	Naval Air Weapons Station
NBVC	Naval Base Ventura County
NCI	Northern Channel Islands
NEPA	National Environmental Policy Act of 1969
NFCT	Non Federal Control Tower
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
nm	nautical mile(s)
NO	nitrogen monoxide
NO_2	nitrogen dioxide
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NOTAM	Notice to Air Missions
NOTMAR	Notice to Mariners
NO_x	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
O_3	ozone
OSHA	Occupational Safety and Health Administration
Pb	lead
PCE	Primary Constituent Element
PFC	perfluorocarbon
PFMC	Pacific Fishery Management Council
$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
PM_{10}	particulate matter less than 10 microns in diameter
ppb	parts per billion
PPE	personal protective equipment
ppm	parts per million
psf	pound per square foot
RCRA	Resource Conservation and Recovery Act
ROG	reactive organic gases
RWQCB	Regional Water Quality Control Board
SATCOM	satellite communication
SBCAPCD	Santa Barbara County Air Pollution Control District
SCAQMD	South Coast Air Quality Management District
SCCAB	South Central Coast Air Basin
SF_6	sulfur hexafluoride
SIP	State Implementation Plan
SLD 30	Space Launch Delta 30
SLD 30/CEI	Space Launch Delta 30, Installation Flight
SLD 30/SE	Space Launch Delta 30, Chief of Safety
SNI	Naval Base Ventura County, San Nicolas Island

SO_2	sulfur dioxide
SPCC	Spill Prevention, Control, and Countermeasures
SR	State Route
Stratolaunch	Stratolaunch, LLC
SUA	Special Use Airspace
TFR	Temporary Flight Restriction
tpy	tons per year
U.S.	United States
USAF	U.S. Air Force
U.S.C.	United States Code
USCG	U.S. Coast Guard
USEPA	United States Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USSF	U.S. Space Force
VCAPCD	Ventura County Air Pollution Control District
VOC	volatile organic compound
VSFB	Vandenberg Space Force Base
VSMR	Vandenberg State Marine Reserve

1.0 INTRODUCTION

Stratolaunch, LLC (Stratolaunch), operating from the Mojave Air and Space Port (MHV) in southern California, proposes to perform testing and operation of the Talon-A hypersonic research testbed vehicle off the coast of central and southern California. Stratolaunch is proposing to perform launch and non-launch operations as part of this action, utilizing a Carrier Aircraft (Figure 1-1) to transport the Talon-A vehicle to the required altitude and location for each test or operational mission.

The "Proposed Action" refers to the federal actions that the lead agency (U.S. Space Force [USSF]) and cooperating agencies (Federal Aviation Administration [FAA] and Department of the Navy [DoN]) would perform as a result of Stratolaunch's Proposed Project. The Proposed Project would include activities at MHV; Vandenberg Space Force Base (VSFB); Naval Base Ventura County (NBVC), San Nicolas Island (SNI); and the Broad Ocean Area (BOA) off the coast of California. For the purposes of this document, the BOA is defined as an expanse of open ocean area of the Pacific encompassed by the extent shown in Figure 1-2 and includes the airway routes that may temporarily close during tests and operations of the Talon-A. The proposed ocean impact area shown in Figure 1-2 is the potential location where the Talon-A test article or vehicle would land in the ocean after the separation test and expendable hypersonic flight test.

Figure 1-1. Stratolaunch Carrier Aircraft

This Draft Environmental Assessment (EA) is provided to support the federal environmental review of this Proposed Project by the USSF under the National Environmental Policy Act of 1969 (NEPA). A Finding of No Significant Impact (FONSI) will be issued if, as a result of this EA, the environmental impacts of implementing the Proposed Action are determined to be not significant. If a FONSI cannot be issued, the USSF will publish a Notice of Intent to prepare an Environmental Impact Statement (EIS).

The Council on Environmental Quality (CEQ) amended its regulations implementing NEPA effective 14 September 2020. This EA meets the requirements of the amended 2020 CEQ regulations.

1.1 LOCATION

Figure 1-2 shows the different locations of the Proposed Project, including MHV, VSFB, the proposed ocean impact area for the separation and hypersonic flight tests, the BOA, and SNI. This section describes these areas in more detail.

Ground operations, takeoff, and landing of the Carrier Aircraft and safety chase plane would occur at MHV. MHV is located just outside Mojave, California at the intersection of Highways 58 and 14. Also known as the Civilian Aerospace Test Center, it is located at an elevation of 2,801 feet (ft) (854 meters [m]). It is the first facility to be licensed in the United States for horizontal launches of reusable spacecraft, having been certified as a spaceport by the FAA on 17 June 2004. The facility covers 2,998 acres (1,213 hectares) and has three runways.

Talon-A flight operations would occur off the coast of California utilizing the Western Missile Test Range and other private or public assets for telemetry. The Western Missile Test Range is operated by VSFB, which is located along the Pacific Ocean in California's Central Coast region. VSFB is west of the City of Lompoc, approximately 55 miles (89 kilometers [km]) northwest of the City of Santa Barbara, and approximately 20 miles (32 km) southwest of the City of Santa Maria. The base encompasses approximately 99,000 acres (40,064 hectares) and is divided into two areas: north base and south base.

The proposed captive carry[1] events would occur over the BOA, but no test articles or vehicles would be released for landing into the ocean (Figure 1-2). The BOA is located up to 265 nautical miles (nm) (491 km) from the coast of California, extending north of VSFB to Monterey, California and south of VSFB to the border of the United States and Mexico. This area is also where the Proposed Project launch operations would occur.

SNI is an alternate landing site that may be used as part of the Proposed Project. SNI is a part of NBVC and is located 65 miles (105 km) south of NBVC Point Mugu, California. It is one of eight islands off the coast of California called the Channel Islands. SNI is located within the 36,000 square mile (93,240 square kilometer [km^2]) Point Mugu Sea Range, which is managed by Naval Air Systems Command (NAVAIR).

[1] A captive carry event is where the Talon-A remains attached to the Carrier Aircraft and does not separate during the specific testing activity.

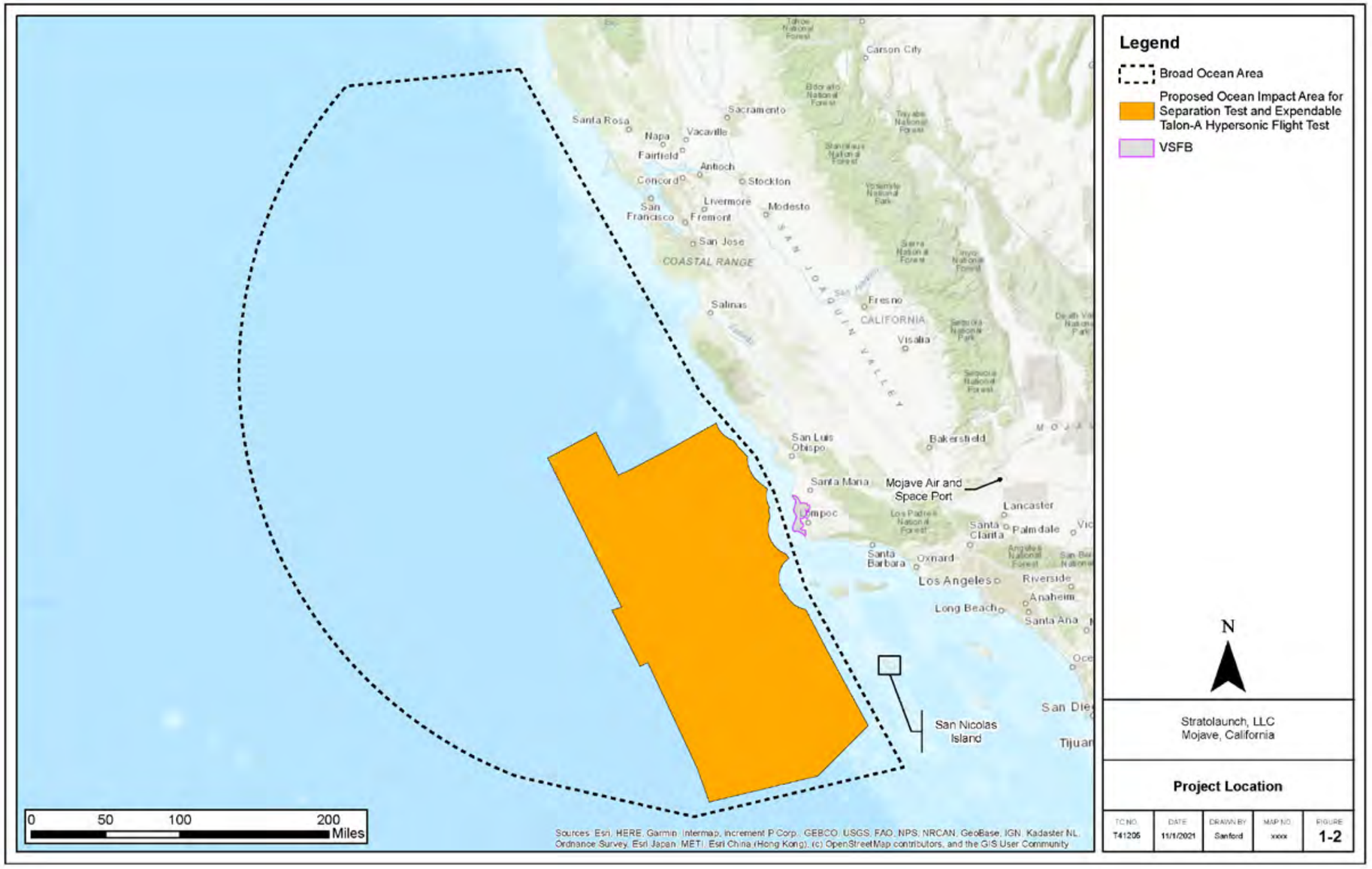

Figure 1-2. Project Location

1.2 PURPOSE AND NEED

The purpose of Stratolaunch's Proposed Project is to perform tests and operation of the Talon-A vehicle via a Carrier Aircraft based out of MHV. Talon-A vehicle tests and operation must be performed safely and in compliance with applicable Range Safety requirements and near a site with telemetry capabilities necessary to acquire data from the Talon-A vehicle from the release altitude to landing. Stratolaunch's Proposed Project is needed to develop warfighting capability while utilizing a cost effective and reusable flight vehicle model. This Proposed Project will fulfill client requirements in the hypersonic technologies and warfare capabilities market as the industry changes.

1.3 INTERAGENCY AND INTERGOVERNMENTAL COORDINATION AND CONSULTATIONS

Through the Interagency and Intergovernmental Coordination for Environmental Planning (IICEP) process, Space Launch Delta 30 (SLD 30) notified and consulted with relevant federal and state agencies on the Proposed Action and alternatives to identify potential environmental issues and regulatory requirements associated with project implementation. This coordination fulfills the Interagency Coordination Act and Executive Order (EO) 12372, *Intergovernmental Review of Federal Programs* (14 July 1982). EO 12372 is implemented by the U.S. Air Force (USAF) in accordance with Air Force Instruction (AFI) 32-1015, *Environmental Impact Analysis Process.* The following discussions summarize the agency coordination and consultations that have been completed.

SLD 30 has determined that no effects to federally listed terrestrial species will occur due to the Proposed Action. This includes western snowy plover (*Charadrius nivosus nivosus*), California least tern (*Sternula antillarum browni*), and California red-legged frog (*Rana draytonii* [CRLF]) on the coast of California or the NCI, as well as desert tortoise (*Gopherus agassizii*) at MHV. Therefore, no Section 7 consultation with the U.S. Fish and Wildlife Service (USFWS) is required.

SLD 30 initiated Section 7 informal consultation with the National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS) on 8 December 2021. NMFS concurred on 4 February 2022 that the Proposed Action is not likely to adversely affect NMFS federally listed species and/or designated Critical Habitat. Appendix B-1 of the EA contains records of agency coordination and consultation.

The Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act in 1996, provides NMFS legislative authority to regulate fisheries and protect Essential Fish Habitat (EFH). The Proposed Action has the potential to adversely affect EFH. Therefore, SLD 30 initiated consultation with NMFS on 7 December 2021. NMFS concurred on 4 February 2022 that the Proposed Action would have no more than minimal adverse effects to EFH with implementation of the proposed conservation measures (Section 2.6.1) to avoid or minimize adverse effects to EFH (Appendix B-1).

Under the Marine Mammal Protection Act (MMPA), the Secretary of Commerce may allow, upon request, the incidental, but not intentional, taking of marine mammals by a specified activity within a specified geographic region. "Take" is defined as "*to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal*" (16 U.S.C. § 1362[13]). An analysis was conducted to determine the potential for take of marine mammals by Level B harassment incidental to and as a result of falling Talon-A debris in the Pacific Ocean. The MMPA defines Level B harassment as any act of pursuit, torment or annoyance which has the potential to disturb a marine mammal stock in the wild by causing disruption of behavioral patterns, including but not limited to migration, breathing, nursing, breeding, feeding, or sheltering. Level B take for a species would occur if the threshold of 0.5 individuals disturbed is exceeded; at 0.5 or less, the number of

individuals is rounded down to zero following conventional rounding rules and would not result in take (80 Federal Register [FR] 13264; Marine Mammal Commission 2015). Based on the results of the take analysis, no species would be taken by Level B harassment. Therefore, the USSF has determined that an Incidental Harassment Authorization (IHA) under the MMPA is not required. The take estimates are provided in Appendix B-2 of this EA.

The National Historic Preservation Act (NHPA) of 1966, as amended, requires federal agencies to comply with Section 106 to protect sensitive cultural resources including historic properties and archaeological resources. Since the Proposed Project would not generate a sonic boom loud enough (all sonic booms would be below 2 pounds per square foot [psf]) or noise vibration of 120 decibels (dB) or greater to potentially affect historic properties and since no ground-disturbing activities are required, consultation under the NHPA is not required.

Under the Coastal Zone Management Act (CZMA) of 1972, any federal action that may affect the coastal zone needs to be conducted in a way that is consistent with state coastal zone management programs. The USSF notified the California Coastal Commission (CCC) about the Proposed Project and determined that the proposed activities would not require consultation with the CCC due to the location, type of activities, and analysis of impacts. On 1 March 2022, the CCC concurred with the USSF's determination that no further consultation under the CZMA was required (see Appendix A).

1.4 PUBLIC NOTIFICATION AND REVIEW

Pursuant to Title 40, Code of Federal Regulations (CFR) § 1506.6, opportunities for public involvement and the availability of environmental documents must be made so as to inform those persons and agencies who may be interested or affected by the Proposed Project. A Notice of Availability (NOA) for public review of the Draft EA and FONSI was published in the *Santa Maria Times* newspaper on 11 August, 12 August, and 13 August 2022. The NOA was published in the *Lompoc Record* newspaper on 10 August, 17 August, and 24 August 2022. Likewise, the NOA was published in the *Ventura County Star* on 11 August, 12 August, and 14 August 2022 and the weekly Spanish publication *Vida* on 11 August and 18 August 2022. The Draft EA and Draft FONSI were made available for public review from 10 August 2022 to 9 September 2022 at the Santa Maria Public Library (421 S. McClelland Street, Santa Maria, CA 93454), Lompoc Public Library (501 East North Avenue, Lompoc, CA 93436), Santa Barbara Public Library (40 E. Anapamu Street, Santa Barbara, CA 93101), and VSFB Library (100 Community Loop B#10343A). The Draft EA and Draft FONSI were also made available at the Ray D. Prueter Library (510 Park Avenue, Port Hueneme, CA 93041) and the E.P. Foster Library (651 E. Main Street, Ventura, CA 93001). Hard or electronic copies of the NOA were also mailed out to the federal, state, local, and requesting entities listed in the Distribution List in Section 6.0.

1.5 LEAD AND COOPERATING AGENCY ACTIONS

Pursuant to agreements between the USSF and the FAA, the USSF is the lead agency for the preparation and coordination of this EA (40 CFR § 1501.7). The FAA and the DoN are cooperating agencies (40 CFR § 1501.8). The USSF's invitation letter to the DoN to be a cooperating agency is provided in Appendix A.

1.5.1 USSF's Proposed Federal Action

The USSF's Proposed Federal Action is to fulfill the USSF's responsibilities to be the launch control authority for the Proposed Project pursuant to 10 United States Code (U.S.C.) § 2276, *Commercial Space Launch Cooperation,* and Department of Defense Instruction (DoDI) 3100.12, *Space Support*. Range assets would be used to support this mission to provide telemetry and optical data streams, and the Range Safety Office would provide flight safety analysis prior to mission execution and are a critical input for Go/No-Go launch decisions during flight. The

USSF's role as the lead agency results from the Memorandum of Agreement between the Department of the Air Force (DAF) and the FAA (Agreement Number FAA-DAF-SLR-2021.01) that states that the DAF has authority over operations that occur on VSFB launch ranges and will support commercial launch and reentry activity on USSF ranges and installations.

1.5.2 FAA's Proposed Federal Action

The FAA's Proposed Federal Action is to fulfill the FAA's responsibilities to license commercial launch operations pursuant to 51 U.S.C. Subtitle V, Chapter 509, Sections 50901–50923 and approve related airspace closures for launch operations. The FAA is a cooperating agency because of its role in licensing commercial space launch operations and approving airspace closures for launch operations. Congress, under the U.S. Commercial Space Launch Act of 1984 (51 U.S.C. Subtitle V, Chapter 509, Sections 50901–50923), provided the U.S. Department of Transportation (DOT) statutory direction to, in part, "*protect the public health and safety, safety of property, and national security and foreign policy interests of the United States"* while *"strengthening and… [expanding] the United States space transportation infrastructure, including the enhancement of United States launch sites and launch-site support facilities, and development of reentry sites, with Government, State, and private sector involvement, to support the full range of United States space-related activities*." Within the DOT, the Secretary of Transportation's authority under the Commercial Space Launch Act has been delegated to the FAA Office of Commercial Space Transportation. Stratolaunch is applying for a vehicle operator's license from the FAA pursuant to 14 CFR Part 450, *Launch and Reentry License Requirements.* MHV has held an FAA-issued Launch Site Operators License (LSOL) since June 2004. Stratolaunch would comply with the requirements of this license during its activities at the MHV, including all safety and risk requirements.

1.5.3 DoN's Proposed Federal Action

The DoN's Proposed Federal Action is to maintain sufficient operational capabilities at SNI to ensure the fulfillment of its mission while also accommodating the proposed alternate landing of the Talon-A under the Proposed Project. The DoN would allow the temporary storage of the Talon-A and associated hazardous waste/materials until they can be transported off the Island. The DoN's Proposed Federal Action results from its congressionally mandated roles and responsibilities under 10 U.S.C. § 8062.

1.6 ORGANIZATION OF DOCUMENT

The format and content of this EA conforms to the requirements of Section 102(2)(c) of NEPA. The content of each chapter of this EA is summarized as follows.

- **Chapter 1 – Introduction** provides a brief description of the Proposed Project and its purpose and need, a description of the Proposed Project location, requested federal actions and agency roles, and the USAF IICEP process.
- **Chapter 2 – Description of Proposed Action and Alternatives** provides a detailed project description describing how the purpose and need would be fulfilled, identifies the environmental protection measures included in the Proposed Project to avoid and minimize potential environmental impacts, and includes an overview of the identification and screening of alternatives considered as part of the environmental evaluation process.
- **Chapter 3 – Affected Environment** describes existing environmental conditions within the project study area.
- **Chapter 4 – Environmental Consequences** discusses and compares the environmental impacts associated with the Proposed Project, including the federal action, feasible alternatives to the Proposed Project, and the No Action Alternative.

- **Chapter 5 – List of Preparers** provides a list of individuals that contributed to the preparation of this EA.
- **Chapter 6 – List of Agencies, Organizations, and Persons Contacted** provides a list of agencies, organizations, and persons that were contacted for input regarding the Proposed Project.
- **Chapter 7 – References** provides a list of materials reviewed and cited during the preparation of this EA.

The appendices contain various reference materials, including technical information and records of coordination activities.

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2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

This chapter describes the Proposed Action and No Action Alternative in detail, describes selection criteria used to identify and select alternatives, and summarizes alternatives that were considered but eliminated from further analysis.

For the purposes of this document, "Proposed Action" refers to the federal actions that the lead agency (USSF) and cooperating agencies (FAA and DoN) would perform as a result of Stratolaunch's Proposed Project. Specifically, the USSF's Proposed Action includes launch control authority for Stratolaunch's flight tests and operations. USSF range assets would be used to support this mission to provide telemetry and optical data streams, and the Range Safety Office would provide flight safety analysis prior to mission execution and are a critical input for Go/No-Go launch decisions during flight. The FAA's Proposed Action is licensing Stratolaunch's launch operations and approving related airspace closures for launch operations. The DoN's role is to authorize the use of facilities at SNI in the event that an alternate landing of the Talon-A is necessary. In addition, the DoN would allow the temporary storage of the Talon-A and associated hazardous waste/materials until they can be transported off the Island.

2.1 SELECTION CRITERIA

The USSF's Proposed Action is to fulfill its role as the launch control authority and provide flight safety analysis prior to mission execution. The FAA's Proposed Action is to license Stratolaunch's launch activities and temporarily close airspace in the study area. The DoN's Proposed Action is to authorize use of SNI while also maintaining sufficient operational capabilities at SNI to ensure the fulfillment of its mission. The Proposed Project alternatives must meet the following selection criteria:

- **Criterion A, Flight Safety:** The Proposed Project must occur in a location that would minimize proximity to population centers in order to avoid safety risk to the surrounding areas in accordance with applicable Range Safety requirements. The Proposed Project must occur over coastal areas during the Talon-A testing phase and have a coastal runway; operating over land during the testing phase would create too much program safety risk.
- **Criterion B, Operational Needs:** The Proposed Project requires that the Talon-A is released near a site with telemetry capabilities necessary to acquire data from the Talon-A vehicle from the release altitude to the landing. The Proposed Project also requires an operationally similar release altitude in order for the Stratolaunch team to collect range integration and flight experience data that would be helpful for future missions. In addition, the Proposed Project must be performed over a large operating area in order to reduce program risk during the testing phase.
- **Criterion C, Business Needs:** The Proposed Project requires a runway with availability to meet Stratolaunch's desired testing and operations schedule and costs.

2.2 SCREENING OF ALTERNATIVES

One alternative considered was the utilization of facilities at Naval Air Weapons Station (NAWS) China Lake. This alternative was not carried forward as it did not meet the alternatives selection criteria. The location would have required that the Talon-A be redesigned to ensure landing occurred on NAWS China Lake-owned terrain. In addition, Stratolaunch would have needed to adjust operational parameters to meet the range constraints. The small operating area at NAWS

China Lake (approximately 100 miles by 40 miles) would have also greatly increased program risk during the testing phase and thus would not meet Stratolaunch's operational needs.

Table 2-1 presents the alternatives and answers whether each would meet the selection standards.

Table 2-1. Alternatives Screening Matrix

Alternative	Selection Criteria		
	A: Flight Safety	B: Operational Needs	C: Business Needs
Preferred Alternative (Proposed Project)	Yes	Yes	Yes
Naval Air Weapons Station China Lake Alternative	No	No	No
No Action Alternative	Yes	No	No

The Proposed Project is the only alternative that met the selection criteria. VSFB has the extensive telemetry capabilities needed to perform the Proposed Project (Criterion B), occurs in a minimally populated area along the California coastline (Criterion A), has a runway with the availability necessary to meet Stratolaunch's desired operational frequency needs (Criterion C), and supports the Western Range operations (Criterion B).

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER CONSIDERATION

The preferred alternative (Proposed Project) was the only alternative that met all selection criteria. Therefore, no other viable action alternatives were identified and carried forward.

2.4 PROPOSED PROJECT

The Stratolaunch Talon-A launch system is comprised of two air vehicles: the Stratolaunch Carrier Aircraft (Figure 1-1) and the Talon-A research testbed vehicle (Figure 2-1). The Talon-A vehicle is an autonomous aircraft that generates thrust via a liquid fueled rocket engine that uses Jet-A as fuel and liquid oxygen (LOX) as its oxidizer. The launch system is supported from the Mojave Control Center (MCC) via radio, a line-of-sight (L/S)-band telemetry system, satellite communications (SATCOM) antennas mounted to the Carrier Aircraft, and a commercial internet service provider. The launch system is also supported by a safety Chase Aircraft (a Cessna Citation 550 Jet) and photograph Chase Aircraft (such as a Gulfstream III or an F-18) that remain in formation with the Carrier Aircraft. The safety Chase Aircraft also originates and returns to MHV and would be sourced internally by Stratolaunch. The photograph Chase Aircraft would take off and land at any nearby airport within a 2-hour flight time, such as Van Nuys Airport, Bob Hope "Hollywood-Burbank" Airport, Edwards Air Force Base, etc. The plane would be sourced internally by Stratolaunch or contracted with either a public or private operation.

The Proposed Project has an anticipated start in the third quarter of calendar year 2022 and would continue until the Talon-A is retired from flight operations. Stratolaunch would apply to renew its launch license with the FAA for any proposed operations extending beyond the initial license period. The estimated general schedule of flights is as follows (the term "launch" in the following list is defined as an event that would release the Talon-A from the Carrier Aircraft, have the Talon-A conduct a powered flight trajectory reaching hypersonic speeds, and generate a sonic boom):

- Year 1 (2022) – two launches (six or more total including non-launch events)
- Year 2 – four launches (12 or more total including non-launch events)
- Year 3 – 20 launches (30 or more total including non-launch events)
- Year 4 – 40 launches
- Year 5 – 52 launches

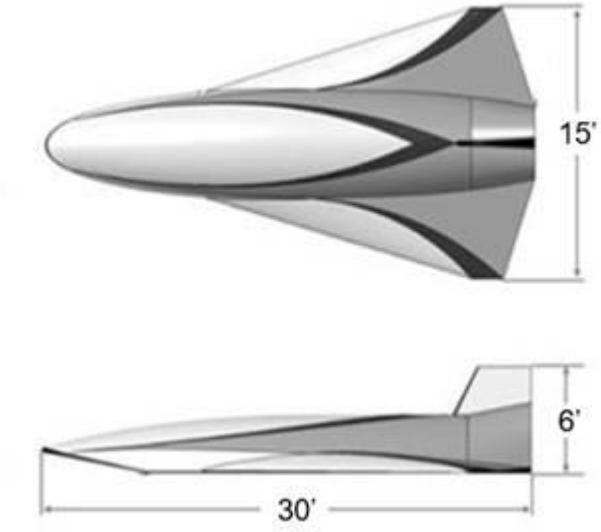

Figure 2-1. Dimensions of the Talon-A Hypersonic Testbed Vehicle

The Proposed Project includes non-launch operations and launch operations. Non-launch operations would include captive carry events of the Talon-A vehicle, which would not release the Talon-A from the Carrier Aircraft but would release propellant and ballast at altitudes greater than 5,000 ft (1,524 m).[2] In addition, non-launch operations would include up to two separation tests of a Talon-A test article (a simulation of the Talon-A test vehicle) that would test the release mechanism on the Carrier Aircraft and drop a simulated Talon-A structure into the ocean. As part of this action, the Talon-A test article would be recovered from the ocean to the extent possible by an ocean-going vessel. As described in more detail below, the ocean-going vessel would originate from and return to a commercial port of entry, such as Santa Barbara, San Pedro, Port Hueneme, or Long Beach. The vessel would be approximately 100 ft (30 m) long and 25 ft (7.6 m) wide and would be similar to ocean-going vessels used in the oil and gas industry. Glide flights would also be included in non-launch (non-FAA licensed) operations where the Talon-A vehicle would be released from the Carrier Aircraft but the engine on the Talon-A would not power the vehicle and the vehicle would land at VSFB's Runway 12-30. To summarize, the following distinct events are part of the non-launch operations included in the Proposed Project:

1. Carrier Aircraft transit flights;
2. Captive carry of Talon-A;
3. Talon-A separation test; and
4. Talon-A glide flights.

[2] When propellants are dispersed at an altitude above 5,000 ft (1,524 m), the fuel evaporates completely before it reaches the ground (FAA 1976, USEPA 2001).

Launch operations would include powered flight of the reusable Talon-A over the BOA off the coast of California with runway landings at VSFB in addition to an alternate landing site at SNI. Up to two hypersonic test flights of the expendable Talon-A would occur that would impact the ocean off the coast of VSFB and would include attempted vehicle recovery by an ocean-going vessel. The proposed impact area for the Talon-A separation test and the expendable hypersonic flight test is within the Western Missile Test Range managed by the SLD 30. Figure 2-2 shows a depiction of the proposed operational and ocean impact area for the Talon-A separation test. Figure 2-3 shows a depiction of the proposed operational and ocean impact area for the expendable Talon-A hypersonic flight test. Figure 2-4 shows the overall geographic area where reusable Talon-A flight operations would occur over the BOA. To summarize, the following distinct events are part of the launch operations included in the Proposed Project:

1. Pre-flight activities at MHV;
2. Recovery of Talon-A test article;
3. Expendable Talon-A hypersonic flight;
4. Recovery of the expendable Talon-A hypersonic test vehicle;
5. Reusable Talon-A launch operations over BOA with runway landings;
6. Alternate landing at SNI runway; and
7. Post-flight activities at VSFB, SNI, and MHV.

All non-launch and launch operations would occur during daytime hours.

Figure 2-2. Potential Landing and Ocean Impact Area for Talon-A Separation Test

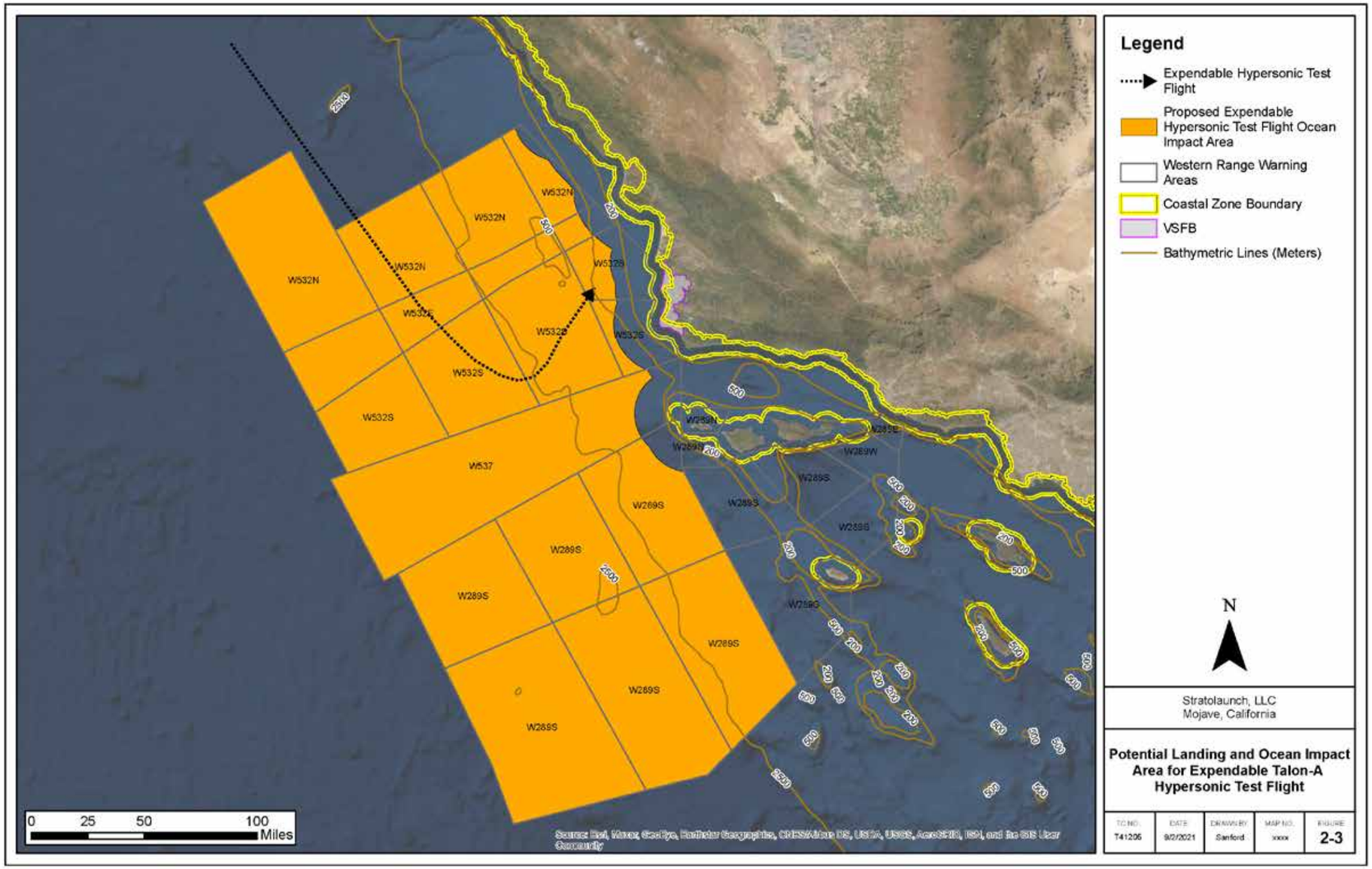

Figure 2-3. Potential Landing and Ocean Impact Area for Expendable Talon-A Hypersonic Flight Test

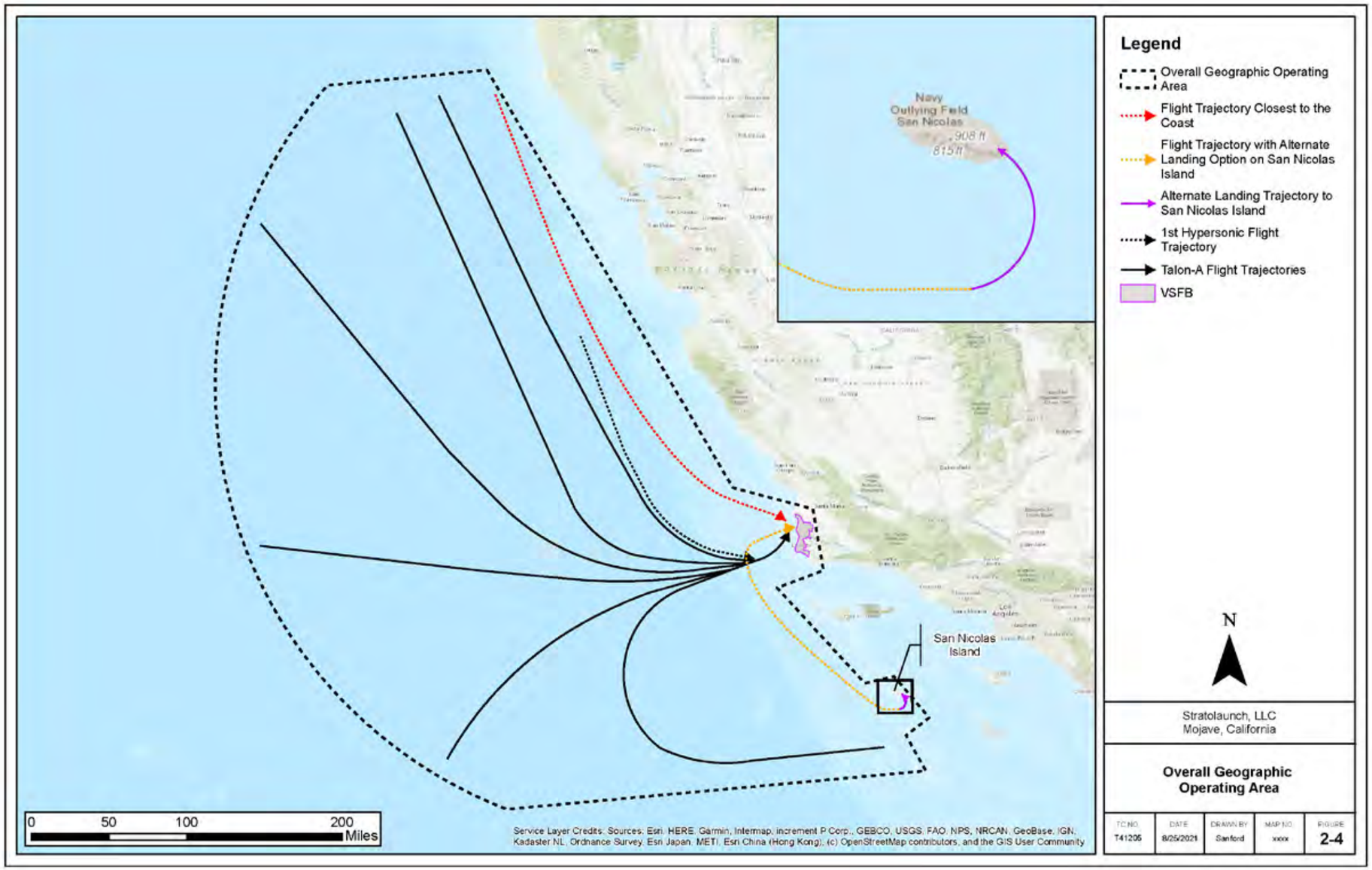

Figure 2-4. Overall Geographic Operating Area

Table 2-2 provides more details on the elements of Stratolaunch's Proposed Project.

Table 2-2. Stratolaunch's Proposed Project Purpose and Frequency

	Mission	Purpose	Frequency	Notes	FAA Launch License Required?
Ground Operations	Pre-flight ground operations at MHV.	Required before flight.	All operations.		Yes
	Post-flight ground operations.	Required post flight.	All reusable Talon-A operations.	Carrier Aircraft post flight in MHV for all operations.	Yes
	Recovery of Talon-A Test article/vehicle.	Recover debris from ocean.	Limited to expendable Talon-A operations.	Both separation test article and hypersonic test vehicle.	No
Initial Test Program	Captive carry of Talon-A with Chase Aircraft.	Talon-A developmental test objectives and crew rehearsals.	All early operations preceding a milestone event.		No
	Talon-A separation test with Chase Aircraft.	Talon-A developmental test objectives.	Up to two tests typically spaced 6 months apart. Both tests will occur within a 12-month time period.	Milestone event.	No
	Expendable Talon-A hypersonic flight with Chase Aircraft.	Talon-A developmental test objectives.	Up to two flights typically spaced 6 months apart. Both flights will occur within a 12 month time period.	Milestone event.	Yes
	Talon-A glide flights with Chase Aircraft.	Talon-A developmental test objectives.	Multiple.		No
Commercial Operation	Reusable Talon-A launch operations over the BOA with runway landings with Chase Aircraft.	Commercial use.	Relatively infrequent at first but would pick up frequency as operations increase. Would increase to up to weekly in frequency.	Commercial payloads planned but will not be deployed. The Talon-A is an in-atmosphere hypersonic research vehicle and would not launch payloads into Earth Orbit.	Yes

	Mission	Purpose	Frequency	Notes	FAA Launch License Required?
	Alternate landing at SNI runway with Chase Aircraft.	Alternative landing site.	No more than three per year.		Yes
	Carrier Aircraft transit flights with Chase Aircraft.	Transit phase of flight.	All operations.	This is a phase of flight that occurs during all flight operations. The Carrier Aircraft and safety chase plane take off and land at MHV.	No

Note: * Each milestone event would be conducted up to two times (until sufficient data has been obtained).

2.4.1 Pre-flight Activities at MHV

Pre-flight activities consist of preparing the integrated launch system for takeoff and launch, mounting the Talon-A vehicle to the Carrier Aircraft, and completing support operations. In accordance with the MHV LSOL, all hazardous pre-flight ground operations would take place in a specified location that has established appropriate safety clear zones. This location would be within the MHV modified site license boundary in the Stratolaunch hangar shown in Figure 2-5. Existing infrastructure would be used to conduct all ground operations related to this action, which include but are not limited to the following:

- Talon-A, Carrier Aircraft, and Chase Aircraft fueling;
- Flight Termination System (FTS) checkouts;
- Composite overwrapped pressure vessel (COPV) pressurization; and
- Pre-flight checklists and procedures.

Figure 2-5. Pre-Flight Activities for the Integrated Launch System and Taxi Route

A mobile International Organization for Standardization (ISO) container would be used to transport LOX from the MHV tank farm to the existing Stratolaunch test stand and Talon-A, as is performed for current Stratolaunch Carrier Aircraft activities.[3] This intermodal ISO container would be 10 ft (3 m) in length and would be surrounded with a carbon steel frame to protect the tank.

The Carrier Aircraft would travel from the Stratolaunch ramp, near the southern end of Runway 12-30 and just west of Taxiway A as shown in Figure 2-5, across Taxiway A, and onto Taxiway J. Prior to taking Runway 12-30, additional pre-flight configurations and checks would occur. Runways 8-26 and 4-22 would not be used as operating runways for the Stratolaunch launch system. The MHV anticipates restricting Runway 12-30 during taxi and takeoff operations. However, Runways 8-26 and 4-22 would remain open during the taxiing activities with the Non Federal Control Tower (NFCT) sequencing movement area operations. The Carrier Aircraft would not traverse or impact non-movement areas (i.e., ramps, aprons, or other areas not controlled by Air Traffic Control) while on the ground. In addition, the NFCT would prioritize emergency aircraft if an emergency were to occur during operations. The Proposed Project does not require airport infrastructure modification at MHV, such as pavement, re-painting, lighting changes, or any construction to conduct taxi or takeoff operations.

2.4.2 Carrier Aircraft Transit Flights

The Stratolaunch integrated Carrier Aircraft and Talon-A launch system, plus safety Chase Aircraft, would take off from MHV and transit to Western Range Airspace per the transit corridor shown in Figure 2-6. The launch system would take off and land at MHV, within Class D airspace. Stratolaunch plans to transit between Mojave and the coast at altitudes greater than 15,000 ft (4,572 m) above mean sea level except when climbing or descending into Mojave's existing Class D airspace. The Carrier Aircraft has a wingspan of 385 ft (117 m), is powered by six Pratt & Whitney PW4056 engines, and features redundant hydraulic, electrical, and pneumatic systems derived from the Boeing 747-400 aircraft. The Carrier Aircraft holds sufficient internal fuel for at least 8 hours loiter time over the vehicle drop area. The aircraft itself has the capability to carry 500,000 pounds (lbs) of external payload. The Carrier Aircraft would provide electrical power, would purge gases, and would be monitored and controlled by a launch engineer onboard the Carrier Aircraft.

After the Talon-A releases from the Carrier Aircraft, the Carrier Aircraft and safety chase plane would follow the pre-coordinated flight path back to MHV for landing.

[3] The LOX transport truck to be used is U.S. Department of Transportation (DOT)-certified for travel on public roadways.

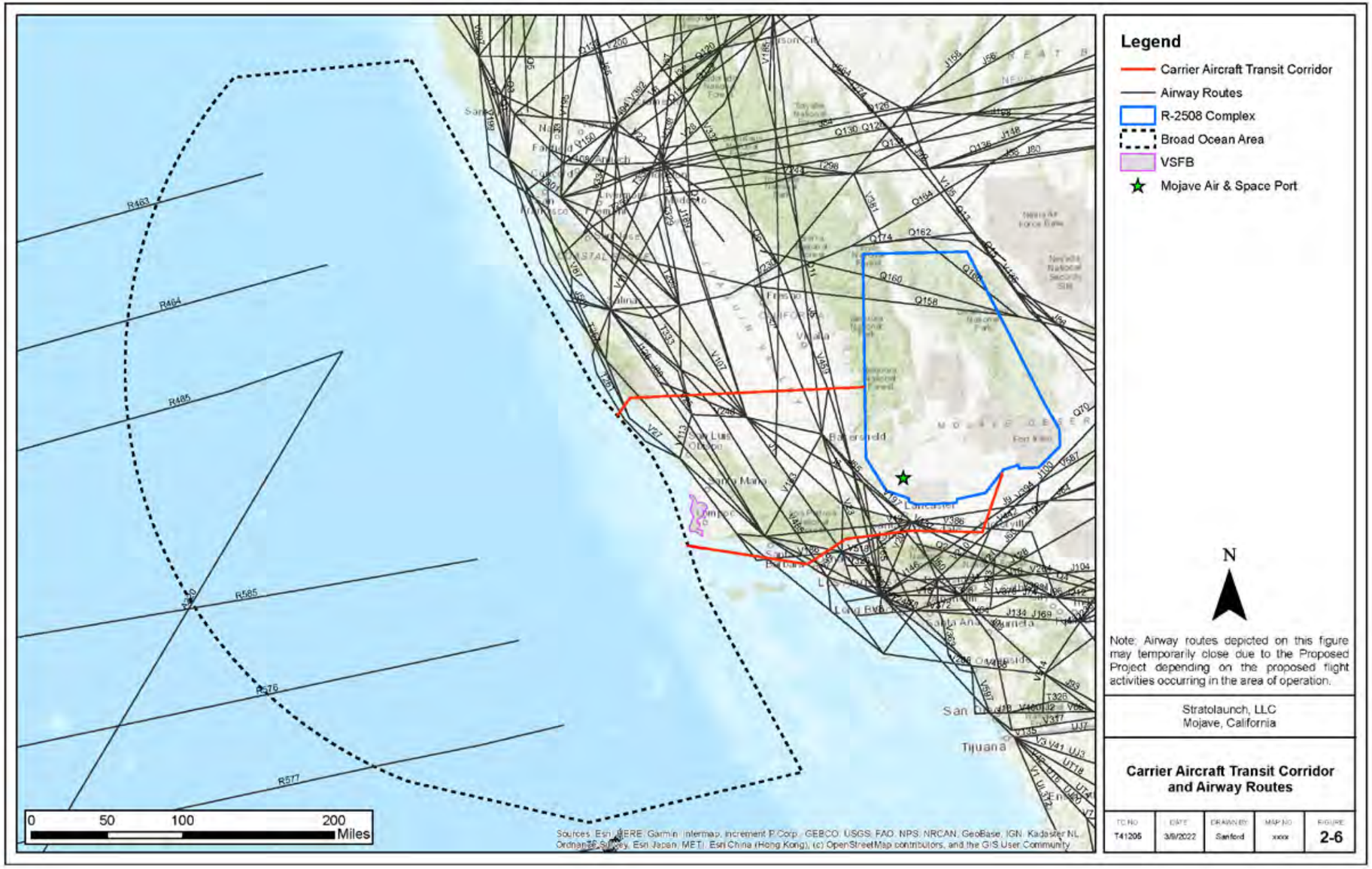

Figure 2-6. Carrier Aircraft Transit Corridor and Airway Routes

Launch License and Airspace Closures

As previously stated, the FAA is a cooperating agency because of its role in licensing commercial space launch operations and approving airspace closures for launch operations. All launch operations would comply with the necessary notification requirements, including issuances of Notices to Air Missions (NOTAMs) and local Notices to Mariners (NOTMARs), consistent with current procedures. A NOTAM provides notice of unanticipated or temporary changes to components of, or hazards in the National Airspace System (FAA Joint Order 7930.2S Change 2, *Notices to Air Missions*). A NOTMAR provides notice of temporary changes in conditions or hazards to navigable waterways and is discussed in more detail at the end of this section.

To comply with the FAA's licensing requirements, Stratolaunch has entered into a Letter of Agreement (LOA) (dated 10 April 2019) with Los Angeles Air Route Traffic Control Center (ARTCC), Air Traffic Control System Command Center Space Operations, and SLD 30 to accommodate the flight parameters of the Stratolaunch launch system. The LOA defines responsibilities and procedures applicable to operations, including the technical procedures to follow when issuing a NOTAM defining the affected airspace prior to launch. The USSF SLD 30 LOA is to be used for launch/recovery operations only. All airspace coordination for launch events, including the offshore hazard area, would be coordinated with SLD 30 and the FAA in SLD 30's LOA. A second LOA that the FAA's Air Traffic Organization developed for Stratolaunch would cover the transit of the Carrier Aircraft from MHV to the offshore hazard area.

The FAA conducts an analysis of the constraints on airspace efficiency and capacity for each licensed launch operation. This analysis is documented in an Airspace Management Plan, which is completed approximately 3 to 5 days prior to launch. This information helps the FAA determine whether the proposed launch would result in an unacceptable limitation on air traffic. If that were the case, the FAA may need to work with the operator to identify appropriate mitigation strategies, such as shortening the requested launch window or shifting the launch time, if possible. The FAA often provides data to launch operators to avoid operations during days with high aviation traffic volume. The Proposed Project would not require the FAA to alter the dimensions (shape and altitude) of the airspace. However, temporary activation of existing Special Use Airspace (SUA) Warning Areas may be necessary to ensure public safety during the proposed operations.

Non-Launch Operations

During the captive carry flights, no airspace closures would be required. The launch system would operate in accordance with Department of Defense (DoD) and FAA operating requirements for flights in SUA and Class A, D, E, F, and G airspace, as well as requirements managed by the Flight Standards District Office and the launch system's certification.

Non-launch operations may require activating the restricted airspace R-2508 Complex, shown in Figures 2-6 and 2-7, depending on the Carrier Aircraft's flight trajectory. Stratolaunch would maintain a minimum altitude of 2,000 ft above the surface of noise sensitive areas (Figure 2-7).

During glide flights, the Talon-A would be operated under a Special Airworthiness Certificate and would require segregated airspace during the autonomous unmanned phase of flight. The temporary airspace closures are common for unmanned aircraft. In the case of the Talon-A, a Certificate of Authorization would be issued by Air Traffic Control. During the unpowered glide flights with a water landing into the Pacific Ocean and later flights with runway landings at VSFB,

FAA would identify an Aircraft Hazard Area (AHA)[4] where the Talon is proposed to operate. During unpowered glide flights leading to runway landings at VSFB, the USSF would activate its restricted airspace R-2516 and R-2517 for use by the Talon-A.

Launch Operations

Stratolaunch launch operations can be divided into phases.[5] During the takeoff and transit phases of flight, Stratolaunch would not require airspace segregation or temporary closures. During the launch phase of the operation, airspace segregation or temporary closures may be required in the oceanic regions (the BOA) shown in Figure 2-6. Prior analyses have concluded that the majority of commercial space launch operations that occur in oceanic regions, such as where Stratolaunch operations would occur, result in minor or minimal impacts on commercial and private users of airspace. This is largely due to the relatively low aircraft traffic density in oceanic regions and the ability of the FAA to manage the airspace for all users. Furthermore, the DoD frequently activates and uses the Warning Areas (Figure 2-7), which comprise the majority of the operating area. Stratolaunch would maintain a minimum altitude of 2,000 ft above the surface of noise sensitive areas (Figure 2-7).

The published airway routes that may be impacted by the Proposed Project are located off the coast of California and shown in Figure 2-6. Prior to each launch, the Warning Areas and airspace that must be temporarily closed would be defined and published through a NOTAM. Specific launch trajectories (including latitude and longitude coordinates) for Stratolaunch operations would be based on mission-specific needs (e.g., separation test, expendable hypersonic flight test, glide flights, reusable launch operations over the BOA with runway landings at VSFB, alternate landings at SNI, etc.). The specific launch trajectory and associated AHAs would be provided in Stratolaunch's Flight Safety Data Package and submitted to the FAA in advance of the launch. This information would be used to determine the necessary airspace closures provided in the NOTAM. For the purposes of the environmental review, Figure 2-8 provides the proposed AHA for the expendable hypersonic flight test.

[4] An AHA is used by FAA Air Traffic Control to segregate air traffic from a launch vehicle, reentry vehicle, amateur rocket, jettisoned stages, or falling debris generated by failures associated with any of these activities pursuant to 14 CFR § 91.143. An AHA is designated via NOTAM as either a TFR or stationary ALTRV. TFRs are normally established over land but extend up to 12 nm offshore. For offshore operations beyond the 12 nm limit, an ALTRV would be used. Unless otherwise specified, the vertical limits of an AHA are from the surface to unlimited. An ALTRV is airspace utilization under prescribed conditions normally employed for the mass movement of aircraft or other special user requirements which cannot otherwise be accomplished. ALTRVs are approved by the appropriate FAA facility.

[5] MHV, as holder of the LSOL, is responsible for managing launch operations scheduling at MHV.

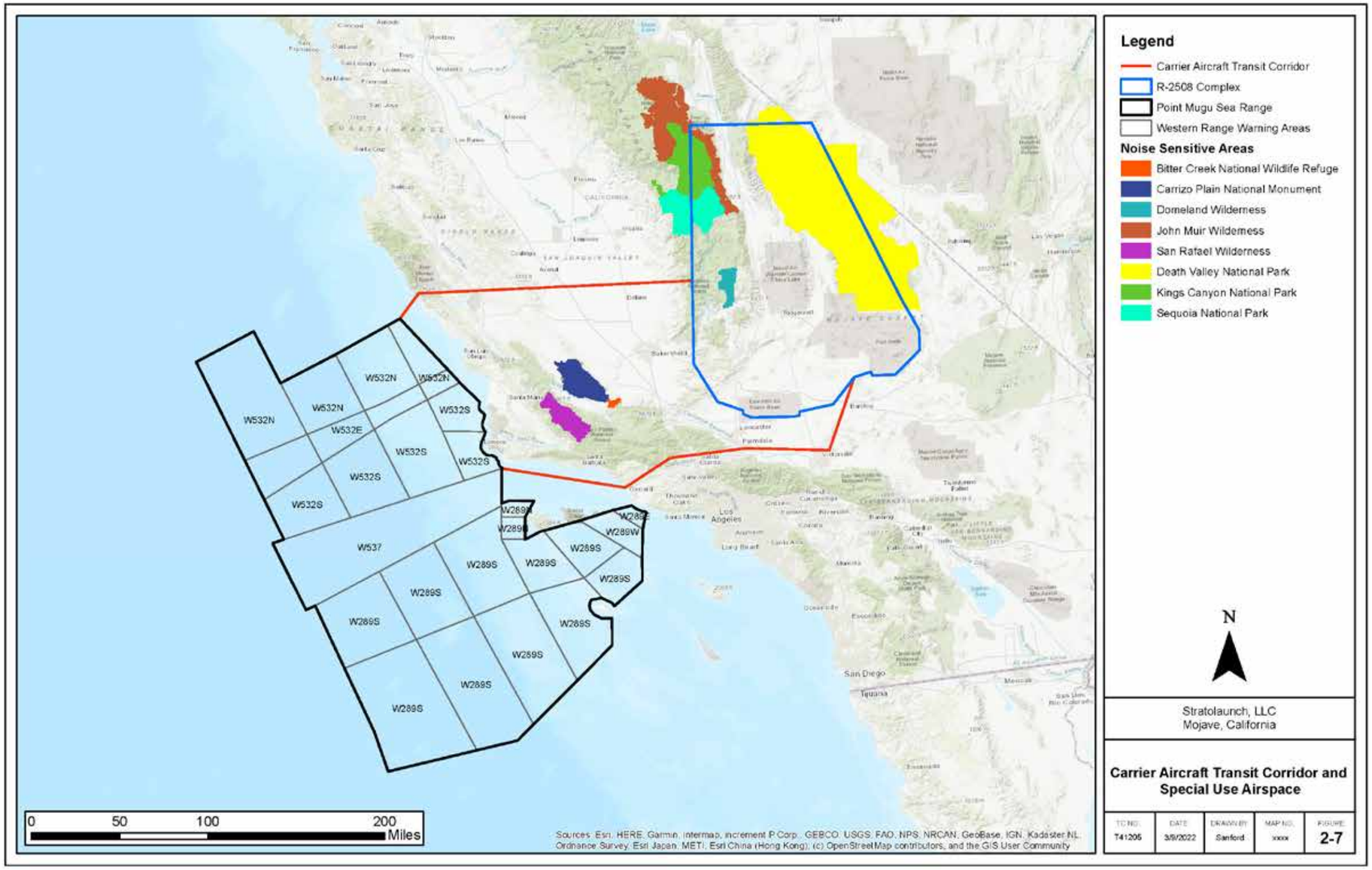

Figure 2-7. Carrier Aircraft Transit Corridor and Special Use Airspace

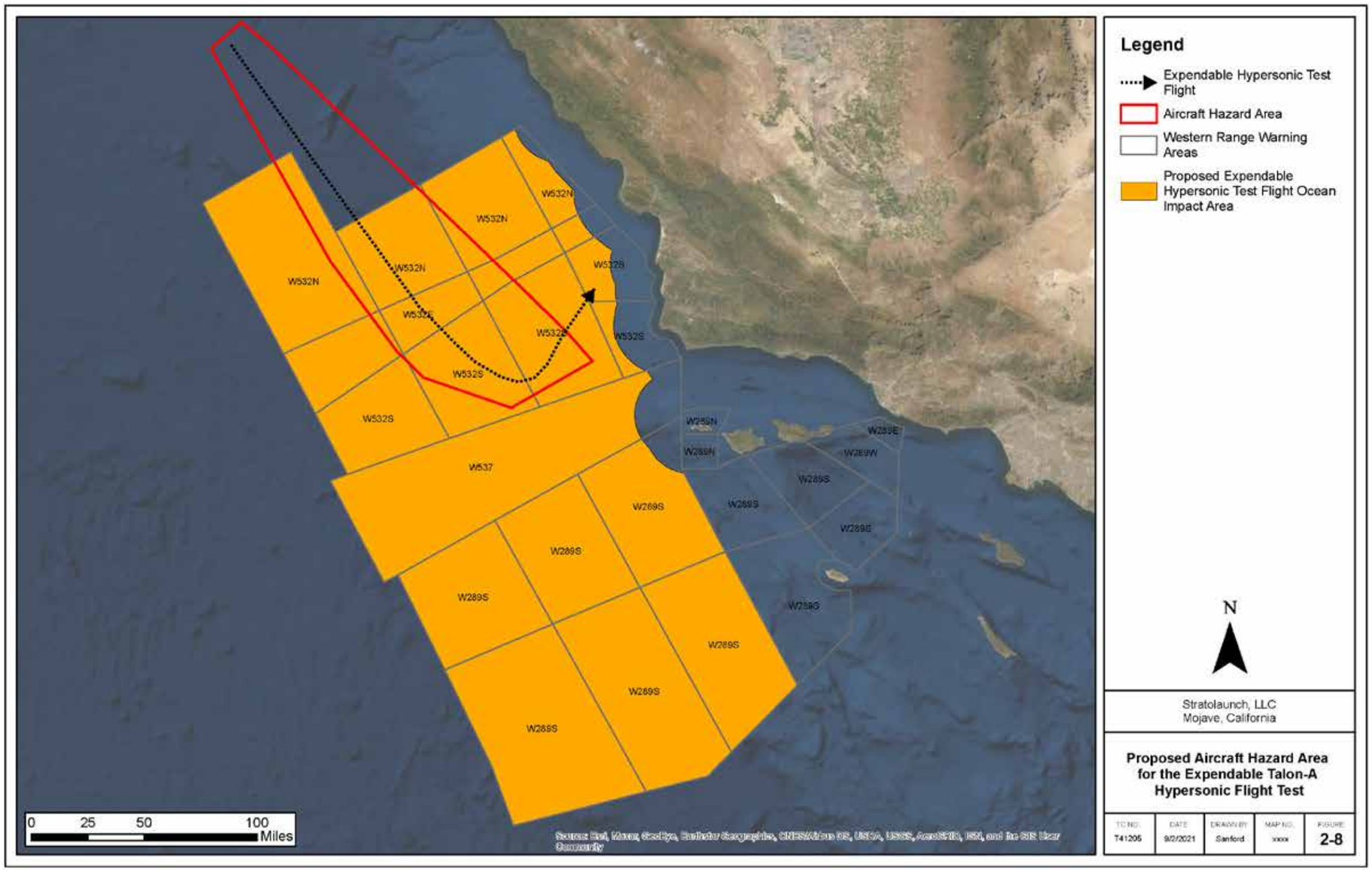

Figure 2-8. Proposed Aircraft Hazard Area for the Expendable Talon-A Hypersonic Flight Test

All launch operations would comply with the necessary notification requirements, including issuance of NOTAMs, consistent with current procedures. Launches would be of short duration and scheduled in advance to minimize interruption of airspace. Takeoff and transit phases of flight would be integrated into the airspace under either visual flight rules or instrument flight rules. Safety and security factors dictate that use of airspace and control of air traffic must be closely regulated. Accordingly, the FAA has promulgated regulations applicable to all aircraft to define permissible uses of designated airspace. These regulations are intended to accommodate the various categories of aviation, whether military, commercial, or private aviation enthusiasts.

The FAA and DoD airspace managers may segregate the operating airspace using altitude reservations (ALTRV), Air Traffic Control-assigned airspaces, Temporary Flight Restriction (TFR), or SUA-Warning Areas. The NOTAM would establish a closure window that is intended to warn aircraft to keep out of a specific region throughout the time that a hazard may exist. The length of the window is primarily intended to account for the time needed for the operator to meet its mission objectives. The location and size of the closure area is defined to protect the uninvolved public.

The closure for a launch typically must begin at the time of launch and would end when any potential debris, including items that are planned to be jettisoned (e.g., stages or fairings) and any debris generated by a failure, has reached the bottom of the affected airspace. Advance notice of these closures via NOTAMs would assist pilots in scheduling around any temporary disruption of flight activities in the area of operation.

The airspace is immediately opened once the mission has successfully cleared the area and all planned jettisoned items no longer impose a risk to the public. The actual duration of airspace closure is normally much less than the original planned closure, especially if the launch window is relatively long and the launch occurs at the beginning of the window. The FAA typically begins to clear airspace and reroute aircraft in advance of a launch and directs aircraft back into the released airspace after the launch to recover the normal flow and volume.

The airspace closure duration depends on the mission type. For the proposed Stratolaunch operations, the launch window is anticipated to be up to 5 hours. This closure time represents the maximum value for this type of mission. The FAA and the operators take steps to reduce the airspace closure durations as a mission unfolds. For example, Stratolaunch plans to conduct its Talon-A release for an air-launched system at the beginning of its launch window. Generally, while Stratolaunch may request a window that spans hours in order to have more opportunity to work around weather or technical issues, the operator makes every effort to launch as soon as possible in the launch window. While percentages are not readily available, far more launches occur at or near the launch window opening than the closing. Furthermore, as the launch unfolds successfully, the FAA incrementally releases airspace as it is no longer affected. The release of airspace closures would vary, as it would be released based on debris fall calculations that can change from mission to mission. In practice, the FAA attempts to divide airspace closures into subsets that can be released incrementally in time, as well as geographically based on airspace boundaries. In doing so, the actual closure times are often significantly shorter than projected maximum values defined in a given NOTAM.

The location and size of airspace closures for commercial space operations also are influenced by multiple factors, including hardware reliability, and the number and type of items that may be jettisoned. The size of airspace closures in the vicinity of the drop point shrink as reliability is established with results and analysis from each launch. For the initial launch of a new launch vehicle, the hazard areas and associated airspace closures around the drop point are bigger to account for the increased likelihood of a vehicle failure relative to a mature, flight-proven vehicle.

Subsequent launches of that launch vehicle would likely include smaller hazard areas compared to the initial launch.

To comply with the necessary notification requirements[6], VSFB would notify the U.S. Coast Guard (USCG) of any upcoming launch operations to allow for the safe operation of the integrated Carrier Aircraft and Talon-A over the open ocean, consistent with current procedures. VSFB would provide the NOTMAR submission 14 days prior to the start of operations. The USCG would be responsible for issuing NOTMARs that provide hazard area locations prior to each mission event with ocean impacts. A NOTMAR provides notice of temporary changes in conditions or hazards in navigable waterways. The Proposed Project would not require the alteration or closure of shipping lanes. The NOTMAR would include the dates and timing of the operations and the coordinates of the hazardous operation area. Operations with ocean impacts would be of short duration and scheduled in advance to minimize interruption to navigable waterways.

2.4.3 Captive Carry of Talon-A

The Stratolaunch Talon-A launch system would perform captive carry tests as part of its Talon-A vehicle testing and operation. These captive carry tests have the same function as dress rehearsals and help to verify that technical integrations, procedures, crew readiness, and training are effective and suitable for the mission. Captive carry flights include flying the Talon-A from MHV to Western Range Airspace and conducting launch procedures at an altitude range of 15,000 to 45,000 ft (4,572 to 13,716 m) at 400 +/- 100 miles per hour (mph) (179 +/-45 meters per second [m/s]). Figure 2-4 depicts example trajectories for landing on VSFB and the alternate landing site on SNI. Figure 2-4 shows a trajectory coming from the south that represents an example trajectory with a Talon-A runway landing on VSFB, but also with the alternate landing option on the SNI runway in the event of an engine-out scenario early in the flight profile.

The Talon-A would not be released from the Carrier Aircraft during the captive carry tests. For captive carry flights that precede separation testing, the propellants are replaced with ballast fluids. Approximately 1,312 lbs, comprising 158 gallons of water, would be used to simulate Jet-A. Up to 5 gallons of propylene glycol would be used as valve antifreeze. Approximately 681 lbs, comprising 38 gallons of calcium chloride, and an additional 2,207 lbs, comprising 265 gallons of water (totaling 2,888 lbs/303 gallons), would be used to simulate LOX. Captive carry events that precede a launch event would be fueled with the planned propellants, LOX and Jet-A. The ballast fluids or propellant would be dumped from the tanks above 5,000 ft (1,524 m) altitude and would dissipate in the air prior to reaching the ocean's surface (none of the material would land in the ocean). Residual amounts of water, propylene glycol, and calcium chloride would remain in the Talon-A tanks upon landing at MHV.

As part of this test, Stratolaunch Talon-A communications and data relay needs may require the staging and operation of a mobile communications trailer on south VSFB. Suitable locations are Space Launch Complex-8 or other locations that provide unobstructed line of site orientation to the captive carry flight path. The equipment would be pre-staged at an elevated and accessible location on a previously disturbed or developed site. External power would be supplied from existing infrastructure or a small generator less than 50 horsepower (hp). The trailer, depicted in Figure 2-9, is single-axle and between 10 and 16 ft in length. Once each event is complete, the trailer would be stowed and transported back to Stratolaunch facilities in Mojave. In addition,

[6] USCG notification requirements for Local NOTMARs are described online at: https://www.pacificarea.uscg.mil/Our-Organization/District-11/Prevention-Division/LnmRequest/.

networked hardware would be required at the Vandenberg Remote Launch Control Center located at Building 8510 to support data collection needs.

Figure 2-9. Stratolaunch Mobile Communications Trailer

2.4.4 Talon-A Separation Test

The Stratolaunch Talon-A launch system plans to perform separation tests as part of this action using a Talon-A test article. Up to two separation tests would be performed in a 12-month period, typically spaced 6 months apart. Talon-A test article release conditions from the Carrier Aircraft would be selected to support analysis for air-launch of powered Talon-A vehicles and would be from approximately 15,000 to 45,000 ft (4,572 to 13,716 m) at 400 +/- 100 mph (179 +/- 45 m/s). Data collection would be accomplished via cameras on the Carrier Aircraft, in addition to ground-based telemetry receivers located on VSFB.

The test article is expendable and would not be equipped with flight safety systems that normally include live ordnance. A clear air and surface hazard footprint is required for safety. No engines would be used and thrust would not be generated; instead, mass simulators would be put in their place. Some avionics, transmitters, and batteries would be onboard to support flight test and systems verification requirements. Approximately 1,312 lbs, comprising 158 gallons of water, would be used to simulate Jet-A during the separation test. Up to 5 gallons of propylene glycol would be used to simulate valve antifreeze. Approximately 681 lbs, comprising 38 gallons of calcium chloride, and an additional 2,207 lbs, comprising 265 gallons of water (totaling 2,888 lbs/303 gallons), would be used to simulate LOX. These fluids would be dumped and dissipated above 5,000 ft (1,524 m) in the air or would remain in the tanks upon ocean impact, depending on the flight test requirements. When propellants are dispersed at an altitude above 5,000 ft (1,524 m), the fuel evaporates completely before it reaches the ground (FAA 1976; USEPA 2001).

Conceptual operations for this action are listed below:

- Ground operations at MHV.
- Carrier Aircraft transit to Western Range Airspace.
- The Talon-A and Carrier Aircraft mated system maneuvers to the selected separation location while accomplishing required system and Range Safety checks.
- When cleared, the Talon-A is released from the Carrier Aircraft.
- The Talon-A test article conducts separation and inflight test points, reaching speeds between 100 and 265 mph (45 and 118 m/s) prior to impact.
- Following the air-launch, the Carrier Aircraft executes a safety maneuver and begins exiting the Western Range Airspace and returning for landing at MHV.
- A visual observation of the impact area may be conducted with available resources such as the safety and photograph Chase Aircraft and maritime recovery vessels.

- Recovery operations for the Talon-A test article are initiated (detailed below).

Like the captive carry test, the separation test may also require the temporary staging and operation of a mobile communications trailer on a previously disturbed or developed site. The same staging requirements and energy use described above for the captive carry test would be required for the Talon-A separation test.

2.4.5 Recovery of Talon-A Test Article

The test article would impact the ocean within the proposed ocean impact area shown on Figure 2-2, between 14 nm (26 km) from the coast (including islands) and the extent of Warning Areas W532, W537, and W289. The test article, upon strike of the ocean surface, would impact up to 4,000 square feet (ft^2) (372 square meters [m^2]). This area was determined by assuming a 20-degree impact angle at a speed of approximately 134 mph (60 m/s). It is anticipated that the Talon-A test article would breakup upon ocean impact. Table 2-3 summarizes the size and number of fragments expected after water impact based on a preliminary breakup analysis.

Table 2-3. Expected Talon-A Test Article Fragments After Water Impact

Fragment Size	Total Mass in Category	Number of Fragments	Percentage of Total Mass
Large Any fragments or Talon-A components that exceed 50 lbs	1,999.7 lbs	4	97%
Small Any fragments or Talon-A components that are between 1.0 lb and 50 lbs	65.36 lbs	14	2%
Negligible Any fragment that is <1 lb	9.1 lbs	66	<1%

Note: lbs = pounds.

Large Fragments

The large category comprises the following pieces:

- Left-wing and right-wing (2 fragments);
- Nose section (1 fragment); and
- Fuselage section (1 fragment).

The wing sections are approximately 186 lbs and are expected to sink once they have been saturated with seawater (Table 2-4). The nose section is approximately 598 lbs and is expected to sink once it has been saturated with seawater (Table 2-4). The fuselage section contains the oxidizer tank, propellant tank, avionics, and propulsion system mass shapes. The tanks would be approximately 4,200 lbs, comprised of 460 gallons of water and calcium chloride. This fragment would have the highest potential to remain buoyant (Table 2-4). However, the tanks and associated piping may lose integrity and allow seawater saturation, which would eventually cause them to sink. The large fragments weigh 1,999.7 lbs dry without fluids and 6,120 lbs including fluids.

Table 2-4. Expected Talon-A Test Article Large Fragments and their Buoyancy

Large Category Pieces	Total Mass in Category	Number of Items	Buoyancy
Wing Segments	186 lbs	2	Sink
Nose Section	598 lbs	1	Sink
Fuselage Section	1,215.7 lbs	1	Float

Note: lbs = pounds.

Small Fragments

The small category comprises 14 pieces, including internal structural components (high density and low density) and avionics equipment that would shear away from the test article upon impact. Only the eight low-density structural component pieces are anticipated to float (Table 2-5).

Table 2-5. Expected Talon-A Test Article Small Fragments and their Buoyancy

Small Category Pieces	Total Mass in Category	Number of Items	Buoyancy
Avionics Equipment	41 lbs	2	Sink
Structural Components High Density	10.26 lbs	4	Sink
Structural Components Low Density	4 lbs	8	Float

Note: lbs = pounds.

Negligible Fragments

Although there are an estimated 66 fragments in the negligible fragment's category, the mass for any single item would be less than 1 lb and in total is less than 10 lbs. These fragments may be structural components, fasteners, composite skin fragments, and other pieces. It is expected that 50 percent of these fragments would sink (approximately 4.5 lbs).

Recovered Floating Debris

After splashdown, a recovery vessel originating from a commercial port of entry such as Santa Barbara, San Pedro, Port Hueneme, or Long Beach would pursue recovery of floating debris. The recovery vehicle would position itself in a safe staging area, potentially as close as 6 nm (11 km) from the release point, and upon splashdown would navigate to the impact location. The estimated transit time to the Talon-A vehicle impact point in the ocean is anticipated to be between 0.5 to 2 hours based on the current impact area. The recovery crew would use multiple tracking methods to locate Talon-A's impact in the water during the approach. This may include one or more of the following:

- Open communication with the MCC and Carrier Aircraft;
- Visual tracking;
- Electro-Optical/Infrared sensors;
- Transmitting locator beacons; or
- Up to 25 lbs of colored dye solution, which would be included with water in the simulated Jet-A tank.

Stratolaunch intends to recover as much floating debris as possible. The recovery vessel would be appropriately sized to recover the full Talon-A system if needed. It is anticipated that the large fuselage section, as well as possible small pieces of the composite structure, may remain buoyant long enough for the vessel to approach and recover. Once the Talon-A is located, the recovery team would approach and perform an initial assessment of the debris and determine whether it is safe to attempt a salvage. At this time, a decision would be made to recover the large fragments or sink them by puncturing the applicable sections. It should be noted that Stratolaunch prefers to recover the Talon-A for post-test inspection. However, conditions may arise that prevent recovery efforts from being performed or that cause recovery efforts to be unsuccessful. Factors impacting the decision to attempt recovery are detailed below:

- The fragment's structural integrity may be poor enough to pose a risk to the safety of the personnel performing the lift.
- Ocean state/weather may impact a safe recovery effort.
- Time of day and ability to perform operations during daylight hours.

- Any reason the captain of the boat would determine as unsafe for the recovery to occur.

An attempt would be made to recover the remaining small and negligible items that float. For the remainder of the day, the recovery vessel would conduct a sector search in the ocean, working outward from the primary impact point to find and recover any small and negligible debris associated with this action. The quantity and mass of unrecovered floating debris is expected to be less than 41 fragments at an approximate total mass of less than 15 lbs.

After recovery efforts are completed, the recovery vessel would transit to a predetermined commercial port, such as Santa Barbara, San Pedro, Port Hueneme, or Long Beach (would not include Vandenberg Harbor), for offloading of the recovered items related to this action for transport back to the MHV for post-test inspection. All recovered items would be weighed to determine the approximate total weight of items not recovered.

2.4.6 Expendable Talon-A Hypersonic Flight

The Stratolaunch Talon-A launch system would perform hypersonic flight tests as part of this action with the expendable Talon-A vehicle impacting the Pacific Ocean off the coast of VSFB. Up to two expendable Talon-A hypersonic test flights would occur over the course of 12 months, typically spaced 6 months apart. The Talon-A would be released from the Carrier Aircraft and engines would be ignited, and a flight profile would be executed to generate hypersonic speeds. Similar to the separation test described above, Talon-A release conditions from the Carrier Aircraft would be from approximately 15,000 to 45,000 ft (4,572 to 13,716 m) at 400 +/- 100 mph (179 +/- 45 m/s). Radiofrequency telemetry emitted from the Talon-A vehicle antennas in flight would be the primary data source. The telemetry would be received by ground-based telemetry receivers and would subsequently be relayed to the MCC via commercial network traffic routes. The test vehicle would be equipped with a flight safety system that includes live ordnance. Live ordnance would be used to initiate flight termination if needed for public safety. Only a very small quantity (a few grams) of ordnance would be included and strategically placed on the nose of the aircraft. Guidance and navigation would be supported by onboard systems in addition to avionics, transmitters, and batteries. The test vehicle would use Jet-A and LOX for propellant. Most of the propellants would be used during flight. However, up to 200 lbs of residual propellant would remain in the tanks upon ocean impact with the potential to be released into the ocean if the tanks are compromised during water impact. Specifically, the residual amounts of oxidizer and fuel would be up to 136 lbs (14.3 gallons) of LOX and 62 lbs (9.3 gallons) of Jet-A, respectively.

Conceptual operations for this action are listed below:

- Pre-Flight Ground operations at MHV.
- Carrier Aircraft transit.
- The Talon-A and Carrier Aircraft mated system maneuvers to the selected release location while accomplishing required system and Range Safety checks.
- When cleared, the Talon-A is released from the Carrier Aircraft.
- The Talon-A is released and conducts a powered flight trajectory, reaching hypersonic speeds.
- After main engine cutoff, the Talon-A vehicle would decelerate and execute an unpowered glide to the planned impact point.
- The Talon-A would make an approach to land at the planned water impact point at a minimum of 14 nm (26 km) off the coast of VSFB.
- Recovery operations for the Talon-A are initiated (detailed below).

Like the captive carry test, the expendable Talon-A hypersonic test flight may require the temporary staging and operation of a mobile communications trailer on a previously disturbed or developed site. The same staging requirements and energy use described above for the captive carry test would be required for the expendable hypersonic test flight.

2.4.7 Recovery of Expendable Talon-A Hypersonic Test Vehicle

The expendable Talon-A would impact the ocean within the proposed ocean impact area shown on Figure 2-3, between 14 nm (26 km) from the coast (including islands) and the extent of Warning Areas W532, W537, and W289. The Talon-A test vehicle, upon strike of the ocean surface, would impact up to 4,000 ft^2 (372 m^2). This area was determined by assuming a 20-degree impact angle at a speed of approximately 134 mph (60 m/s). The Talon-A vehicle is anticipated to remain intact after water impact. However, it is possible that the vehicle would break up into the following pieces:

- Wings (2 fragments, anticipated to float);
- Nose (1 fragment, anticipated to sink); and
- Fuselage (1 fragment, anticipated to float).

Recovered Floating Debris

Recovery of the expendable Talon-A hypersonic test vehicle would be identical to the recovery of the Talon-A test article as described above. A recovery vessel would be positioned close to the Talon-A splashdown location, and the entire Talon-A test vehicle would be recovered, if possible. In the event of vehicle breakup after ocean impact, as much floating debris would be recovered as possible. All ocean impact and recovery actions would occur during daylight hours. After recovery efforts are completed, the recovery vessel would transit to a predetermined commercial port for offloading of the recovered items for transport back to the MHV for post-test inspection. All recovered items would be weighed to determine the approximate total weight of items not recovered.

2.4.8 Talon-A Glide Flights

Stratolaunch would validate flight system capabilities of the Talon-A prior to powered flight operations that would land on a runway. Stratolaunch may conduct multiple unpowered glide flights with the Talon-A vehicle to achieve this milestone. The Talon-A would be mated to the Carrier Aircraft and take off from MHV. The Talon-A vehicle would be released from the Carrier Aircraft off the California coastline at a speed and altitude necessary to execute a successful approach to landing on VSFB Runway 12-30. The Carrier Aircraft would return to MHV after the Talon-A is released. If the first glide test is unsuccessful, additional glide tests would be required to meet this milestone.

Standard propellants (LOX and Jet-A) would be used for glide flights. However, the motor would remain off, and a maximum of 2,760 lbs (290.2 gallons) of LOX and 1,280 lbs (192 gallons) of Jet-A would be dumped at or above 5,000 ft (1,524 m) above ground level (AGL) while descending. Between 60 and 200 lbs of residual propellant would remain in the tanks upon runway landing. Since the Talon-A vehicle would not be powered during the glide flights, live ordnance would not be included on the vehicle during these tests.

Conceptual operations for this Proposed Project are listed below:

- Pre-flight ground operations at MHV.
- Carrier Aircraft transit.
- The Talon-A and Carrier Aircraft mated system maneuvers to the selected release location while accomplishing required system and Range Safety checks.

- When cleared, the Talon-A is released from the Carrier Aircraft.
- The Talon-A is released and conducts approach and landing maneuvers.
- The propellants are dumped while descending.
- The Talon-A would make an approach to land at the VSFB runway. The Talon-A is estimated to be above 5,000 ft (1,524 m) AGL when crossing the beach west of the approach end of the runway, which is above the minimum requirement of 1,900 ft (579 m) AGL over Purisima Point.
- After landing, Stratolaunch would conduct post-flight ground operations.

Like the captive carry test, the Talon-A glide flights may require the temporary staging and operation of a mobile communications trailer on a previously disturbed or developed site. The same staging requirements and energy use described above for the captive carry test would be required for the Talon-A glide flights.

2.4.9 Reusable Talon-A Launch Operations over BOA with Runway Landings

Stratolaunch desires to operate a reusable Talon-A vehicle for various trajectories over the BOA (Figure 2-4) off the coast of central and southern California with runway landings at VSFB Runway 12-30. Stratolaunch would regularly perform flights off the coast, including up to weekly events. The number of flights would be relatively infrequent at first but would pick up frequency as operations increase. All flights over Mach 1 would be a minimum of 30 nm (56 km) away from the coast to ensure sonic boom levels are below 1 psf to the Channel Islands or California coastline. The estimated general schedule of flights is as follows (the term "launch" in the list below is defined as an event that would release the Talon-A from the Carrier Aircraft, have the Talon-A conduct a powered flight trajectory reaching hypersonic speeds, and generate a sonic boom):

- Year 1 (2022) – two launches (six or more total including non-launch events)
- Year 2 – four launches (12 or more total including non-launch events)
- Year 3 – 20 launches (30 or more total including non-launch events)
- Year 4 – 40 launches
- Year 5 – 52 launches

The Talon-A would use Jet-A for fuel and LOX for oxidizer during these operations over the BOA. Most of the propellants would be used during flight; however, between 60 and 200 lbs of residual propellant would remain in the tanks upon runway landing. The Talon-A vehicle would be equipped with a flight safety system that includes live ordnance.

Conceptual operations for this Proposed Project are listed below:

- Pre-flight ground operations at MHV.
- Carrier Aircraft transit.
- The Talon-A and Carrier Aircraft mated system maneuvers to the selected release location while accomplishing required system and Range Safety checks.
- When cleared, the Talon-A is released from the Carrier Aircraft.
- The Talon-A is released and conducts a powered flight trajectory, reaching hypersonic speeds.
- After main engine cutoff, the Talon-A vehicle would decelerate and execute an unpowered glide to the VSFB runway. The Talon-A is estimated to be above 5,000 ft (1,524 m) AGL when crossing the beach west of the approach end of the runway, which is above the minimum requirement of 1,900 ft (579 m) AGL over Purisima Point.
- After landing, Stratolaunch would conduct post-flight ground operations.

Like the captive carry test, Talon-A launch operations may require the temporary staging and operation of a mobile communications trailer on a previously disturbed or developed site. The same staging requirements and energy use described above for the captive carry test would be required for launch operations.

2.4.10 Alternate Landing at SNI Runway

It is anticipated that high-valued flight assets or vehicle configurations may require an alternate landing option for certain missions. Alternate landings are anticipated to be unlikely with a frequency of no more than three per year. These missions would require an approach from the south heading north to the VSFB coastline. It is anticipated that the Talon-A would land at the VSFB runway. However, the Talon-A release point would allow for an unpowered glide flight to SNI in the event of an engine-out scenario early in the flight profile. SNI maintains a 10,000 ft (3,048 m) concrete and asphalt runway that can accommodate an aircraft the size of a Lockheed C-5A Galaxy. Other island facilities include radar tracking instrumentation, electro optical devices, telemetry, communications equipment, missile and target launch areas, and personnel support. In both scenarios, most of the propellants would be used or dumped during flight; however, between 60 and 200 lbs of residual propellant would remain in the tanks upon runway landing. The Talon-A vehicle would be equipped with a flight safety system that includes live ordnance.

In accordance with the Point Mugu Sea Range-Safety, Airfields Operations requirements, Stratolaunch would develop and follow an Operations Plan that would include coordination required to deconflict the airfield with other users, as well as possible runway closures for short periods of time.

Conceptual operations for this Proposed Project are listed below:

- Pre-flight ground operations at MHV.
- Carrier Aircraft transit.
- The Talon-A and Carrier Aircraft mated system maneuvers to the selected release location while accomplishing required system and Range Safety checks.
- When cleared, the Talon-A is released from the Carrier Aircraft. In a normal trajectory, the flight would perform as expected and the Talon-A would land on VSFB's runway.
- However, during an engine-out scenario, the Talon-A is released but fails to ignite the rocket motor. In this scenario, the Talon-A would dump propellants and make an approach to land at the SNI runway.
- After landing, trained Stratolaunch and/or government personnel would conduct post-flight ground operations.

2.4.11 Post-flight Activities at VSFB, SNI, and MHV

2.4.11.1 Post-flight Activities at VSFB and SNI for the Talon-A

Post-flight ground operations encompass everything performed at the runway after landing related to the Talon-A vehicle testing and operations. This event covers ground operations at VSFB in addition to SNI; additional requirements for SNI are covered at the end of this section. Immediately after landing and once the Talon-A comes to a stop on the primary runway, the vehicle would commence safing steps to allow personnel to approach. Safing of the Talon-A includes venting LOX and reducing pressures inside pressure vessels that may not be safe for operational personnel. In addition, safing pins would be installed in all applicable ordnance per USSF Range Safety and FAA protocols. Once all safing of the Talon-A is complete, the vehicle would be towed to an apron or staging area determined by the flightline controller. Once safely off the runway, the Talon-A would undergo numerous non-hazardous procedures to ready it for transport, including draining and capture of the residual Jet-A into DOT-compliant waste

containers. The Talon-A would be lifted onto a flatbed, secured, and readied for transport back to MHV for processing for subsequent missions, testing, or storage, as determined by Stratolaunch.

Ground operations on SNI would be performed as described above for VSFB but would include shipping of the Talon-A and any residual Jet-A fuel off the Island via the harbor and transport barge to Port Hueneme. In the case of an alternate landing at SNI, residual amounts of oxidizer and fuel would be up to 136 lbs (14.3 gallons) of LOX and 62 lbs (9.3 gallons) of Jet-A, respectively. An Inter-Service Agreement between the USSF and Commander, Navy Region Southwest (CNRSW) would be established to manage storage and shipment of the Talon-A and residual fuel via barge. Alternatively, contracted sealift or airlift services may be used to provide expedited vehicle removal. Stratolaunch would reclaim the Talon-A and DOT-compliant container of Jet-A at Port Hueneme. Stratolaunch would contract out the transportation of hazardous waste off-base and to a certified hazardous waste facility. The Talon-A would be transported back to MHV on a flatbed truck.

2.4.11.2 Post-flight Activities at MHV for the Carrier Aircraft

The Carrier Aircraft would return to MHV after completing the launch mission. For nominal missions, no hazardous post-flight ground operations would be required to return the Carrier Aircraft to safe conditions. The Carrier Aircraft would land on Runway 12-30 at MHV and come to a full-stop. Ground personnel would tow the aircraft clear of the runway and back to the Stratolaunch hangar via back-taxi and the existing taxiways such as Taxiway J. MHV anticipates restricting Runway 12-30 during landing operations. However, Runways 8-26 and 4-22 would remain open during these activities with the NFCT sequencing movement area operations. No infrastructure modification at MHV would be required for landing or taxi operations.

For scrubbed launches, or mission events that are stopped prior to completion for a variety of reasons, the Talon-A would remain attached to the Carrier Aircraft, and the combined launch system would return to MHV in the same manner as described for the nominal mission. Talon-A's propellant would be dumped prior to landing. Upon return, the integrated launch system would taxi to the Stratolaunch hangar, the system would be safed, and the Talon-A would be demated from the Carrier Aircraft, if necessary, before the next launch attempt. In accordance with the MHV LSOL, any hazardous post-flight ground operations would take place in a specified location that has established appropriate safety clear zones. These activities would occur within the MHV modified site license boundary on the aircraft parking apron outside the Stratolaunch hangar, as well as inside the hangar.

2.5 NO ACTION ALTERNATIVE

Pursuant to 40 CFR § 1502.14(c), the No Action alternative must be considered. The No Action Alternative is used for comparative analysis of the potential impacts of the Proposed Project. Under the No Action Alternative, the FAA would not issue a Vehicle Operator License to Stratolaunch to conduct licensed operations, and FAA would not enter into a LOA for the proposed closure of airspace for Talon-A launch activities and operations because the proposed testing and operations of the Talon-A hypersonic research testbed vehicle would not be conducted. While the No Action Alternative does not meet the Proposed Action's purpose and need, it has been retained for detailed analysis under 40 CFR § 1502.14(c) for comparison purposes with the Proposed Action.

Under the No Action Alternative, Stratolaunch's testing and operations of the Talon-A hypersonic research testbed vehicle would not be performed. This would not allow Stratolaunch to achieve its goal of testing hypersonic capabilities for the future development of hypersonic technologies and warfare capabilities. Therefore, Stratolaunch would not meet the DoD's goal to prototype,

demonstrate, test, and field warfighting capability more quickly utilizing a cost effective and reusable flight vehicle model. Therefore, the No Action Alternative is not preferred.

2.6 ENVIRONMENTAL PROTECTION MEASURES

Environmental protection measures (EPMs) would be implemented as part of the Proposed Project to avoid or minimize potential adverse effects to various environmental resources. Mandatory EPMs (denoted by "shall" or "would") are part of the project design and would be implemented as part of the Proposed Project so as to avoid, minimize, reduce or compensate for the anticipated potential environmental impacts. Discretionary measures (denoted by "may" or "could") may or may not be implemented to further reduce potential environmental impacts. Implementation of all measures would be overseen by qualified Stratolaunch personnel or contractor staff. Should Stratolaunch fail to follow these EPMs, further assessment of Stratolaunch's activities may be required.

2.6.1 Biological Resources

The following measures would be implemented to minimize the potential for adverse impacts to biological resources:

- Vessels 65-ft (20-m) long or longer will comply with the Right Whale Ship Strike Reduction Rule (50 CFR § 224.105), including reducing speeds to 10 knots or less in Seasonal Management Areas.
- Communication media, such as the National Oceanic and Atmospheric Administration weather radio, U.S. Coast Guard Navigational Telex broadcasts, and NOTMAR, will be checked by vessel operators for relevant information related to vessel operations.
- Trained personnel/lookout would watch for marine wildlife during vessel operations. If an Endangered Species Act (ESA)-listed species is observed during vessel operations, operators will attempt to remain parallel to the animal's course and avoid excessive speed or abrupt changes in direction until the animal(s) has left the area.
- Vessel operators will reduce speed to 10 knots or less when mother/calf pairs or groups of ESA-listed marine mammals are observed.
- Stratolaunch will report any interactions with ESA-listed species to the USSF Conservation Chief and Natural Resources Lead (30 CES/CEI).
- The USSF will immediately report any collision(s) with and/or injury to any protected species in the Pacific Ocean to NMFS West Coast Region Office.
- The USSF will also report stranded, injured, or dead sea turtles or marine mammals to the NMFS West Coast Region Stranding Hotline (866-767-6114).
- All recovered items would be weighed to determine the approximate total weight of items not recovered. For every 3 lbs of unrecovered debris, a compensatory donation to the California Lost Fishing Gear Recovery Program will be made sufficient to recover 1 lb of lost gear. The specific donation ratio (3:1) may be adjusted based on coordination with NMFS.
- The Talon-A will have an estimated maximum weight of 2,300 lbs at the time of each test flight. Based on the Talon-A maximum weight and a compensatory donation of $7.50/lb to recover 1 lb of lost gear for every 3 lbs of unrecovered debris, the maximum donation Stratolaunch may be obligated to pay for any unrecovered debris for all four test flights will be no more than $23,000.
- Stratolaunch's quality control program will conduct pre-flight inspections to ensure that foreign debris, including potential invasive species, are not present on the Talon-A.

2.6.2 Hazardous Materials and Waste

The following measures would be implemented to minimize the potential for adverse impacts to hazardous materials and waste:

- All planned aircraft and equipment fueling (including mobile communications trailers) would occur on impervious surfaces.
- All planned Talon-A defueling would occur on impervious surfaces at VSFB or SNI. Hazardous waste from defueling on SNI would be collected and stored in a 50 gallon drum located on the flightline that is dedicated to offloading fuel from the Talon-A. All hazardous waste collection and storage on SNI would be coordinated with the NBVC Hazardous Waste Program Manager and eventually transported off the Island in accordance with the 2020 NBVC Hazardous Waste Management Plan.
- Appropriate emergency response plans would be prepared for Talon-A post flight operations in coordination with VSFB and SNI airfield operations offices. The NBVC Environmental Division shall review the response plans.

2.6.3 Occupational Safety and Health

The following measures would be implemented to minimize the potential for adverse impacts on occupational safety and health:

- Stratolaunch would prepare and implement a Site-Specific Health and Safety Plan for VSFB and SNI.
- Stratolaunch would appoint a qualified safety officer as a point of contact for all applicable tasks.
- Stratolaunch and subcontractors would comply with the federal Occupational Safety and Health Administration (OSHA) standards.
- All safety precautions operations and evacuation procedures for operations conducted within the Western Missile Test Range would be followed per Space Launch Vehicle Flight Hazard Zone requirements.
- The FAA would oversee installation of ordnance related to FTS occurring prior to applicable missions with live ordnances.
- Stratolaunch shall ensure that their personnel and subcontractors receive formal safety, fire prevention, and occupational health orientation and training. Unique personnel training shall be provided for hazardous operations such as ordnance operations.
- Personal protective equipment (PPE) shall be compatible with the hazardous materials involved. PPE for propellant handling and ordnance operations shall be subject to approval by DAF Wing Safety.
- Stratolaunch would complete a Preliminary Flight Data Package for review and approval by Space Launch Delta 30, Chief of Safety (SLD 30/SE) prior to each launch that includes activities at VSFB to ensure compliance with all applicable health and safety rules and regulations.
- Coordination with SLD 30/SE, FAA, and the DoN (i.e., NBVC for alternate landings at SNI) would be required to implement Launch Plans, which include potential launch anomaly and debris control plans in order to protect the general public and nearby support personnel during launch anomalies and emergencies.
- Marine vessels in the vicinity of the BOA would be notified of operations by the NOTMAR.

2.6.4 Noise

The following measures would be implemented to minimize the potential for adverse impacts to noise:

- Flights, testing, and heavy equipment use would primarily occur during normal weekday business hours.
- Mufflers on recovery vehicles and other heavy equipment would be properly maintained and in good working order.
- Personnel would use adequate personal hearing protection to limit exposure and ensure compliance with federal health and safety regulations.

2.6.5 Solid Waste Management

The following measures would be implemented to minimize the potential for adverse impacts to solid waste management:

- Solid waste would be minimized through source reduction, reuse, and recycling to the extent practical.
- All materials that are disposed of off-base from VSFB would be reported to the Space Launch Delta 30, Installation Flight (SLD 30/CEI) Solid Waste Manager.
- Any excess soil generated during construction would be diverted to the extent practical from disposal at a landfill.

2.6.6 Transportation

The following measures would be implemented to minimize the potential for adverse impacts to transportation:

- Stratolaunch would coordinate with California Department of Transportation (Caltrans) and the California Highway Patrol (CHP) when necessary for the transportation of recovered materials to MHV.
- Warning signs, cones, and flaggers would be provided when necessary to warn roadway users of truck crossings, and to control traffic flow if necessary.
- Vehicles accessing Stratolaunch would primarily enter Airport Boulevard from SR58 nearest to Riccomini Street.

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3.0 AFFECTED ENVIRONMENT

This section describes the existing environment near and within the study area for the Proposed Action and the No Action Alternative. In addition to the USSF's environmental review policies and procedures, this EA considers the FAA's NEPA-implementing policy, FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, and FAA Order 1050.1F Desk Reference[7] so that the FAA can adopt, fully or in part[8], the EA when conducting its environmental review of a license application and airspace closures for Talon-A launches. FAA Order 1050.1F contains a list of environmental "impact categories" that the FAA must consider in its environmental reviews. The resources identified for analysis in this EA, which include the requirements of FAA Order 1050.1F, include air quality, climate, biological resources, hazardous materials and waste management, occupational safety and health, noise, socioeconomics, solid waste management, transportation, and water resources. This chapter describes the existing conditions and resources within the geographic area that could potentially be directly or indirectly affected by the implementation of the Proposed Project. The President's CEQ regulations define direct effects as those "which are caused by the action and occur at the same time and place.[9]" Indirect effects are defined by CEQ regulations as those "…which are caused by the action and are later in time and farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems.[10]"

This EA examines the following locations potentially affected by the Proposed Project: MHV, VSFB, the proposed ocean impact area for the separation and hypersonic flight tests, the BOA, and SNI. MHV is where the Carrier Aircraft and safety chase plane would take off and land. VSFB is where runway landings of the reusable Talon-A would occur. The proposed ocean impact area for the separation and hypersonic flight tests is within the Western Missile Test Range managed by the SLD 30. Figure 2-2 depicts the proposed operational and ocean impact area for the Talon-A separation test. Figure 2-3 shows the proposed operational and ocean impact area for the expendable Talon-A hypersonic flight test. The separation and hypersonic flight tests are the only aspects of the Proposed Project that would land in the ocean. The BOA is defined as an expanse of open ocean area of the Pacific encompassed by the extent shown in Figure 1-2. SNI is an alternate landing site for a Talon-A runway landing in the event of an engine-out scenario early in the flight profile.

The following resources were considered but not analyzed in detail in this EA:

- ***Environmental Justice.*** EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires all federal agencies to adopt strategies to address environmental justice concerns within the context of agency

[7] U.S. Department of Transportation, Federal Aviation Administration – Office of Environment and Energy, 1050.1F Desk Reference, Version 2, February 2020: Available: https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order/desk_ref/

[8] The FAA's authority with respect to the Proposed Action is licensing commercial launches of the Talon-A. The FAA does not have authority with respect to the non-powered launches proposed in this EA. The FAA's other federal action would be to temporarily close airspace to ensure safety of operations.

[9] President's CEQ Regulations 40 CFR Section 1508.8(a).

[10] President's CEQ Regulations 40 CFR Section 1508.8(b).

operations. Environmental Impact Analysis Process (EIAP), as promulgated in Title 32 CFR Part 989, requires that a project proponent comply with EO 12898 to ensure that these types of impacts are considered in EAs and other environmental documents. As defined in DOT Order 5610.2(a), the Proposed Project would not result in a disproportionately high and adverse impact on minority or low-income populations (FAA 2020). The Proposed Project would occur in an unpopulated area of VSFB, MHV, and/or SNI, and potential environmental impacts with the exception of noise would not extend into populated areas. Noise impacts would be of short duration and would be consistent with the existing noise environment. For example, the Carrier Aircraft would operate from the existing MHV runway. In addition, Talon-A flight operations would occur over the Pacific Ocean. Sonic booms that may occur over land would be less than 1 psf, which is less than that of a thunderclap (approximately 1 psf), and would not impact humans; therefore, there would be no impacts to predominantly minority or low-income populations.

- ***Cultural Resources.*** The Proposed Project, known as an undertaking per Section 106 of NHPA, would not require any construction or ground disturbance. Therefore, there would be no disturbance to archaeological resources. The Proposed Project includes the potential for a sonic boom to hit the California coastline and/or Northern Channel Islands (NCI) at levels less than 1 psf. These sonic booms would be of short duration, would not cause structural damage, and would not have the potential to affect historic properties. Similarly, the noise associated with the Proposed Project would not exceed 120 dB and would be consistent with the existing noise conditions at MHV, VSFB, and SNI; therefore, noise vibrations would not have the potential to affect historic properties. The very low number of Chase Aircraft operations included in the Proposed Project would not disturb cultural resources on the surface as a result of overflight noise. The Chase Aircraft would only be used to support the launch system and would remain in formation with the Carrier Aircraft. Overall, the Proposed Project does not have the potential to affect historical, architectural, archaeological, or other cultural resources. Therefore, there are no further obligations for consultation with the California State Historic Preservation Officer by the USSF, FAA, or DoN under Section 106 of the NHPA of 1966, as amended.
- ***Geology and Earth Resources.*** The Proposed Project would not have any ground disturbance; therefore, the Proposed Project would not result in substantially increased soil erosion or increase the likelihood of strong seismic activity. No further analysis is required.
- ***Land Use, Aesthetics, and Visual Effects.*** The Proposed Project would not change the existing or planned land use of MHV, VSFB, or SNI. Carrier Aircraft operations would take off from an existing runway at MHV and the reusable Talon-A vehicle would land on an existing runway at VSFB or SNI. The Proposed Project would conform to the existing designated land uses. Similarly, the pre-flight and post-flight activities would not differ visually from those activities already occurring at MHV, VSFB, or SNI. Therefore, no further analysis is required.
- ***Recreation/DOT Act Section 4(f) Resources.*** The Proposed Project would not significantly restrict public access to the beach or other recreation areas. Per FAA Order 1050.1F, Exhibit 4-1, resources that are protected by Section 4(f) are publicly owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance; and publicly or privately owned land from an historic site of national, state, or local significance. Section 4(f) resources considered include Jalama Beach County Park, Surf Beach, County of Santa Barbara Ocean Beach Park, Wall Beach, Miguelito Park, Rancho Guadalupe Dunes County Park, Point Sal Beach State Park, Gaviota Beach State Park, and Channel Islands National Park. The FAA's action of issuing Stratolaunch a license and closing airspace would not result in a physical taking,

adverse temporary occupancy, or constructive use of DOT Act Section 4(F) resources. The launch system also has the potential to overfly the following areas, depending on the specific mission objectives: Death Valley National Park, John Muir Wilderness, Domeland Wilderness, Sequoia National Park, Kings Canyon National Park, Bitter Creek National Wildlife Area, Carrizo Plain National Monument, and San Rafael Wilderness Area (Figure 2-7). Stratolaunch plans to transit between Mojave and the coast at altitudes greater than 15,000 ft (4,572 m) above mean sea level except when climbing or descending into Mojave's Class D airspace and would never plan to operate the Carrier Aircraft below 2,000 ft (610 m) AGL over these areas. No further analysis is required.

- ***Utilities.*** The Proposed Project would use existing utilities and would not require additional sources of power or other public utilities. Therefore, no further analysis is required.
- ***Coastal Zone Management/Resources.*** The Proposed Project would occur on existing runways at MHV VSFB, and SNI, and operations would occur over the open ocean at an altitude of 15,000 to 45,000 ft (4,572 to 13,716 m). MHV is located outside of the California Coastal Zone and is approximately 71 miles (114 km) from the coast. Operations would take place outside of the coastal zone as defined by the CZMA. No direct or indirect effects to the coastal zone would occur from the recovery efforts of floating debris after the two separation and two expendable Talon-A hypersonic flight tests. Other debris is anticipated to sink and would not impact the coastal zone. In the event that the fuselage ruptures on ocean impact during these four tests, Jet-A and dye solution would be released into the ocean. However, the dye would dissolve in water and Jet-A would evaporate or naturally disperse within a day or less. Therefore, the release of dye and propellant into the ocean during these four tests would not significantly impact the coastal zone. On 1 March 2022, the CCC concurred with the USSF's determination that no further consultation under the CZMA was required (see Appendix A). Therefore, no further analysis is required.
- ***Children's Environmental Health and Safety Risks*.** The Proposed Project would not disproportionately affect children within the affected environment. The Proposed Project would occur within unpopulated areas near MHV, VSFB, and SNI, and potential environmental impacts with the exception of noise would not extend into populated areas. Mojave Elementary and Mojave Junior/Senior High School, which enroll approximately 775 students (Public School Review 2022), are located less than 1,000 ft (305 m) from the boundary of MHV property but over 5,000 ft (1,524 m) from the major runway on MHV. Given the location of the takeoff and landing sites, the existing noise environment, and the temporary nature of increased noise levels during operations, no further analysis is required.
- ***Natural Resources and Energy Supply*.** The Proposed Project would not have a measurable effect on natural resources, as defined by the FAA Order 1050.1F Desk Reference (FAA 2020), such as water, asphalt, aggregate, or wood. Aircraft and marine vessels in the vicinity of the AHA and Ship Hazard Area may need to re-route if abiding by the NOTAM and NOTMAR. Potential impacts of aircraft and marine vessel re-routing would be temporary and coordinated in advance and would result in a negligible increase in fuel expenditure. Therefore, no further analysis is required.
- ***Farmlands*.** The Proposed Project would not convert agricultural land on MHV, VSFB, or SNI to other uses and would not result in a decrease in agricultural productivity. The Proposed Project does not include construction or ground disturbance and there is no prime or unique farmland at MHV. Therefore, the Proposed Project would not impact farmlands.

- ***Visual Effects, Light Emissions, and Visual Resources/Visual Character.*** Exhibit 4-1 FAA Order 1050.1F states that the FAA has not established significant thresholds for Light Emissions and Visual Resources/Visual Character. The Proposed Project does not involve construction at MHV, VSFB, or SNI. The Proposed Project would not create an annoyance or interfere with normal activities due to light emissions or change the visual character of the area around any of the three airfields. While flights of the Carrier Aircraft and Chase Aircraft would originate at MHV, the hypersonic flight of the Talon-A would occur over the Pacific Ocean. The Proposed Project would not affect the visual character of the area, contrast with visual resources, or block/obstruct views of visual resources from other locations.
- ***Wetlands, Floodplains, and Wild and Scenic Rivers*.** The Proposed Project would not impact any undisturbed areas and therefore would not affect wetlands, floodplains, or any water features. There are no wild and scenic rivers within the affected environment. The nearest wild and scenic rivers from the Stratolaunch hangar on MHV are approximately 45 miles to the southwest (Piru Creek) and 47 miles to the north (Kern River). Therefore, the Proposed Project would not affect wild and scenic rivers.

3.1 AIR QUALITY

3.1.1 Definition of the Resource

Air quality in a given location is defined by the concentration of various pollutants in the atmosphere. The interaction of the following three factors affect the concentrations of these pollutants: the physical characteristics of the air basin, the prevailing meteorological conditions within the air basin, and the amount of pollution emitted into the atmosphere. The interrelationship of these factors determines the measurable concentration of pollutants in the atmosphere. By comparing a pollutant concentration in the atmosphere to federal and/or state ambient air quality standards, the United States Environmental Protection Agency (USEPA) and/or state agencies can assess and determine attainment of the air quality in a region.

Pursuant to the Clean Air Act Amendments of 1990 (CAA), the USEPA has established National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. The NAAQS are classified as primary and secondary standards. Primary standards prescribe the maximum permissible concentration in the ambient air and are required to protect public health. Secondary standards specify levels of air quality required to protect public welfare, including materials, soils, vegetation, and wildlife, from any known or anticipated adverse effects. NAAQS are established for six pollutants (known as criteria pollutants): ozone (O_3), particle pollution (i.e., respirable particulate matter less than 10 microns in diameter [PM_{10}] and respirable particulate matter less than 2.5 microns in diameter [$PM_{2.5}$]), carbon monoxide (CO), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and lead (Pb).

The USEPA classifies air quality within each Air Quality Control Region with regard to its attainment of the NAAQS. According to USEPA guidelines, an area with air quality concentration less than the NAAQS for a specific pollutant is designated as being in attainment of the NAAQS for that pollutant. Any area exceeding the ambient air quality standards is classified as a nonattainment area. Where there is a lack of data for the USEPA to make a determination regarding attainment or nonattainment, the area is designated as unclassified and is treated as an attainment area until proven otherwise.

A summary of NAAQS and California Ambient Air Quality Standards (CAAQS) is presented in Table 3-1.

Table 3-1. National and California Ambient Air Quality Standards

Pollutant	Averaging Periods	CAAQS	NAAQS	
			Primary	Secondary
Ozone (O_3)	1 Hour	0.09 ppm (180 µg/m³)	N/A	N/A
	8 Hour	0.070 ppm (137 µg/m³)	0.070 ppm (137 µg/m³)	Same as Primary Standard
Particulate Matter (PM_{10})[7]	24 Hour	20 µg/m³	N/A	N/A
	Annual Arithmetic Mean	50 µg/m³	150 µg/m³	Same as Primary Standard
Fine Particulate Matter ($PM_{2.5}$)	24 Hour	N/A	35 µg/m³	Same as Primary Standard
	Annual Arithmetic Mean	12 µg/m³	12.0 µg/m³	15 µg/m³
Carbon Monoxide (CO)	1 Hour	20 ppm (23 mg/m³)	35 ppm	N/A
	8 Hour	N/A	9 ppm (10 mg/m³)	N/A
Nitrogen Dioxide (NO_2)	1 Hour	0.18 ppm (339 µg/m³)	100 ppb (188 µg/m³)	N/A
	Annual Arithmetic Mean	0.030 ppm (57 µg/m³)	0.053 ppm (100 µg/m³)	Same as Primary Standard
Sulfur Dioxide (SO_2)	1 Hour	0.25 ppm (655 µg/m³)	75 ppb (106 µg/m³)	N/A
	3 Hour	N/A	N/A	0.5 ppm (1,300 µg/m³)
	24 Hour	0.04 ppm (105 µg/m³)	N/A	N/A
Lead	30-Day Average	1.5 µg/m³	N/A	N/A
	Calendar Quarter	N/A	1.5 µg/m³ (for certain areas)	Same as Primary Standard
	Rolling 3-Month Average		N/A	0.15 µg/m³ / Same as Primary Standard
Visibility Reducing Particles	8 Hour	Extinction of 0.23 per km	No National Standards	
Sulfates	24 Hour	25 µg/m³		
Hydrogen Sulfide	1 Hour	0.03 ppm (42 µg/m³)		
Vinyl Chloride	24 Hour	0.01 ppm (26 µg/m³)		

Sources: CARB 2016 and USEPA 2021a.

Notes: µg = microgram, mg = milligram, ppm = parts per million, m³ = cubic meter, ppb = parts per billion, km = kilometer, N/A = not applicable.

3.1.2 Regulatory Review

A designation of attainment/maintenance means that the pollutant is currently in attainment (i.e., meets the NAAQS) and that measures are included in the State Implementation Plan (SIP) to ensure that the NAAQS for that pollutant are not exceeded again (i.e., are maintained). The

federal CAA requires that states develop SIPs stating how they will attain or maintain NAAQS. SIPs are a compilation of new and previously approved plans, programs, district rules, state regulations and federal controls. States and local air quality management agencies prepare SIPs for USEPA approval.

General Conformity is a key component of the CAA strategy intended to ensure federal actions are consistent with SIPs in achieving and maintaining the NAAQS. A Proposed Action consistency with General Conformity would ensure consistency with a state's SIP.

Section 176(c) of the federal CAA contains requirements that apply specifically to federal agency actions, including actions receiving federal funding. This section of the CAA requires federal agencies to ensure that their actions are consistent with the CAA. General conformity applicability pertaining to the Proposed Action is codified in 40 CFR Part 93.153(b).

Federal agencies are required to evaluate their proposed actions to ensure that they (1) do not cause or contribute to new violations of any federal ambient air quality standards, (2) do not increase the frequency or severity of any existing violations of federal ambient air quality standards, and (3) do not delay the timely attainment of federal ambient air quality standards. To this end, the USEPA General Conformity rule requires a formal conformity determination document for federally sponsored or funded actions in nonattainment or maintenance areas when the net increase in direct and indirect emissions of nonattainment or maintenance pollutants exceed specified *de minimis* thresholds.

A federal action is exempt from General Conformity requirements if the total emissions resulting from the action are equal to or less than the *de minimis* thresholds. Thus, the action's calculated emissions are compared against established *de minimis* emission levels based on the nonattainment status for each applicable criteria pollutant in the area of concern to determine the relevant compliance requirements.

Santa Barbara County is currently in attainment for all NAAQS (USEPA 2021b). Eastern Kern County is currently in attainment for all NAAQS except the 8-hour Ozone (Eastern Kern Air Pollution Control District [EKAPCD] 2021). Eastern Kern County is moderate nonattainment for the 8-hour Ozone. Table 3-2 defines the *de minimis* thresholds for nonattainment areas.

Table 3-2. *De Minimis* Thresholds in Nonattainment Areas

Pollutant	Degree of Non-attainment	*de minimis* Level (tpy)
Ozone	Serious	50
	Severe	25
	Extreme	10
	Marginal and Moderate (outside an ozone transport region)	100
	Marginal and Moderate (inside an ozone transport region)	50 (VOC)
		100 (NO_x)
Carbon monoxide	All	100
Particulate matter	Moderate	100
	Serious	70
SO_2 or NO_2	All	100
Lead	All	25

Notes: NO = nitrogen monoxide, NO_2 = nitrogen dioxide, NO_x = nitrogen oxides (NO and NO_2), SO_2 = sulfur dioxide, tpy = tons per year, VOC = volatile organic compound.

3.1.3 Regional Setting

To better manage air pollution on a regional basis, the state of California is divided into air basins, which are areas delineated based on similar geographical and meteorological features within their boundaries. Thus, air basins are delineated based on their potential for trapping air pollutants due to natural barriers such as mountains. Pollutants tend to stagnate unless dispersed into other areas by strong enough prevailing winds. Air basins are served by either county air pollution control districts or multi-county air quality management districts.

VSFB is within Santa Barbara County, which is part of the South Central Coast Air Basin (SCCAB). The SCCAB consists of Ventura, Santa Barbara, and San Luis Obispo Counties. The Santa Barbara County Air Pollution Control District (SBCAPCD) is responsible for regulating air pollution from all sources except mobile sources in Santa Barbara County. The SBCAPCD is also responsible for the attainment of federal and state standards within Santa Barbara County.

VSFB's climate is Mediterranean, or dry summer subtropical. The weather is cool and wet from November through April and warm and dry from May through October. The Pacific Ocean, which borders VSFB on the west and south, has a moderating effect on temperature fluctuations.

The portion of Santa Barbara County that would be affected by emissions from the Proposed Project generally includes VSFB and the surrounding portions of Santa Barbara County north of the Santa Ynez Mountains.

SNI is located in an unclassified air quality attainment area of Ventura County. Ventura County is within the jurisdiction of the Ventura County Air Pollution Control District (VCAPCD), which is responsible for air quality in Ventura County. Ventura County is currently in attainment for all NAAQS (VCAPCD 2022).

The MHV is in the eastern portion of Kern County. Eastern Kern County is located on the western edge of the Mojave Desert and is separated from populated valleys and coastal areas to the west and south by several mountain ranges. These valleys and coastal areas contain the major source of ozone precursor emissions affecting ozone exceedances within Kern County's part of the Mojave Desert Air Basin (MDAB). The Eastern Kern County region is largely impacted by ozone transport from both the San Joaquin Valley Air Basin and the South Coast Air Basin. Elevated levels of particulate matter are primarily associated with fugitive dust, which is produced through a combination of high winds, dry soil conditions resulting from an arid climate, and ground-disturbing activities such as mining, agriculture, and construction. The Eastern Kern County Air Pollution District is responsible for regulating air pollution from all sources except mobile sources and also responsible for the attainment of federal and state standards within Eastern Kern County.

MHV is within the Eastern Kern County, which is part of the MDAB. The MDAB consists of sections of Kern, Los Angeles, San Bernardino and Riverside Counties. MHV is under the jurisdiction of the EKAPCD, which is responsible for local air quality. Pollutant concentrations within the Eastern Kern County are assessed relative to the NAAQS. Eastern Kern County is currently in attainment for all NAAQS except 8-hour Ozone (EKAPCD 2021).

3.1.4 Affected Environment

The affected environment for air quality requires knowledge of the type of pollutant, emission rates of the pollutant source, proximity to other emission sources, and local and regional meteorology. For inert pollutants (all pollutants other than O_3 and its precursors), the affected environment is generally limited to a few miles downwind from the source. However, for photochemical pollutants such as O_3, the affected environment may extend much farther downwind. O_3 is a secondary pollutant formed in the atmosphere by photochemical reactions of previously emitted pollutants, or precursors (reactive organic gases [ROG], NO_x, and PM_{10}). The maximum effect of precursors

on O_3 levels tends to occur several hours after the time of emission during periods of high solar load and may occur many miles from the source. O_3 and O_3 precursors transported from other regions can also combine with local emissions to produce high local O_3 concentrations.

The affected environment for air quality consists of the SCCAB and the MDAB.

3.1.5 Existing Ambient Air Quality

To determine attainment of the NAAQS and CAAQS, air districts monitor air quality through a network of air monitoring stations within their boundaries. Data collected at the monitoring stations is compiled and used to track air quality conditions and support attainment efforts. A summary of ambient air quality data reported at monitoring stations near VSFB and MHV is presented in Tables 3-3 and 3-4, respectively.

Table 3-3. Air Quality Data at the Lompoc HS&P, Lompoc H Street and Vandenberg South Monitoring Stations

Pollutant (NAAQS)	2016	2017	2018	2019	2020
O_3					
Max National Concentration 8-hr period (ppm)	0.066	0.072	0.067	0.064	0.064
Days over 8-hr NAAQS (0.070 ppm)	0	0	0	0	0
PM_{10}					
Max National Concentration 24-hr period (µg/m^3)	257.2	399.8	66.8	80.0	106.7
Days over 24-hr NAAQS (150 µg/m^3)	4	2	0	0	0
$PM_{2.5}$					
Max National Concentration 24-hr period (µg/m^3)	30.9	53.4	40.6	23.4	85.6
Days over 24-hr NAAQS (35 µg/m^3)	0	4	2	0	8

Notes: NAAQS = National Ambient Air Quality Standards, O_3 = ozone, ppm = parts per million, PM_{10} = respirable particulate matter less than 10 microns in diameter matter, $PM_{2.5}$ = respirable particulate matter less than 2.5 microns in diameter, µg = microgram, m^3 = cubic meter

Source: CARB 2022

Table 3-4. Air Quality Data at the Mojave Monitoring Station (923 Poole Street)

Pollutant (NAAQS)	2016	2017	2018	2019	2020
O_3					
Max National Concentration 8-hr period (ppm)	0.093	0.085	0.094	0.077	0.100
Days over 8-hr NAAQS (0.070 ppm)	52	35	53	10	15
PM_{10}					
Max National Concentration 24-hr period (µg/m^3)	139.2	93.4	93.1	248.7	99.0
Days over 24-hr NAAQS (150 µg/m^3)	0	0	0	2	0
$PM_{2.5}$					
Max National Concentration 24-hr period (µg/m^3)	25.7	26.9	39.0	19.8	72.8
Days over 24-hr NAAQS (35 µg/m^3)	0	0	2	0	4

Notes: NAAQS = National Ambient Air Quality Standards, O_3 = ozone, ppm = parts per million, PM_{10} = respirable particulate matter less than 10 microns in diameter matter, $PM_{2.5}$ = respirable particulate matter less than 2.5 microns in diameter, µg = microgram, m^3 = cubic meter

Source: CARB 2022

3.2 CLIMATE

3.2.1 Definition of the Resource

Changes in global climate patterns have recently been associated with global warming, an average increase in the temperature of the atmosphere near the earth's surface, attributed to accumulation of greenhouse gas (GHG) emissions in the atmosphere. Climate change refers to any significant change in measures of climate, such as average temperature, precipitation, or

wind patterns over a period of time. GHGs trap solar heat in the atmosphere, which in turn heats the surface of the earth. Some GHGs occur naturally and are emitted to the atmosphere through natural processes, while others are created and emitted solely through human activities (e.g., combustion of fossil fuel). Common GHGs include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6). GHGs are commonly quantified in the equivalent mass of CO_2, denoted as carbon dioxide equivalent (CO_2e), which takes into account the global warming potential (GWP) of each individual GHG compound. The most common GHG that results from human activity is CO_2, followed by CH_4 and N_2O. CO_2 enters the atmosphere through burning fossil fuels (coal, natural gas, and oil), solid waste, trees, and wood products, and also as a result of certain chemical reactions (e.g., manufacture of cement). Sources of CO_2 include on- and off-road vehicles, boilers, generators, aircraft, marine vessels, and rocket launches. CO_2 is removed from the atmosphere (or "sequestered") when absorbed by plants as part of the biological carbon cycle.

3.2.2 Regulatory Review

The USEPA is the federal government agency responsible for writing and implementing federal regulation for the protection of the environment, including implementation of measures to address climate change. To this end, the USEPA pursues a number of efforts, including regulatory initiatives such as the GHG Reporting Program.

The GHG Reporting Program, codified in 40 CFR, Part 98, requires mandatory reporting of GHG emissions for certain industrial operations, most of which are large emitters of GHGs (e.g., electricity generation facilities, oil refineries, and manufacturing operations). Mandatory reporting is also required for facilities capable of emitting more than 25,000 metric tons (MT) of CO_2-equivalents ($MTCO_2e$) per year from all combined stationary fuel combustion sources (e.g., boilers and stationary engines).

3.2.3 Affected Environment

The affected environment for climate includes the GHG emissions associated with all altitudes of Talon-A non-launch and launch events, use of a maritime recovery vessel to recover the Talon-A test article and test vehicle, a support generator to power a mobile trailer on VSFB, ground transportation of the Talon-A from VSFB to MHV, and employee daily commute and use of existing office space at MHV.

3.2.4 Greenhouse Gas Emissions in the United States and California

According to the USEPA, average temperatures across the contiguous 48 states have increased over the past century by nearly 3 degrees Fahrenheit (°F) (about 1.67 degrees Celsius [°C]) in the winter, 2 °F (1.12 °C) in the spring, and 1.4 °F (0.78 °C) in the summer and fall (USEPA 2021c). Based on the 2021 update of the CARB California GHG inventory, California emitted 418.2 million metric tons (MMT) CO_2e in 2019 (CARB 2021). According to CARB, the potential impacts in California due to global climate change include loss of snowpack, sea level rise, more extreme heat days per year, more high O_3 days, more large forest fires, more drought years, increased erosion of California's coastlines, sea water intrusion into the Sacramento and San Joaquin Deltas and associated levee systems, and increased pest infestation. A summary of GHG emissions occurring in the United States and California over the past 5 years is presented in Table 3-5 as reference.

Table 3-5. U.S. and California Greenhouse Gas Emissions (MMT CO2 Equivalent)

Area	2015	2016	2017	2018	2019
U.S.[1]	6,671.1	6,520.3	6,483.3	6,671.4	6,558.3
California[2]	440.8	429.0	424.5	425.2	418.2

Sources: [1]USEPA 2021d; [2]CARB 2021

Notes: MMT=million metric tons, CO_2=carbon dioxide

3.3 BIOLOGICAL RESOURCES

The following biological resources are within the affected environment for the Proposed Project: wildlife, special-status wildlife species, marine reserves and conservation areas, and EFH and marine habitat.

3.3.1 Definition of the Resource

The following are considered special-status biological resources:

- Plant and wildlife species that are federally listed, proposed for listing, or candidates for listing.
- Plant and wildlife species that have been delisted.
- Plant and wildlife species that are state listed or candidates for listing.
- California Fully Protected Species.
- Wildlife species considered California Species of Special Concern by the California Department of Fish and Wildlife (CDFW).
- Plant species listed as sensitive by the California Native Plant Society (CNPS).
- Golden and bald eagles protected under the Bald and Golden Eagle Protection Act.
- Federal Birds of Conservation Concern.
- Winter roost locations for monarch butterflies protected under the Local Coastal Plan of Santa Barbara County (Santa Barbara County 2019).
- Marine mammal species protected under the MMPA.

Under Section 7 of the ESA of 1973, as amended (Title 16 U.S.C. Sections 1531 *et seq.*), federal agencies are required to assess the effect of any project on species that are federally listed threatened or endangered or proposed for listing. Section 7 consultations with the USFWS and NMFS are required for federal projects if such actions have the potential to directly or indirectly affect federally listed species or destroy or adversely modify designated Critical Habitat. No species or Critical Habitat administered by USFWS would be affected by this project. Therefore, consultation under Section 7 of the ESA with the USFWS is not required.

It is also USAF policy to consider species listed by state agencies, and other federal special-status species when evaluating the impacts of a project. In California, these include "Fully Protected" wildlife species, which are protected by the CDFW, per the California Fish and Game Code Sections 3511, 4700, 5050, and 5515. Although not subject to the requirements of the California Endangered Species Act (CESA), as a goal of its Integrated Natural Resource Management Plan (INRMP), SLD 30 also protects and conserves species considered sensitive by the state when not in direct conflict with the military mission.

The MMPA of 1972 (16 U.S.C. 1361 – 1407) restricts the taking of marine mammals, and its implementing regulations (50 CFR Part 216) prohibit the "taking" of any marine mammals. Taking includes injuring, killing, or harassing a marine mammal stock in the wild. The MMPA defines harassment as any act of pursuit, torment, or annoyance which has the potential to injure a marine mammal or marine mammal stock in the wild or has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering. Implementation of the

MMPA is a joint effort between NMFS and USFWS. NMFS is responsible for the management and conservation of cetaceans (whales and dolphins) and pinnipeds (seals and sea lions), while USFWS is responsible for southern sea otters (*Enhydra lutris nereis*). NMFS is also responsible for sea turtles under the ESA. An analysis was conducted to determine the potential for take of marine mammals by Level B harassment (i.e., potential behavioral disturbance) incidental to falling Talon-A debris in the Pacific Ocean. It has been determined that an IHA under the MMPA is not required because no species would be taken by Level B harassment (Appendix B-2).

VSFB is also subject to the requirements of the Migratory Bird Treaty Act (MBTA) of 1918 (16 U.S.C. 703 – 712) as amended, which protects native migratory birds, including their eggs and nests.

3.3.2 Affected Environment

The existing biological setting includes all biological resources areas that could be affected directly or indirectly by the Proposed Project. The affected environment for biological resources includes portions of the Pacific Ocean off the coast of VSFB and California. The Talon-A flight path during the separation test and expendable hypersonic test flight would be executed within the coastal Warning Areas off the coast of VSFB. Specifically, the proposed ocean impact location associated with these test flights would be between 14 nm (26 km) from the coast (including islands) and the extent of Warning Areas W532, W537, and W289 (i.e., ocean impact would occur at a location within the proposed ocean impact area shown in Figures 2-2 and 2-3). The sonic boom areas generated during the expendable hypersonic test flight and reusable Talon-A launch operations over the BOA are also included in the affected environment. This includes areas over the ocean and over land, including the coast of California and the NCI, for the easternmost trajectories. The BOA is the expanse of open ocean area of the Pacific encompassed by the extent shown in Figure 1-2.

All marine vessel(s) would transit to and from a commercial port and would use established shipping channels. Therefore, vessel use would avoid nearshore sensitive habitats (e.g., kelp), nearshore Critical Habitat (e.g., black abalone), and areas where black abalone (*Haliotis cracherodii*) and white abalone (*Haliotis sorenseni*) are known to occur. No activities under the Proposed Project would occur in nearshore sensitive habitats, nearshore Critical Habitat, or areas occupied by black abalone or white abalone. Since the Talon-A glide test landing on VSFB and the alternate landing on SNI would not generate sonic booms, no biological resources would be impacted as a result of these activities. In addition, all pre-flight ground operations would occur at the existing MHV facility, the Carrier Aircraft would transit to and from the MHV to Western Range Airspace using the established transit corridor over mainland California, and post-flight ground operations would occur at established runways on VSFB and SNI. Therefore, these areas are not included in the affected environment for biological resources.

A mobile communications trailer would be staged on existing disturbed or developed sites. Since no ground disturbance would occur, the affected environment does not include vegetation communities, special-status plant species, or wetlands/Waters of the U.S. Biological resources within the affected environment are presented in Table 3-6. The Proposed Project would not affect any vegetation communities or special-status plant species.

Table 3-6. Biological Resources within the Affected Environment

Biological Resource	Affected Environment	Figure(s)*
Terrestrial Wildlife	Could be present in CA coastal areas and NCI. Very small sections of coastline could experience sonic booms of 0.5 psf or less during reusable Talon-A launch operations over the BOA. No ground disturbance would occur for the Proposed Project. The federally and state threatened desert tortoise (*Gopherus agassizii*) is not within the affected environment and does not have the potential to occur.	4-2, 4-3
Marine Wildlife	Could be present in BOA, nearshore marine waters, and at marine haul-out areas along CA coast and on NCI. These areas could experience sonic booms of less than 1 psf during reusable Talon-A launch operations over the BOA. Also could be present in ocean impact area between 14 nm (26 km) from coast to W532, W537, W289 (i.e., proposed ocean impact area for the separation test and hypersonic flight test).	4-4, 4-5, 4-6
Marine Reserves and Conservation Areas	Includes BOA and nearshore marine waters. These areas could experience sonic booms of less than 1 psf during reusable Talon-A launch operations over the BOA. Also includes ocean impact area between 14 nm (26 km) from coast to W532, W537, W289 (i.e., proposed ocean impact area for the separation test and hypersonic flight test).	4-7
EFH and Marine Habitat	Includes ocean impact area between 14 nm (26 km) from coast to W532, W537, W289 (i.e., proposed ocean impact area for the separation test and hypersonic flight test).	4-8, 4-9

Notes: BOA = Broad Ocean Area, EFH = Essential Fish Habitat, km = kilometer, NCI = Northern Channel Islands, nm = nautical miles.

*These figures are provided in Section 4.3.2 since they show the proposed sonic boom areas and/or ocean impact areas in addition to existing biological resources.

3.3.3 Terrestrial Wildlife

A 0.5 psf or less sonic boom may be generated over land on the coast of California or the NCI during reusable Talon-A launch operations over the BOA (Figure 4-2, Figure 4-3). A variety of bird species have been observed within the affected environment and are likely to be found on the coast of California. These species include, but are not limited to, house finch (*Carpodacus mexicanus*), Brewer's blackbird (*Euphagus cyanocephalus*), swallows (*Hirundo* spp.), turkey vulture (*Cathartes aura*), red-tailed hawk (*Buteo jamaicensis*), California quail (*Callipepla californica*), black phoebe (*Sayornis nigricans*), California scrub-jay (*Aphelocoma californica*), spotted towhee (*Pipilo maculatus*), California towhee (*Melozone crissalis*), Anna's hummingbird (*Calypte anna*), bushtit (*Psaltriparus minimus*), American kestrel (*Falco sparverius*), white-crowned sparrow (*Zonotrichia leucophrys*), red-shouldered hawk (*Buteo lineatus*), and wrentit (*Chamaea fasciata*). These bird species also nest within this area. Amphibian species also occur, including CRLF, western toad (*Bufo boreas*), Monterey ensatina (*Ensatina eschscholtzii eschscholtzii*), arboreal salamander (*Aneides lugubris*), California newt (*Taricha torosa*), black-bellied slender salamander (*Batrachoseps nigriventris*), western spadefoot (*Spea hammondii*), Baja California treefrog (*Pseudacris hypochondriaca*), and American bullfrog (*Rana catesbeiana*) (USAF 2011). Reptile species observed or expected to occur include, but are not limited to, western fence lizard (*Sceloporus occidentalis*), southern alligator lizard (*Elgaria multicarinata*), side-blotched lizard (*Uta stansburiana*), western skink (*Eumeces skiltonianus*), gopher snake (*Pituophis catenifer*), Pacific rattlesnake (*Crotalus helleri*), and coast horned lizard (*Phrynosoma blainvillii*) (USAF 2011). A variety of large- and medium-sized mammal species are also expected

to occur, including, but not limited to, coyote (*Canis latrans*), mule deer (*Odocoileus hemionus*), raccoon (*Procyon lotor*), bobcat (*Lynx rufus*), brush rabbit (*Sylvilagus bachmani*), desert cottontail (*Sylvilagus audubonii*), long-tailed weasel (*Mustela frenata*), and California ground squirrel (*Spermophilus beecheyi*) (USAF 2011). In addition, small mammals are expected to occur, such as various species of mice (*Peromyscus* spp.) and Botta's pocket gopher (*Thomomys bottae*) (USAF 2011), as well as several bat species. Special-status terrestrial wildlife species on the coast of California are discussed in Section 3.3.5.

The NCI are an important breeding and resting area for a large number of landbirds, shorebirds, and seabirds (NBVC 2013). The NCI also support various amphibians and reptiles including Channel Islands slender salamander (*Batrachoseps pacificus pacificus*), Baja California tree frog, black-bellied slender salamander, southern alligator lizard, island fence lizard (*Sceloporus occidentalis becki*), western side-blotched lizard, western yellowbellied racer (*Coluber constrictor mormon*), San Diego nightsnake (*Hypsiglena ochrorhyncha klauberi*), and Santa Cruz Island gopher snake (*Pituophis catenifer pumilus*) (NBVC 2013). Mammals that use the NCI include island fox (*Urocyon littoralis*), island deer mouse, harvest mouse, Channel Islands spotted skunk (*Spilogale gracilis amphiala*), house rat, and numerous species of bats (NBVC 2013). Special-status terrestrial wildlife species on the NCI are discussed in Section 3.3.5.

3.3.4 Marine Wildlife

The affected environment for marine wildlife includes the proposed ocean impact area associated with the separation test and expendable hypersonic test flight (Figures 2-2 and 2-3) and the sonic boom areas during the expendable hypersonic test flight (Figure 4-4) and launch operations over the BOA (Figure 4-5). Special-status marine wildlife species are discussed in Section 3.3.6. Marine mammal haul-outs that occur in the affected environment are also discussed in Section 3.3.6. The ocean depth in a majority of the affected environment is thousands of meters deep (120 to 4,634 m). Marine species that may occur at the ocean surface, in the water column, or on the sea floor in these areas include marine mammals, sea turtles, fish, seabirds, and invertebrates, some of which are protected under the ESA and/or MMPA. However, due to the large area of available habitat in the Pacific Ocean and the known population sizes of these species (Carretta et al. 2015, 2019), their density in the affected environment is likely very low. For example, the density of a given marine mammal species in the open ocean is expected to be a fraction of one individual per 0.4 square mile (1 km^2).

3.3.5 Special-status Terrestrial Wildlife Species

The affected environment for special-status terrestrial wildlife species includes areas over land on the California coast or NCI that may experience 0.5 psf or less sonic booms during reusable launch operations over the BOA. Locations of special-status terrestrial species and Critical Habitat are shown in Figures 4-2 and 4-3. The Santa Ynez River estuary area shown in Figure 4-2 provides foraging for California least terns and is primarily used by adult terns and their young in late summer (mid-July to mid-September). Terrestrial Critical Habitat within the affected environment includes western snowy plover (Santa Rosa Island and northwest of VSFB) and CRLF (northeast and southeast of VSFB). Primary Constituent Elements (PCEs) are physical and biological features that provide for a species' life-history processes and are essential to the conservation of the species. PCEs are used to define Critical Habitat. Western snowy plover PCEs include sandy beaches, dune systems immediately inland of an active beach face, salt flats, mud flats, seasonally exposed gravel bars, artificial salt ponds and adjoining levees, and dredge spoil sites with suitable tides, vegetation, and prey features, and minimal disturbance from the presence of humans, pets, vehicles, or human-attracted predators. CRLF PCEs include aquatic breeding and non-breeding habitat, upland habitat, and dispersal habitat.

Table 3-7 lists the special-status species that occur or have the potential to occur within the affected environment. Potential occurrence was determined based on past documentation and suitability of habitat within the region for a particular species. Descriptions of these species and their potential for occurring in the affected environment are provided below. This EA considers species that may be affected by activities under the Proposed Project (Table 3-7). A low-level sonic boom of approximately 0.3 psf may occur over known western snowy plover nesting habitat (Table 3-7). Since sonic booms would not occur underwater, special-status freshwater fish species were not given further consideration in this EA, such as the federally listed endangered tidewater goby (*Eucyclogobius newberryi*) and federally and state listed endangered unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*). Special-status bird species that are not known to occur in the affected environment and unlikely to be in the affected environment were also not considered, such as the federally listed threatened and state listed endangered western yellow-billed cuckoo (*Coccyzus americanus occidentalis*), federally and state listed endangered southwestern willow flycatcher (*Empidonax traillii extimus*), and federally listed threatened and state listed endangered marbled murrelet (*Brachyramphus marmoratus*). Since listing in 1967, the California condor (*Gymnogyps californianus*) has been documented on or near VSFB only once in 2017; however, this individual perished in Big Sur, California later the same year. Therefore, this species is not known to occur in the affected environment.

Desert tortoises have not been detected within MHV during several years of surveys and are not expected to reoccupy the area due to high levels of human activity and large amounts of disturbed land (USFWS 2007). The closest known desert tortoise occurrences in the CDFW California Natural Diversity Database (CNDDB) are approximately 3 miles from the Stratolaunch hangar from 2004 and 2006 (CDFW 2021). There is no indication that desert tortoises or any other federally listed species have been located within MHV since the 2007 USFWS determination. In addition, MHV is not located within Critical Habitat of the desert tortoise or any other federally listed species. Therefore, desert tortoises would not be present at MHV. No other federally listed species are likely to occur at MHV (USFWS 2007).

3.3.6 Special-status Marine Wildlife Species

The affected environment for special-status marine wildlife species is the proposed ocean impact area associated with the separation test and expendable hypersonic test flight and the sonic boom areas during the expendable hypersonic test flight and reusable launch operations over the BOA. Locations of special-status marine species, including marine mammal haul-outs, are shown in Figures 4-4 and 4-5. Critical Habitat for special-status marine species is shown in Figure 4-6. Critical Habitat for humpback whale (*Megaptera novaeangliae*) and leatherback sea turtle (*Dermochelys coriacea*) occurs within the affected environment. Descriptions of special-status marine species and their potential for occurring in the affected environment are provided in Table 3-8.

The USSF has determined that an IHA under the MMPA is not required based on the results of the take analysis, which calculated that no marine mammals would be taken by Level B harassment (i.e., potential behavioral disturbance) from falling Talon-A debris in the Pacific Ocean. Take estimates are provided in Appendix B-2.

Table 3-7. Special-status Terrestrial Wildlife Species Potentially Occurring in the Affected Environment

Common Name	Scientific Name	Status		Occurrence within the Affected Environment		Habitat	Notes
		Federal	State	VSFB	NCI		
Birds							
California brown pelican	*Pelecanus occidentalis californicus*	FD	SD, FP	Documented	Documented	Coastal marine, estuaries	Documented on VSFB (roosting and feeding) and on the NCI (breeding).
Ferruginous hawk	*Buteo regalis*	BCC	WL	Documented	-[1]	Open grassland, prairie	Documented on VSFB (wintering).
Northern harrier	*Circus hudsonius*	-[1]	CSC	Documented	Documented	Prairie grasslands, marshes, wetlands	Nesting records on VSFB and documented on the NCI.
White-tailed kite	*Elanus leucurus*	-	FP	Documented	-	Open grassland, prairie	Nesting records on VSFB but numbers vary annually.
Golden eagle	*Aquila chrysaetos*	BGEPA, BCC	FP, WL	Documented	-	Grasslands, open woodland	Documented on VSFB (year-round).
Bald eagle	*Haliaeetus leucocephalus*	BGEPA, FD, BCC	SE, FP	Rare	Documented	Large lakes, wetlands	Rare winter migrant on VSFB (historical), documented on the NCI.
American peregrine falcon	*Falco peregrinus anatum*	FD, BCC	SD, FP	Documented	Documented	Open areas with proximity to water	Nesting records on VSFB and documented on the NCI.

Table 3-7. Special-status Terrestrial Wildlife Species Potentially Occurring in the Affected Environment

Common Name	Scientific Name	Status		Occurrence within the Affected Environment		Habitat	Notes
		Federal	State	VSFB	NCI		
Western snowy plover	*Charadrius nivosus nivosus*	FT, BCC	CSC	Documented	Documented	Beaches, barren ground	Documented nesting on VSFB and the NCI. Critical Habitat occurs on the Santa Rosa Island and northwest of VSFB.
Black oystercatcher	*Haematopus bachmani*	BCC	-	Documented	-	Intertidal	Documented on VSFB (nesting).
Long-billed curlew	*Numenius americanus*	BCC	WL	Documented	-	Intertidal	Documented on VSFB.
California least tern	*Sternula antillarum browni*	FE	SE, FP	Documented	-	Coastal marine, estuaries	Documented nesting on VSFB.
Burrowing owl	*Athene cunicularia hypugea*	BCC	CSC	Documented	-	Grasslands	Documented on VSFB (historical nesting).
Allen's hummingbird	*Selasphorus sasin*	BCC	-	Documented	Documented	Coastal sage scrub, riparian shrub	Resident riparian breeder on VSFB and documented on the NCI.
Nuttall's woodpecker	*Picoides nuttallii*	BCC	-	Documented	-	Deciduous riparian and adjacent oak woodland	Resident riparian breeder on VSFB.
Olive-sided flycatcher	*Contopus cooperi*	BCC	CSC	Documented	-	Coniferous woodlands	Breeder in woodland areas on VSFB.
Loggerhead shrike	*Lanius ludovicianus*	BCC	CSC	Documented	-	Open grasslands	Chaparral and coastal scrub breeder on VSFB.

Table 3-7. Special-status Terrestrial Wildlife Species Potentially Occurring in the Affected Environment

Common Name	Scientific Name	Status		Occurrence within the Affected Environment		Habitat	Notes
		Federal	State	VSFB	NCI		
Purple martin	*Progne subis*	-	CSC	Very Rare	-	Open areas, riparian	Fall/spring transient at the Santa Ynez River mouth on VSFB.
Oak titmouse	*Baeolophus inornatus*	BCC	-	Documented	-	Dry oak, oak-pine woodlands	Resident breeder on VSFB.
Yellow warbler	*Dendroica petechia brewsteri*	BCC	CSC	Documented	-	Riparian	Summer resident riparian breeder at Santa Ynez River on VSFB.
Yellow-breasted chat	*Icteria virens*	-	CSC	Documented	-	Riparian	Summer resident riparian breeder at Santa Ynez River on VSFB.
Black-chinned sparrow	*Spizella atrogularis*	BCC	-	Potential	-	Chaparral, sage, and scrub	Status on VSFB is currently unknown.
Belding's savannah sparrow	*Passerculus sandwichensis beldingi*	-	SE	Potential	-	Coastal salt marsh	Suspected in Santa Ynez River estuary on VSFB.
Tricolored blackbird	*Agelaius tricolor*	BCC	ST, CSC	Documented	-	Marsh, riparian, agricultural fields	Resident on VSFB (historical breeding).
Lawrence's goldfinch	*Spinus lawrencei*	BCC	-	Potential	-	Dry, open woodlands	Status on VSFB is currently unknown (historical breeding).

Table 3-7. Special-status Terrestrial Wildlife Species Potentially Occurring in the Affected Environment

Common Name	Scientific Name	Status		Occurrence within the Affected Environment		Habitat	Notes
		Federal	State	VSFB	NCI		
California condor	*Gymnogyps californianus*	FE	SE, FP	Potential	-	Vast expanses of open savannah, grasslands, and foothill chaparral in mountain ranges	One documented occurrence of this species on or near VSFB in 2017; however, this individual perished in Big Sur, California later the same year.
Amphibians							
California red-legged frog	*Rana draytonii*	FT	CSC	Documented	-	Chiefly associated with perennial ponds, streams	Common, but localized resident in wetlands on VSFB. Critical Habitat occurs adjacent to VSFB to the northeast and southeast.
California newt	*Taricha torosa*	-	CSC	Documented	-	Wet forests, oak woodland, chaparral, and grasslands	-
Western spadefoot	*Spea hammondii*	Under Review	CSC	Documented	-	Grassland, vernal pools in or near loose sandy or loamy soils	-

Table 3-7. Special-status Terrestrial Wildlife Species Potentially Occurring in the Affected Environment

Common Name	Scientific Name	Status		Occurrence within the Affected Environment		Habitat	Notes
		Federal	State	VSFB	NCI		
Reptiles							
Western pond turtle	*Emys marmorata*	-	CSC	Documented	-	Chiefly associated with perennial ponds, streams	Documented along San Antonio Creek, Santa Ynez River, Honda Creek, and Punchbowl and Pine Canyon Lakes on VSFB.
Coast horned lizard	*Phrynosoma blainvillii*	-	CSC	Documented	-	Scrub, chaparral, and grassland with open shrub canopy and loose sandy or loamy soils	Documented in scrub and chaparral habitats on VSFB.
Silvery legless lizard	*Anniella pulchra*	-	CSC	Documented	-	Sparsely vegetated coastal scrub and chaparral with loose sandy or loamy soils	Documented in coastal dunes on VSFB.
Two-striped garter snake	*Thamnophis hammondii*	-	CSC	Documented	-	Pools, creeks, cattle tanks, and other water sources, often in rocky areas, in oak woodland, chaparral, and brushland	-
Mammals							
Pallid bat	*Antrozous pallidus*	-	CSC	Documented	Documented	Rocky outcroppings, sparsely vegetated grasslands	Resident forager and potential breeder on VSFB and documented on NCI.

Table 3-7. Special-status Terrestrial Wildlife Species Potentially Occurring in the Affected Environment

Common Name	Scientific Name	Status		Occurrence within the Affected Environment		Habitat	Notes
		Federal	State	VSFB	NCI		
Townsend's big-eared bat	*Corynorhinus townsendii*	-	CSC	Documented	Documented	Pine forests, scrub	Resident forager and potential breeder on VSFB and documented on NCI.
Western red bat	*Lasiurus blossevillii*	-	CSC	Documented	-	Forages in forests, woodlands	Resident breeder at 13th Street Bridge on VSFB.
American badger	*Taxidea taxus*	-	CSC	Documented	-	Open plains, prairies, dry grasslands	Widespread in very low densities on VSFB.
Woodrat	*Neotoma* sp.	-	CSC	Documented	-	Coastal sage scrub	Observed on VSFB.
Island fox[2]	*Urocyon littoralis*	FD	ST	-	Documented	Grasslands, coastal sage scrub and bluff, sand dunes, island chaparral, oak woodland, island woodland, riparian woodland, pine forest, coastal marsh	Known to occur on NCI, federally delisted on NCI.

Sources: USAF 2011, 2016; NBVC 2013; CDFW 2021.

Notes: FD = Federally Delisted Species, FE = Federally Endangered Species, FT = Federally Threatened Species, BCC = Federal Bird Species of Conservation Concern, BGEPA = Bald and Golden Eagle Protection Act, MMPA = Marine Mammal Protection Act, MMPA-Depleted = Species is designated as depleted under the MMPA, SD = State Delisted Species, SE = State Endangered Species, ST = State Threatened Species, CSC = California Species of Special Concern, FP = California Fully Protected Species, WL = California Watch List Species, Common = over 15 individuals per year of historical survey, Rare = 1–15 individuals per year of historical survey, Very Rare = Less than 1 individual per year of historical survey.

[1] "-" = no conservation status or no occurrence data.

[2] The subspecies of island fox that occur on San Miguel, Santa Rosa, and Santa Cruz Islands are federally delisted and state listed threatened species.

Table 3-8. Special-status Marine Wildlife Species

Common Name	Scientific Name	Status		Occurrence within the Affected Environment			Habitat	Notes
		Federal	State	VSFB	NCI	Pacific Ocean		
Marine Mammals								
Blue whale	*Balaenoptera musculus*	FE, MMPA-Depleted	-	Documented	Documented	Common	Coastal, open ocean	The feeding BIA* for blue whale occurs within the affected environment.
Fin whale	*Balaenoptera physalus*	FE, MMPA-Depleted	-	Documented	Documented	Common	Offshore, open ocean	-
Humpback whale	*Megaptera novaeangliae*	FE (Central America DPS), FT (Mexico DPS), MMPA-Depleted	-	Documented	Documented	Common	Coastal, open ocean	Critical Habitat for humpback whale occurs within the affected environment. Feeding BIAs* for humpback whale occur within the affected environment.
Killer Whale	*Orcinus orca*	FE (Southern Resident DPS), MMPA-Depleted	-	Documented	Documented	Uncommon	Nearshore, open ocean	-

Table 3-8. Special-status Marine Wildlife Species

Common Name	Scientific Name	Status		Occurrence within the Affected Environment			Habitat	Notes
		Federal	State	VSFB	NCI	Pacific Ocean		
North Pacific right whale	*Eubalaena japonica*	FE, MMPA-Depleted	-	-	Potential	Potential	Coastal, open ocean	-
Sei whale	*Balaenoptera borealis*	FE, MMPA-Depleted	-	-	Rare	Rare	Offshore, open ocean	-
Sperm whale	*Physeter microcephalus*	FE, MMPA-Depleted	-	Documented	Documented	Common	Nearshore, offshore	-
Bryde's whale	*Balaenoptera edeni*	MMPA	-	-	Rare	Rare	Open ocean	-
Minke whale	*Balaenoptera acutorostrata*	MMPA	-	Documented	Documented	Common	Nearshore, offshore	-
Pygmy sperm whale	*Kogia breviceps*	MMPA	-	-	Documented	Potential	Nearshore, open ocean	-
Dwarf sperm whale	*Kogia sima*	MMPA	-	-	Documented	Potential	Open ocean	-
Short-finned pilot whale	*Globicephala macrorhynchus*	MMPA	-	-	Documented	Uncommon	Offshore, open ocean	-
Long-beaked common dolphin	*Delphinus capensis*	MMPA	-	Documented	Documented	Common	Nearshore	-

Table 3-8. Special-status Marine Wildlife Species

Common Name	Scientific Name	Status		Occurrence within the Affected Environment			Habitat	Notes
		Federal	State	VSFB	NCI	Pacific Ocean		
Common bottlenose dolphin	*Tursiops truncatus*	MMPA	-	Documented	Documented	Common	Coastal, offshore	-
Striped dolphin	*Stenella coeruleoalba*	MMPA	-	Documented	Documented	Uncommon	Offshore	-
Northern right whale dolphin	*Lissodelphis borealis*	MMPA	-	Documented	Documented	Common	Open ocean	-
Risso's dolphin	*Grampus griseus*	MMPA	-	Documented	Documented	Common	Nearshore, offshore	-
Dall's porpoise	*Phocoenoides dalli*	MMPA	-	Documented	Documented	Common	Nearshore, offshore	-
Harbor porpoise	*Phocoena phocoena*	MMPA	-	Documented	Documented	Common	Nearshore, offshore	-
Cuvier's beaked whale	*Ziphius cavirostris*	MMPA	-	-	Documented	Potential	Open ocean	-
Baird's beaked whale	*Berardius bairdii*	MMPA	-	-	Documented	Potential	Open ocean	-

Table 3-8. Special-status Marine Wildlife Species

Common Name	Scientific Name	Status		Occurrence within the Affected Environment			Habitat	Notes
		Federal	State	VSFB	NCI	Pacific Ocean		
Mesoplodont beaked whales (Blainville's beaked whale; Ginkgo-toothed beaked whale; Perrin's beaked whale; Stejneger's beaked whale; Hubbs' beaked whale; Pygmy beaked whale)	*Mesoplodon* spp.	MMPA	-	-	Documented	Rare, Potential	Open ocean	-
Pacific harbor seal	*Phoca vitulina richardsi*	MMPA	-	Common	Common	Common	Rocks and beach haul-outs, nearshore coastal waters, open ocean	Haul out on coasts of VSFB and NCI.
California sea lion	*Zalophus californianus*	MMPA	-	Common	Common	Common	Rocks and beach haul-outs, nearshore coastal waters, open ocean	Haul out on coasts of VSFB and NCI.
Northern elephant seal	*Mirounga angustirostris*	MMPA	-	Documented	Common	Common	Rocks and beach haul-outs, nearshore coastal waters, open ocean	Haul out on coasts of VSFB and NCI.

Table 3-8. Special-status Marine Wildlife Species

Common Name	Scientific Name	Status		Occurrence within the Affected Environment			Habitat	Notes
		Federal	State	VSFB	NCI	Pacific Ocean		
Steller sea lion	*Eumetopias jubatus*	FD, MMPA	-	Rare / Documented	Rare	Rare	Rocks and beach haul-outs, nearshore coastal waters, open ocean	Haul out on coast of VSFB and are rare visitors to NCI.
Northern fur seal	*Callorhinus ursinus*	MMPA-Depleted**	-	Common	Common	Common	Rocks and beach haul-outs, nearshore coastal waters, open ocean	Haul out on coast of NCI (San Miguel Island).
Guadalupe fur seal	*Arctocephalus townsendi*	FT, MMPA-Depleted	ST, FP	-	Rare	Documented	Open ocean	Rare visitors to NCI.
Gray whale	*Eschrichtius robustus*	FE (Western North Pacific DPS) MMPA-Depleted	-	Documented	Documented	Common	Nearshore, offshore	The gray whale potential presence BIA* and gray whale migration BIA* occur within the affected environment.
Short-beaked common dolphin	*Delphinus delphis*	MMPA	-	Documented	Documented	Common	Nearshore, open ocean	-
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*	MMPA	-	Documented	Documented	Common	Offshore, open ocean	-

Table 3-8. Special-status Marine Wildlife Species

Common Name	Scientific Name	Status		Occurrence within the Affected Environment			Habitat	Notes
		Federal	State	VSFB	NCI	Pacific Ocean		
Southern sea otter	*Enhydra lutris nereis*	FT, MMPA-Depleted	FP	Documented	Occasional	-	Coastal waters with numbers concentrated around kelp beds (i.e., rafting areas)	May haul out on coast of VSFB and are occasional visitors to the NCI.
Sea Turtles								
Green turtle	*Chelonia mydas*	FT (East Pacific DPS)	-	-	Documented	Documented	Beach nesting, coastal, open ocean	-
Leatherback turtle	*Dermochelys coriacea*	FE (Pacific DPS)	SCE	-	Documented	Documented	Beach nesting, open ocean	Critical Habitat for leatherback turtle occurs within the affected environment.
Loggerhead turtle	*Caretta caretta*	FE (North Pacific Ocean DPS)	-	-	Documented	Documented	Beach nesting, coastal, open ocean	-
Olive ridley turtle	*Lepidochelys olivacea*	FT	-	-	Documented	Documented	Beach nesting, coastal, open ocean	-

Table 3-8. Special-status Marine Wildlife Species

Common Name	Scientific Name	Status		Occurrence within the Affected Environment			Habitat	Notes
		Federal	State	VSFB	NCI	Pacific Ocean		
Fishes								
Giant manta ray	*Manta birostris*	FT	-	-	-	Documented	Coastal, open ocean	-
Scalloped hammerhead shark	*Sphyma lewini*	FE (Eastern Pacific DPS)	-	-	-	Documented	Coastal	-
Steelhead	*Oncorhynchus mykiss*	FE (Southern California DPS), FT (South-Central California Coast DPS)	-	Documented	-	Documented	Coastal, open ocean	-

Sources: U.S. Department of Commerce 2008; USAF 2011, 2016; NBVC 2013; CDFW 2021.

Notes: BIA = Biologically Important Areas, DPS = Distinct Population Segment, FE = Federally Endangered Species, FD = Federally Delisted Species, FT = Federally Threatened Species, MMPA = Marine Mammal Protection Act, MMPA-Depleted = Species is designated as depleted under the MMPA, SCE = State Candidate Endangered, ST = State Threatened Species, FP = California Fully Protected Species.

* Biologically Important Areas (BIAs) do not receive special regulatory protection, but they provide information on areas where cetaceans are known to occur for activities such as feeding, migrating, etc.

** The eastern Pacific stock of the northern fur seal is listed as depleted under the MMPA, while the San Miguel Island stock is protected under the MMPA but is not listed as depleted (Carretta et al. 2015).

3.3.7 Marine Reserves and Conservation Areas

The affected environment for marine reserves and conservation areas is the proposed ocean impact area associated with the separation test and expendable hypersonic test flight and the sonic boom areas during the expendable hypersonic test flight and launch operations over the BOA. Under the National Marine Sanctuaries Act, NOAA established national marine sanctuaries for marine areas with special conservation, recreational, ecological, historical, cultural, archaeological, scientific, educational, or aesthetic qualities. The Channel Islands National Marine Sanctuary (CINMS) is a collection of marine reserves and marine conservation areas located at the Channel Islands approximately 40 miles (65 km) south of VSFB. CINMS regulations are listed in 15 CFR 922.71-922.74. Section 922.72(a)(1) prohibits taking any marine mammal, sea turtle, or seabird within or above the CINMS, except as authorized by the MMPA, ESA, MBTA, or any regulation promulgated under the MMPA, ESA, or MBTA. In addition, the coastline from Purisima Point to just south of Point Arguello has been designated as the Vandenberg State Marine Reserve (VSMR) pursuant to the Marine Managed Areas Improvement Act. The VSMR management objectives include providing for complete protection of this diverse area containing shallow hard- and soft-bottom habitats, kelp beds, and associated marine life. Marine Reserves and Marine Conservation Areas in the affected environment are shown in Figure 4-7. This figure shows the sonic booms from the expendable Talon-A hypersonic flight and the easternmost trajectories for reusable Talon-A launch operations, which are the trajectories most likely to potentially impact the marine reserves and marine conservation areas located off the California coast and near the NCI.

3.3.8 Essential Fish Habitat and Marine Habitat

The Magnuson-Stevens Fishery Conservation and Management Act, as amended by the Sustainable Fisheries Act in 1996, protects EFH by the establishment of Regional Fishery Management Councils that develop Fishery Management Plans for federally managed species. EFH is defined as “those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity” (16 U.S.C. § 1802[10]). Fish are defined by the Magnuson-Stevens Fishery Conservation and Management Act as “finfish, mollusks, crustaceans, and all other forms of marine animals and plant life other than marine mammals and birds,” and waters are defined as all aquatic areas, including their biological, chemical, and physical properties. Substrate is defined as sediment, hard-bottom structures underlying the waters, and associated biological communities (50 CFR § 600.10). EFH includes all habitats used at any time during the life cycle of a managed species. The affected environment for EFH and marine habitat is the proposed ocean impact area associated with the separation test and expendable hypersonic test flight.

The Pacific Fishery Management Council (PFMC) has identified EFH off the west coast in their Fisheries Management Plans (FMPs). The PFMC is one of eight regional fishery management councils established by the Magnuson-Stevens Fishery Conservation and Management Act of 1976. The council recommends fishery management measures in the Federal waters off Washington, Oregon, and California. EFH within the affected environment is summarized in the following three FMPs: Coastal Pelagic Species (CPS) (PFMC 2019), Pacific Coast Groundfish (PFMC 2020), and Highly Migratory Species (PFMC 2018). The following stocks are managed under the CPS FMP: Pacific sardine (*Sardinops sagax*), Pacific (chub) mackerel (*Scomber japonicus*), northern anchovy (*Engraulis mordax*), market squid (*Doryteuthis opalescens*), jack mackerel (*Trachurus symmetricus*), and krill/euphausiids. The boundary for CPS EFH extends from the marine waters along the shoreline of California, Oregon, and Washington to the limits of the Exclusive Economic Zone (EEZ) (up to 200 nm [370 km] off the coast). The Pacific Coast Groundfish FMP manages over 90 species of groundfish off the west coast, including 70 species of rockfish, six species of roundfish, 12 species of flatfish, and four species of elasmobranchs

(sharks and skates) (PFMC 2020). Groundfish EFH within the affected environment is shown in Figure 4-8.

The EFH for highly migratory species is defined as marine waters from the shoreline to 200 nm (370 km) offshore. The following stocks are managed under the Highly Migratory Species FMP: north Pacific albacore (*Thunnus alalunga*), yellowfin tuna (*T. albacares*), bigeye tuna (*T. obesus*), Pacific bluefin tuna (*T. thynnus*), skipjack tuna (*Katsuwonus pelamis*), common thresher shark (*Alopias vulpinus*), shortfin mako shark (*Isurus oxyrinchus*), blue shark (*Prionace glauca*), striped marlin (*Tetrapturus audax*), swordfish (*Xiphias gladius*), mahi mahi (*Coryphaena hippurus*). There are an additional eight non-target stocks considered in the Highly Migratory Species FMP as ecosystem component species. These stocks include bigeye thresher shark (*Alopias superciliosus*), pelagic thresher shark (*A. pelagicus*), common mola (*Mola mola*), wahoo (*Acathocybium solandri*), escolar (*Lepidocybium flavobrunneum*), lancetfishes (*Alepisauridae* species), louvar (*Luvarus imperialis*), and pelagic stingray (*Dasyetis violacea*). These species are tracked by the PFMC, and, if management were needed, would be reclassified as a management unit species (PFMC 2018).

In addition to designating EFH, the PFMC has also identified Habitat Areas of Particular Concern (HAPC) for federally managed species. HAPCs are defined as habitat that provide important ecological functions, are sensitive to human-caused environmental degradation, would be subjected to and negatively impacted by development activity stressors, and/or are relatively rare (50 CFR § 600.815(a)(8)). NMFS may also identify HAPC as EFH that is important to the long-term productivity of populations of one or more managed species. Within the affected environment, the only identified HAPCs are offshore rocky reefs that provide habitat for groundfishes (Figure 4-9). Rocky reef habitats are composed of bedrock, boulders, or smaller rocks, such as cobble and gravel, and include the following hard bottom habitats: rocky outcrops, ridges, banks, seamounts, and other areas of seafloor that are exposed because of ocean currents. The rocky reefs HAPC is defined as waters, substrates, and other biogenic features associated with hard substrate to mean higher high water (MHHW).

3.4 HAZARDOUS MATERIALS AND WASTE MANAGEMENT

3.4.1 Definition of the Resource

Hazardous materials and wastes are defined and identified by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (42 U.S.C. 9601–9675); the Toxic Substances Control Act (15 U.S.C. 2601-2671); the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act (RCRA; 42 U.S.C. 6901-6992); and the corresponding State of California laws and regulations. Both federal and state OSHA regulations govern protection of personnel in the workplace. In general, these hazardous materials and wastes may present substantial danger to public health and welfare, to workers, or to the environment due to their quantity, concentration, or physical, chemical, or infectious characteristics.

3.4.2 Affected Environment

The affected environment for Hazardous Materials and Waste Management resources includes the areas where hazardous materials would be used, and hazardous waste would be generated in association with the Proposed Project. This includes the following areas:

- Pre-flight ground operations areas at MHV;
- Electrical generator use at the mobile communications trailer staging location on south VSFB;
- The Carrier Aircraft Transit Flight Corridor;
- Talon-A Captive Carry, Separation, and Hypersonic Flight Test Corridors;

- Talon-A landing and post-flight ground operations areas at VSFB; and
- Alternate landing and post-flight ground operations at the SNI Runway.

3.4.3 Hazardous Materials Management at MHV

Numerous types of hazardous materials are currently used at MHV, which in turn generate hazardous wastes. The hazardous materials at MHV mostly consist of airplane fuels and rocket propellants (i.e., oxidizers and fuels). Other hazardous materials used, generated, and/or stored onsite include acetylene, paints, used motor and hydraulic oil, gear lubricant, and hydraulic fluid (FAA 2012). Proposed operations at MHV may require the use of hazardous materials by Stratolaunch personnel and onsite contractors. Stratolaunch would be responsible for preparing its own Emergency Response Plan for the operations program per USEPA and OSHA requirements. This Plan would ensure that all hazardous material incidents follow the appropriate guidance, policies, and protocols. Likewise, the Plan would ensure that the associated emergency response guidance is available to and followed by all MHV personnel and commercial entities. The Plan would also meet requirements in the Mojave LSOL for Stratolaunch to store hazardous materials. In addition, the existing Spill Prevention, Control, and Countermeasures (SPCC) Plan for MHV would be followed as applicable, which describes monitoring requirements and operating procedures used to prevent fuel spills. Gasoline, diesel, lubricant, adhesives, coatings, and solvents would be used during Talon-A pre-flight ground operations, as described in Section 2.4.

3.4.4 Hazardous Waste Management at MHV

Management of hazardous waste for the Stratolaunch Talon-A program would comply with the RCRA Subtitle C (40 CFR Part 240-299) and with California Hazardous Waste Control Laws as administered by the California EPA, Department of Toxic Substances Control (DTSC), under Title 22, Division 4.5 of the CCR. These regulations require that hazardous wastes be handled, stored, transported, disposed of, or recycled according to defined procedures. Stratolaunch would be required to follow all federal, state, and local laws and regulations (as well as Air Force Manual [AFMAN] 32-7002, Environmental Compliance and Pollution Prevention), which regulate hazardous waste, including its generation, storage, transportation, and disposal.

3.4.5 Hazardous Materials Management at VSFB

Proposed operations on VSFB may require the use of hazardous materials by Stratolaunch and on-base contractors. Stratolaunch would be responsible for preparing a site-specific Emergency Response Plan for the post-landing Talon-A safing and defueling operations at VSFB, per USEPA and OSHA requirements. This Plan would ensure that all hazardous material incidents follow the appropriate guidance, policies, and protocols. Likewise, the Plan would ensure that the associated emergency response guidance is available to and followed by all military personnel and commercial entities involved in the operations.

3.4.6 Hazardous Waste Management at VSFB

Management of hazardous waste for the Stratolaunch Talon-A program would comply with the RCRA Subtitle C (40 CFR Part 240-299) and with California Hazardous Waste Control Laws as administered by the California EPA, DTSC, under Title 22, Division 4.5 of the CCR. These regulations require that hazardous wastes be handled, stored, transported, disposed of, or recycled according to defined procedures. Stratolaunch would be required to follow all federal, state, and local laws and regulations (as well as AFMAN 32-7002) that regulate hazardous waste, including its generation, storage, transportation, and disposal. Stratolaunch would also be required to obtain a USEPA Generator Identification Number for all hazardous waste generated on VSFB. As stated in Section 2.4, residual LOX would be vented from the Talon-A after landing,

and between 60 and 200 lbs of residual Jet-A would be off-loaded into DOT-compliant waste containers for transport off VSFB.

3.4.7 Hazardous Materials Management at SNI

Proposed operations on SNI, specifically an alternate landing on the SNI runway for a Talon-A engine-out scenario early in the flight profile, may require the use of hazardous materials by military personnel and on-base contractors. The DoN implements a Hazardous Material Control and Management Program and Hazardous Waste Minimization Program, governed by Office of the Chief of Naval Operations M-5090, for all of its facilities, including NBVC. Stratolaunch would be responsible for preparing a site-specific Emergency Response Plan for the post-landing Talon-A safing and defueling operations at SNI, per requirements presented in the Integrated Solid Waste Management Plan for NBVC (Naval Facilities Engineering and Expeditionary Warfare Center [NAVFAC EXWC] 2014). This Plan would ensure that all hazardous material incidents follow the appropriate guidance, policies, and protocols. Likewise, the Plan would ensure that emergency response guidance is available to and followed by all military personnel and commercial entities involved in a potential alternate landing operation at SNI.

3.4.8 Hazardous Waste Management at SNI

Management of hazardous waste for the Stratolaunch Talon-A program would comply with the RCRA Subtitle C (40 CFR Part 240-299) and with California Hazardous Waste Control Laws as administered by the California EPA, DTSC, under Title 22, Division 4.5 of the CCR. In addition, management of hazardous waste would comply with the Hazardous Waste Management Plan for NBVC. These regulations require that hazardous wastes be handled, stored, transported, disposed of, or recycled according to defined procedures. Stratolaunch would be required to follow all federal, state, and local laws and regulations as well as DoN requirements that regulate hazardous waste, including its generation, storage, transportation, and disposal.

3.4.9 Hazardous Materials Transportation and Safety

Hazardous materials such as propellants, ordnance, chemicals, and other hazardous material payload components must be transported to MHV per U.S. DOT regulations for interstate and intrastate shipment of hazardous materials (Title 49 CFR 100–199). Stratolaunch would obtain commodities consumed through flight tests from a contract provider. All bulk commodities would be transported in tankers and stored at MHV. LOX and Jet-A would be stored at the MHV tank farm. Fuel delivery within MHV would be by ground equipment approved for use under Stratolaunch's FAA license and the Mojave LSOL. Should alternate landings occur at SNI, residual Jet-A fuel would be collected in DOT-compliant containers. The residual Jet-A would then be transported under manifest using Stratolaunch's EPA Waste Generator ID along with the test vehicle by barge to NBVC for truck transport back to MHV. Talon-A alternate landings at SNI would generate approximately 62 lbs (9.3 gallons) of residual Jet-A fuel.

3.4.10 Toxic Release Contingency Plans and Toxic Hazard Corridors at VSFB

VSFB maintains SLD 30 Instruction 91-106, *Toxic Hazard Assessments*, which defines toxic fuel control measures and toxic fuel operation procedures. Stratolaunch would be required to prepare toxic hazard assessments that identify program-specific toxic material used for Talon-A landings, payloads, and ground support equipment used at VSFB.

3.5 OCCUPATIONAL SAFETY AND HEALTH

3.5.1 Definition of the Resource

Per 32 CFR Part 989.27, occupational safety and health issues include potential safety hazards to military personnel and others at a work site. The primary priority when planning and conducting non-launch and launch operations is the safety of Stratolaunch and military personnel and the public.

3.5.2 Affected Environment

The affected environment for occupational safety and health includes the area used during the Proposed Project where human health and safety could be affected by the operations of the Stratolaunch Talon-A program.

3.5.3 Regional and On-Base Personnel Safety

All personnel and their organizations are responsible for industrial hygiene and ground safety during launches and operations at their respective locations and regions of influence. Monitoring and exposure to workplace chemicals, physical hazards, hearing and respiratory protection, and oversight of all hazardous or potentially hazardous operations is the responsibility of individuals and their respective organizations. The MHV Commercial Space Transportation License (LSO 04-009 [Rev.1]) and the United States Space Force Command Manual 91-710, Volume 6, 18 February 2020 outline existing regulations and protocols to keep personnel safe. The Space Force Space Command Manual includes requirements for ground and launch personnel working with hazardous materials such as propellant and live ordnance.

VSFB is involved in regional emergency planning since they have the potential to affect off-base areas. In case of an emergency on VSFB, mutual aid agreements between VSFB and various local agencies have been established to allow the agencies to support notification and response efforts; Kern County has similar agreements with MHV. The VSFB Emergency Operations Center responds to accidents off-base upon request of the County. There is an Aerospace Rescue Fire Fighting unit responsible for emergency response services at MHV. The firefighting crew follows the National Fire Protection Standard 402 and the USAF Defense Logistics Agency Manual 8210.1. MHV also has a Fueling Policy to address all fueling activities and a SPCC Plan that provides guidance for operation of the above-ground fuel storage tanks (FAA 2012).

3.6 NOISE

This section provides a definition of noise as a resource area and a description of the existing noise environment at and around the study area.

3.6.1 Definition of the Resource

Sound results from vibrations introduced into a medium such as air that stimulate the auditory nerves of a receptor to produce the sensation of hearing. Sound is undesirable if it interferes with communication, is intense enough to damage hearing, or diminishes the quality of the environment. Noise is defined as unwanted sound. Human responses to sound vary with the types and characteristics of the sound source, the distance between the source and receptor, receptor sensitivity, the background sound level, and other factors such as time of day. Sound may be intermittent or continuous, steady or impulsive, and may be generated by stationary sources such as generators or mobile sources such as cars or aircraft.

Sound varies by both intensity and frequency. Sound pressure level, described in decibels (dB), is used to quantify sound intensity. The dB is a logarithmic unit that expresses the ratio of a sound pressure level to a standard reference level. Hertz (Hz) are used to quantify sound frequency. The human ear responds differently to different frequencies. “A-weighting” or measuring in A-

weighted decibels (dBA), approximates a frequency response expressing the perception of sound by humans. Table 3-9 provides sounds encountered in daily life and their sound levels.

Table 3-9. Common Sounds and Their Levels

Outdoor	Sound Level (dBA)	Indoor
Jet flyover at 1,000 ft (305 m)	100	Rock band
Gas lawnmower at 3 ft (0.9 m)	90	Food blender at 3 ft (0.9 m)
Downtown (large city)	80	Garbage disposal
Heavy traffic at 150 ft (48 m)	70	Vacuum cleaner at 10 ft (3 m)
Normal conversation	60	Normal speech at 3 ft (0.9 m)
Quiet urban daytime	50	Dishwasher in next room
Quiet urban nighttime	40	Theater, large conference room

Source: Harris 1998.

Note: dBA = A-weighted decibels, ft = feet, m = meter.

Sound pressure, as outlined above, describes steady noise levels, although very few noises are, in fact, constant. Therefore, additional noise metrics such as the following have been developed to describe noise:

- Maximum Sound Level (L_{max}) – L_{max} is the maximum sound level of an acoustic event in dB (e.g., when a launch vehicle is directly overhead).
- Equivalent Sound Level (L_{eq}) – L_{eq} is the average sound level in dB of a given event or period of time.
- Day-night Sound Level (DNL) – DNL is the average sound energy in a 24-hour period with a penalty added to the nighttime levels. Due to the potential to be particularly intrusive, noise events occurring between 10:00 p.m. and 7:00 a.m. are assessed a 10-dB penalty when calculating DNL. DNL is a useful descriptor for aircraft and launch noise because it (1) averages ongoing yet intermittent noise, and (2) accounts for the total sound energy over a 24-hour period. DNL provides a measure of the overall acoustical environment, but it does not directly represent the sound level at any given time. For well-distributed sound, L_{eq} is approximately 6.4 dBA lower than DNL.
- Community Noise Equivalent Level (CNEL) – CNEL is a variant of DNL used in the State of California, where in addition to the 10-dB penalty during the nighttime, the CNEL includes a 4.8 dB penalty for events during the evening (7:00 p.m. to 10:00 p.m.). As with DNL, CNEL does not directly represent the sound level at any given time. CNEL is always equal to or greater than DNL and may be used in lieu of DNL for FAA actions in California per FAA Order 1050.F1 Paragraph B-1 of Appendix B.
- Peak sound level (dBP) is the maximum instantaneous sound level for an individual acoustical event. For impulsive sounds, such as sonic booms, the true instantaneous peak sound pressure level, which lasts for only a fraction of a second, is important in determining impacts. The peak pressure of the shock wave, which is used to describe sonic booms, is usually presented in psf.

3.6.2 Affected Environment

The affected environment for noise is the areas on and immediately surrounding MHV and VSFB. SNI is not included in the affected environment for noise because the Talon-A would only glide into the Island's runway in the event of an engine out scenario, which would not increase existing noise levels. The immediate area surrounding MHV and VSFB is largely composed of undeveloped and rural land, with some unincorporated residential areas. Sound levels in nearby areas are typically low, but higher levels occur in industrial areas and along transportation corridors. The Cities of Mojave, California City, and Rosamond are near MHV. Lompoc and Santa Maria are the two main population centers near VSFB.

Most environments include near-constant, long-term sound sources that create a background sound level and intermittent, intrusive sources that create sound peaks that are noticeably higher than background levels. In remote areas far away from any human activities, the background sound level is determined by natural sources such as water (e.g., rain), and wind blowing through the vegetation. The extent to which an intrusive sound affects a given receptor in the environment depends upon the degree to which it exceeds the background sound level. Both background and intrusive sound may affect the quality of life in a given environment.

MHV

Existing noise at MHV is primarily from aircraft activities, with a total of 21,302 aircraft operations for a 12-month period ending April 2020 (FAA 2022). Table 3-10 provides the fleet mix. The area to the north and east of the MHV is open and undeveloped land. Noise sensitive areas, including commercial and residential development, are immediately west and south of MHV (Kern County 2012). Local schools are almost all located at least 1 to 2 miles (2 to 3 km) from the main runway of the MHV. The two closest schools, Mojave Elementary School and Mojave Junior/Senior High School, are immediately west of MHV and approximately 1.25 miles (2.01 km) from the proposed pre-flight operations area. These noise sensitive land uses are outside the 65 dB DNL noise contour (Figure 3-1).

Table 3-10. Mojave Air and Space Port Operations Fleet

Type of Aircraft	Operations
Air Carrier	33
Air Taxi	6
General Aviation Local	8,426
General Aviation Itinerant	9,718
Military	3,119
Total	**21,302**

Source: FAA 2022.

Notes: Operations for a 12-month period ending 29 April 2020.

On-airport noise is generated by aircraft, automobiles, and trucks. Other less frequent but more intense sources of noise are from aerospace testing launches. The *Kern County Airport Land Use Compatibility Plan* (2012) illustrated noise contours above DNL 65 dBA extending to the northwest and southeast past the boundaries of MHV (Figure 3-1). FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, and FAA Order 1050.1F Desk Reference[11] state that CNEL may be used in lieu of DNL for projects in California. However, noise contours using CNEL were unavailable for MHV. Therefore, Figure 3-1 shows noise contours in DNL. DNL is comparable to CNEL, as both noise metrics measure average sound energy over a 24-hour period, except that DNL does not include the 4.8 dB penalty for events occurring during the evening. Although the noise contours are from 2012, newer noise contours were not available. The 2019 *Written Reevaluation for the 2017 Environmental Assessment for Issuing a License to Virgin Orbit for LauncherOne Launches at the Mojave Air and Space Port* states that the noise data and analyses conducted in the 2017 EA remain substantially valid (FAA 2019). This 2017 EA used the same 2012 noise data from Kern County. Therefore, the noise contours shown on Figure 3-1 are a valid representation of the current noise levels in DNL at MHV.

[11] U.S. Department of Transportation, Federal Aviation Administration – Office of Environment and Energy, 1050.1F Desk Reference, Version 2, February 2020: Available: https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order/desk_ref/.

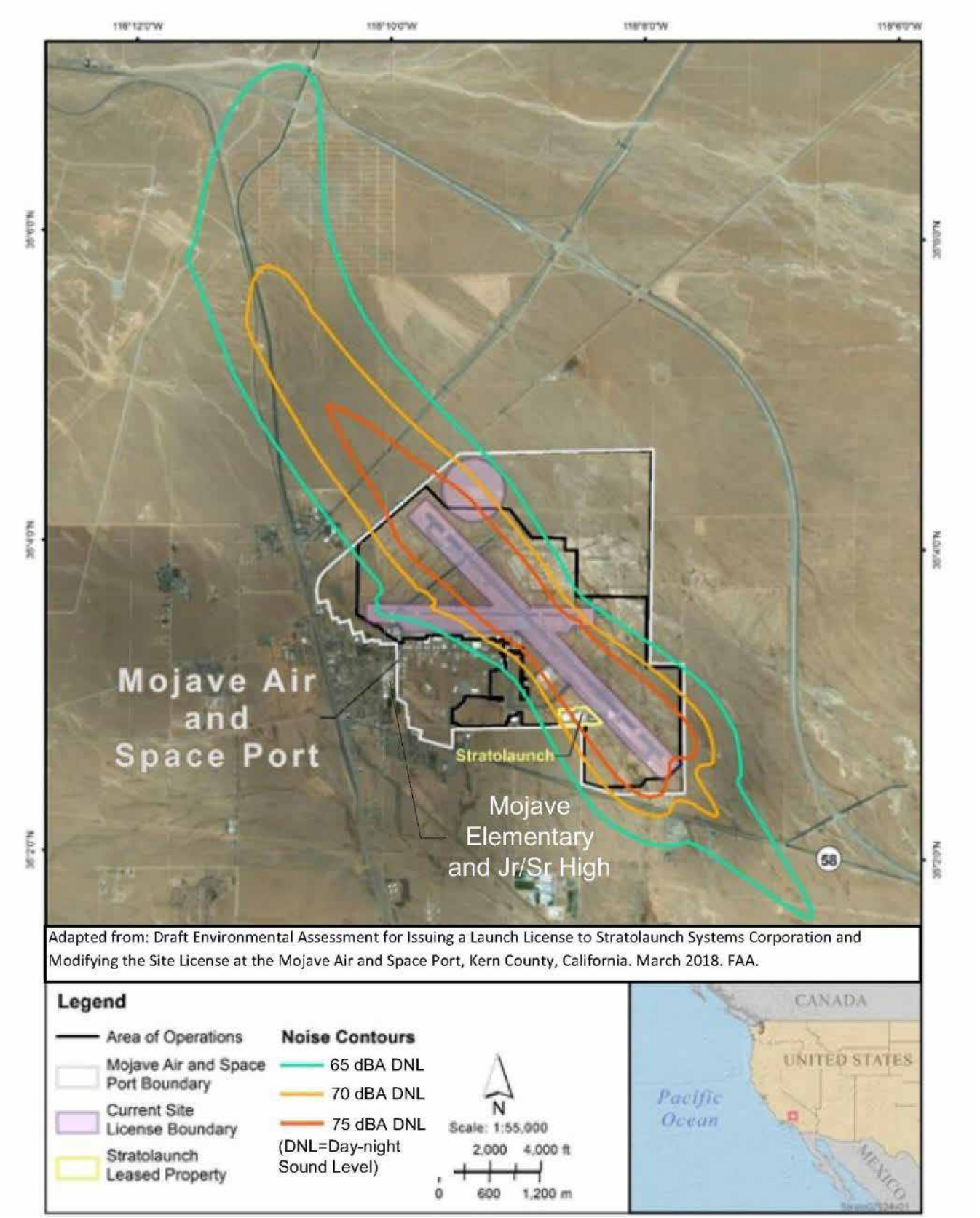

Figure 3-1. Noise Contours for the Mojave Air and Space Port

The contours generally follow aircraft takeoff and landing routes and represent the overall sound level that a sensitive receptor currently encounters from aircraft activity with nighttime activities penalized 10-dBA (i.e., DNL) (Kern County 2012).

VSFB

Noise sensitive land uses on and near VSFB include residential areas, hospitals, libraries, and schools. These sensitive receptors are in the cantonment area of VSFB, Lompoc, and Santa Maria. VSFB housing is more than 2 miles (3 km) from the main runway, and the City of Lompoc is approximately 6 miles (10 km) southeast and is the closest off-base community. Table 3-11 outlines the land use category and the estimated background noise levels for nearby areas (ANSI 2013).

Table 3-11. Estimated Background Noise Levels Near Vandenberg Space Force Base

Direction	Land Use Category	Background Noise (dBA)		
		L_{eq}		DNL
		Daytime	Nighttime	
South	Rural Quiet Residential	40	34	42
North	Light Industrial Commercial Quiet residential	52	53	47
East				

Source: ANSI 2013.

Notes: dBA = A-weighted decibels, L_{eq} = Equivalent Sound Level, DNL = Day-night Sound Level.

Noise at VSFB is primarily produced by automobile and truck traffic, fixed-wing aircraft operations, and trains passing through the base. Existing noise levels on VSFB are generally low, with higher levels occurring near industrial facilities and transportation routes. Other less frequent, but more intense, sources of noise are from missile and space launches at VSFB. These currently include Minuteman, Ground Based Interceptor, and Taurus launches from the north base area, as well as Minotaur, Atlas V, Falcon-9, and Delta IV launches from the south base area. Depending on the launch vehicle and location on the base, resulting noise levels in Lompoc may reach an estimated maximum unweighted sound pressure level of 100 dB, and Santa Maria may reach 95 dB for about 20 seconds per launch. Because launches from VSFB occur infrequently, and the launch noise generated from each event is of very short duration, the average (CNEL) noise levels in the nearby areas are not affected (USAF 1998, 2000, 2006; FAA 2017).

Although rocket launches and reentering vehicles from VSFB often produce sonic booms, the resulting overpressures are normally over the ocean in the direction of the launch or reentry azimuth, and generally do not affect the coastline. However, some southern launches from south base can cause sonic booms to occur over portions of the Channel Islands (USAF 1995, 1998, 2000).

3.7 SOCIOECONOMICS

3.7.1 Definition of the Resource

Socioeconomic resources include the population, income, employment, and housing conditions of a community or affected environment.

3.7.2 Affected Environment

MHV

In 2019, the U.S. Census Bureau estimated the Mojave population at 4,699 (U.S. Census Bureau 2019). Approximately 54.5 percent of the Mojave population identifies as White, 23.1 percent identifies as Black or African American, 3.3 percent identifies as American Indian and Alaska Native, 0.9 percent identifies as Asian, 2.0 percent identifies as Native Hawaiian and Other Pacific Islander, and 13.9 percent identifies as some other race. Approximately 40.3 percent of the population identifies as Hispanic or Latino of any race (U.S. Census Bureau 2019). The median household income is estimated to be $27,333 with 34.8 percent of the population living in poverty. The employment rate in Mojave is approximately 42.7 percent. Approximately 75.7 percent of the population is a high school graduate or higher. The median housing value is $105,800 in Mojave, and there are 1,930 total housing units (U.S. Census Bureau 2019).

In 2019, the U.S. Census Bureau estimated the Kern County population at 887,641. California City and Rosemond, with 13,826 and 20,851 residents respectively, are the principal communities to the northeast and south of Mojave. Bakersfield is a large city to the northwest of Mojave with a population of 377,917 (U.S. Census Bureau 2019).

The Bureau of Labor Statistics reported that the Bakersfield area had 347,400 employed civilians in August 2021. Of those employed, there were approximately 260,600 non-agricultural wage and salary employments, including the professional and business services industry which accounted for 26,900 jobs. The August 2021 unemployment rate of the area was approximately 10 percent, above the state average of 7.5 percent and national average of 5.2 percent (Bureau of Labor Statistics 2021a).

VSFB

VSFB is the largest employer in Santa Barbara County with an employment level of over 6,800 people as of 2014 (USAF 2014). In 2019, the U.S. Census Bureau estimated the Santa Barbara County population at 444,829. Santa Maria and Lompoc, with 106,224 and 43,232 residents respectively (U.S. Census Bureau 2019), are the first and third largest cities in the county (California Department of Finance 2022).

The Bureau of Labor Statistics reported August 2021 results for the Santa Barbara-Santa Maria area of 208,600 total civilians employed. Of those employed, there were approximately 184,800 non-agricultural wage and salary employments, including the construction-related industry, which accounted for 9,100 jobs. The August 2021 unemployment rate of the area was approximately 5.5 percent, below the state average of 7.5 percent and above national average of 5.2 percent (Bureau of Labor Statistics 2021b).

3.8 SOLID WASTE MANAGEMENT

3.8.1 Definition of the Resource

Solid waste management includes the waste streams that would be generated by a project and evaluates how these wastes would impact environmental resources. Solid waste management also evaluates the impacts on waste handling and disposal facilities that would likely receive the wastes.

3.8.2 Affected Environment

The affected environment for solid waste management is the regulatory environment for solid waste management issues established to promote pollution prevention involved with the Proposed Project. The affected environment of potential impacts to Solid Waste Management as a result of the Proposed Project encompasses the MHV, VSFB, and SNI wastesheds, which may

be impacted by increased solid waste generation during operations of the Stratolaunch Talon-A program. Current California Solid Waste regulations require 50 to 75 percent diversion of solid waste including construction and demolition (C&D) debris waste materials from landfills. In 1989, the California Integrated Waste Management Act (Assembly Bill 939) mandated a 50 percent reduction of the quantity of solid waste disposed of in California landfills from a 1990 baseline. The 50 percent reduction was to be accomplished by 1 January 2000. The State of California passed Senate Bill 1374, amending the Public Resources Code, Section 42912, which addresses the issue of C&D debris, diversion requirements, and the development of a model ordinance to be implemented by local jurisdictions (e.g., Santa Barbara County, Kern County). AFMAN 32-7002, Environmental Compliance and Pollution Prevention, directs the Base Civil Engineer to "make every practical effort to maximize diversion of non-hazardous solid waste and C&D debris" and identifies the key policy document referenced by the AFMAN is DoDI 4715.23. The DoDI prescribes the following integrated solid waste management hierarchy:

a. Source reduction.
b. Sustainable procurement of goods and services.
c. Reuse of materials.
d. Donation.
e. Recycling.
f. Composting and mulching.
g. Waste to energy recovery.
h. Incineration.
i. Landfilling.

Numerous types of hazardous materials, which generate hazardous wastes, are currently used at MHV. The hazardous materials at MHV mostly consist of airplane fuels and rocket propellants (i.e., oxidizers and fuels). Other hazardous materials used, generated, and/or stored onsite include acetylene, paints, used motor and hydraulic oil, gear lubricant, and hydraulic fluid (FAA 2012). Solid waste is also generated at MHV from onsite employees. Hazardous and solid wastes at MHV are managed in accordance with applicable federal, state, and local laws and regulations as well as AFMAN 32-7002, Environmental Compliance and Pollution Prevention.

Waste at MHV, VSFB, and SNI are managed in accordance with applicable federal, state, and local laws and regulations. VSFB is required to track all materials going off-base for diversion, recycling, or disposal. VSFB must report the weight (in tons), the type of material, and the destination to the State of California. Additionally, any materials recycled on-base by processes other than the base landfill must be reported to the SLD 30/CEI Solid Waste Manager at least quarterly, with copies of weight tickets and receipts provided. Stratolaunch would transport solid waste via a waste hauler to their designated disposal facility. The party/unit responsible for the diversion, disposal, or recycling reports the information to the Solid Waste Manager. Solid waste diversion and disposal requirements are documented in the VSFB Integrated Solid Waste Management Plan (ISWMP) (USAF 2018). Solid waste at VSFB is hauled offsite through a contract with a waste hauler to an offsite facility. The waste hauler is responsible for items e. through i. of the hierarchy above, to meet the final landfill disposal site diversion requirements in accordance with the VSFB ISWMP.

The Navy Region Southwest Regional ISWMP documents NBVC's comprehensive approach to managing solid waste and includes waste prevention, reuse, recycling, composting, waste to energy conversion, and disposal requirements (NAVFAC EXWC 2014).

Stratolaunch would comply with all solid and hazardous waste regulations.

3.9 TRANSPORTATION

This section provides a definition of transportation as a resource area and a description of the existing transportation environment between VSFB and MHV, and the roadways at and around the study area.

3.9.1 Definition of the Resource

Roadway capacity is the ability of the road network to serve traffic demand, which is dependent on factors such as roadway width, number of lanes, intersection control, and other physical factors. Traffic volumes are reported as average daily traffic (ADT), which represents the number of vehicles averaged over a daily period.

3.9.2 Affected Environment

The affected environment for transportation resources is the access roadways to and between MHV and VSFB, including Highway 101, State Route (SR) 1, SR135, SR166, SR223, SR58, and roads within MHV and VSFB. Existing conditions of roadways that would be used under the Proposed Project are evaluated based on roadway capacity and traffic volume.

The primary access routes to MHV from VSFB are SR58 and SR166. Starting at VSFB, SR1 provides access to Santa Maria to the northeast and Santa Barbara to the southeast. SR135 connects SR1 with Highway 101. Highway 101 is a four-lane divided highway that connects northern and southern California. SR166 meets Highway 101 north of Santa Maria. SR166 is a two-lane east-west connection from Highway 101 to Interstate 5 south of Bakersfield. SR99 parallels Interstate 5 connecting SR166 with SR223, both two-lane undivided highways. SR223 is also an east-west corridor that leads to SR58 south of Bakersfield. SR58 is a four-lane divided highway that runs east-west through Kern County, connecting Bakersfield with MHV to the south. The Stratolaunch facility on Riccomini Street is located just off SR58 from Airport Boulevard.

Access routes would also be used to transport recovered debris, or the Talon-A after performing an alternate landing at SNI, from commercial ports to MHV. Possible ports include the Port of Long Beach, Santa Barbara, San Pedro, or Hueneme.

Recovered debris would only be returned to MHV up to four times. Selected access routes, in addition to those already described, may include Interstate Highways 710 and 405, SR14, SR33, SR126, SR150, or SR154 and local roads commonly used to transport cargo from ports. Interstate Highways 710 and 405 are multi-lane divided highways that connect areas around metropolitan Los Angles. Cargo transported from the Port of Long Beach or San Pedro would use these routes to access SR14 to MHV. SR14 is eight to four lanes as it travels north from Los Angeles. Access routes from Santa Barbara or Port Hueneme would be SR1 or Highway 101 to two-lane SR150 or SR33. SR33 is a two-lane north-south connection to SR166.

Alternate landings at SNI would be unlikely with a frequency of no more than three landings per year. Alternate landings would require personnel to transit to SNI on existing daily flights or contracted airlift or sealift assets. Transporting the Talon-A and hazardous waste (such as propellant) back to the mainland from SNI would occur via barge through Port Hueneme. The routes described previously would be used to transport the Talon-A from Port Hueneme back to MHV (i.e., SR1 or Highway 101 to two-lane SR150 or SR33 that would connect to SR166).

3.10 WATER RESOURCES

3.10.1 Definition of the Resource

Water resources include surface water and groundwater and their physical, chemical, and biological characteristics. Surface water includes lakes, rivers, streams, wetlands, and other less common Waters of the U.S. Groundwater refers to water below the ground surface. This section

also considers industrial or hazardous waste management, as it applies to water resources. The Clean Water Act (CWA) establishes the structure for regulating discharges of pollutants to Waters of the U.S. The National Pollutant Discharge Elimination System (NPDES) program under the CWA requires a permit for the discharge of any pollutant to Waters of the U.S. from point and non-point sources. Wastewater from any discernible confined and discrete conveyances from which pollutants are or may be discharged are point sources. Stormwater runoff from industrial, municipal, and construction sites are non-point sources. The CWA and implementing USEPA regulations provide the authority and framework for state regulations. The SWRCB administers the NPDES program in California through the Porter Cologne Water Quality Act/California Water Code. The SWRCB and the Regional Water Quality Control Boards (RWQCBs) administer the NPDES Program for industrial activities, municipalities, and construction activities through stormwater General Permits. VSFB is in the jurisdiction of the Central Coast Regional Water Quality Control Board Region 3. SNI is in the jurisdiction of the Los Angeles Regional Water Quality Control Board Region 4.

3.10.2 Affected Environment

The affected environment for water resources includes those areas where surface water and/or groundwater may be potentially affected by the Proposed Project. The Proposed Project does not include any ground disturbance. All land-based operations would occur at existing facilities and runways on MHV, VSFB, and SNI. Therefore, MHV, VSFB, and SNI are outside the affected environment for water resources. The Talon-A separation test and expendable hypersonic flight impact areas in the Pacific Ocean make up the affected environment for water resources. These surface waters may have potential impacts from the residual propellant and Talon-A debris during the separation test and expendable hypersonic flight test. The ocean impact areas would occur between 14 nm (26 km) from the coast (including islands) and the extent of Warning Areas W532, W537, and W289 (Figures 2-2 and 2-3).

3.10.3 Marine Surface Water

Water quality objectives and implementation provisions were established in the California Ocean Plan (State Water Resources Control Board 2019) to protect the beneficial uses of California's marine waters. Beneficial uses include industrial water supply; water contact and non-contact recreation, including aesthetic enjoyment; navigation; commercial and sport fishing; mariculture; preservation and enhancement of designated Areas of Special Biological Significance; rare and endangered species; marine habitat; fish migration; fish spawning and shellfish harvesting (State Water Resources Control Board 2019). These criteria apply to territorial marine waters of the State and discharges outside waters of the state that could affect the quality of waters of the state. The Federal Submerged Lands Act of 1953 clarified the definition of waters of the state as 3 miles (5 km) from the coast and 3 miles (5 km) around any islands lying off the coast. The USEPA has also established the National Ambient Water Quality Criteria to protect human health and welfare and aquatic life from pollutants in freshwater and marine surface Waters of the U.S. (USEPA 2021e). The salinity in the affected environment is typical for an oceanic environment, averaging 34 parts per thousand, although seasonal variations occur (Onuf 1987). Seawater pH levels range from 7.5 to 8.5. The surface water contains more dissolved oxygen than deeper water due to photosynthesis and wave mixing, ranging from 0.69 to 0.76 ounces per gallon. Dissolved oxygen levels below the surface range from 0.05 to 0.08 ounces per gallon (California Cooperative Fisheries Investigation [CALCOFI] 1982). Sea surface temperatures within the affected environment vary from approximately 54 to 72 °F (12 to 22 °C) (NOAA 2021), and also vary depending on upwelling, climatic conditions, and latitude (Tait 1980).

4.0 ENVIRONMENTAL CONSEQUENCES

This section presents the results of the analysis of potential environmental effects of implementing the Proposed Action and the No Action Alternative as described in Section 2 (Description of the Proposed Action and Alternatives). For each environmental component, anticipated impacts are assessed considering short- and long-term effects.

This EA considers the FAA's NEPA-implementing policy, FAA Order 1050.1F, so the FAA can adopt the EA, fully or in part, when conducting its environmental review of a license application for Stratolaunch launches and when proposing to make airspace changes. The FAA uses thresholds of significance that serve as specific indicators of significant impact for some resources (referred to as "impact categories" in FAA Order 1050.1F). FAA actions that would result in impacts at or above these thresholds require the preparation of an Environmental Impact Statement unless impacts can be reduced below threshold levels. The FAA has not defined significance thresholds for all resource areas; however, the FAA has identified factors that should be considered in evaluating the significance of potential environmental impacts (FAA Order 1050.1F, Paragraph 4-3.3). The FAA's significance thresholds are considered in the assessment of potential environmental consequences in this EA because the FAA is a cooperating agency in preparation of this EA and plans to adopt this EA to support its environmental review of Stratolaunch's license application under 14 CFR Part 450 and temporary airspace closure requests.

4.1 AIR QUALITY

This section analyses impacts on ambient air quality associated with the Proposed Project and the No Action Alternative. As provided in Exhibit 4-1 of FAA Order 1050.1F, an action would cause significant air quality impacts if pollutant concentrations were to exceed one or more of the NAAQS for any of the time periods analyzed or would increase the frequency or severity of any such existing violations. To determine significance under NEPA, Proposed Project concentrations were compared to the applicable NAAQS (see Table 3-1). General Conformity is a key component of the CAA strategy intended to ensure that federal actions are consistent with SIPs in achieving and maintaining the NAAQS.

4.1.1 Proposed Action

Air quality impacts from the USSF's Proposed Action of using its range assets and fulfilling its role as launch control authority would not occur. Similarly, no significant air quality impacts would occur from the FAA's Proposed Action of issuing a commercial space launch license or temporarily closing airspace since minimal additional emissions would be generated from aircraft departure delays. The FAA has rarely, if ever, received reportable departure delays associated with commercial space transportation launches. No air quality impacts would occur from the DoN's Proposed Action of authorizing use of SNI for the alternate landing of the Talon-A. These landings would not generate emissions as the Talon-A would unpowered glide to SNI in the event of an engine-out scenario early in the flight profile.

Criteria Pollutants and General Conformity

The Proposed Project would not have a construction phase, and, therefore, would not generate any construction emissions.

Carrier Aircraft transit flights, the safety Chase Aircraft, the maritime recovery vessel, a support generator to power a mobile trailer on VSFB (if needed), ground transportation of the Talon-A from VSFB to MHV, and employee daily commute at MHV would generate long-term emissions would be generated during Proposed Project operations. Operational emissions associated with aircraft, the power generator, and staff commute were calculated using the USAF's Air Conformity

Applicability Model (ACAM). Emissions associated with the ground transportation of the Talon-A from VSFB to MHV were calculated using guidance from the Air Force Civil Engineer Center 2020 Air Emissions Guide for Air Force Mobile Sources (AFCEC 2020). Emissions associated with the marine vessel were calculated using procedures prescribed in the USEPA Port Emissions Inventory Guidance: Methodologies for Estimating Port-Related and Goods Movement Mobile Source Emissions (USEPA 2020).

Operational emissions are presented in Appendix D and summarized in Table 4-1.

Table 4-1. Proposed Project Operation Emissions of Criteria Pollutants

Phase and Thresholds	CO	VOC	NO_x	SO_2	PM_{10}	$PM_{2.5}$	Pb
Operation Emissions (tpy)*	4.9	1.5	10.7	0.5	0.1	0.1	0.0
De minimis Threshold (tpy)	None	50	50	None	70	None	None
Significant?	No	No	No	No	No	No	No

Notes: CO = carbon monoxide, NO_x = nitrogen oxides (nitrogen oxide and nitrogen dioxide), Pb = lead, PM = particulate matter, SO_2 = sulfur dioxide, tpy = tons per year, VOC = volatile organic compound.

* Emissions that are significantly small appear as zero when rounded up to the nearest tenth.

As presented in Table 4-1, the Proposed Project would not exceed *de minimis* thresholds for any criteria pollutant. Emissions include the operation phase (long-term effects) of the Proposed Project. The Proposed Project emissions do not exceed general conformity *de minimis* thresholds, and are, therefore, not anticipated to contribute to NAAQS exceedances.

4.1.2 No Action Alternative

Under the No Action Alternative, Stratolaunch's testing and operations of the Talon-A hypersonic research testbed vehicle would not be performed, and current criteria pollutant emissions would remain unchanged.

4.2 CLIMATE

4.2.1 Proposed Action

Climate-related impacts from the USSF's Proposed Action of using its range assets and fulfilling its role as launch control authority would not occur. The FAA's Proposed Action of issuing a commercial space launch license or temporarily closing airspace may result in minimal additional GHG emissions generated from aircraft departure delays but would not have a notable impact on climate. No climate-related impacts would occur from the DoN's Proposed Action of authorizing use of SNI for the alternate landing of the Talon-A since these landings would be unpowered and would not generate GHG emissions.

FAA Order 1050.1F states that the FAA has not identified significance thresholds for aviation or commercial space launch GHG emissions, nor has the FAA identified specific factors to consider in making a significance determination for GHG emissions. There are currently no accepted methods of determining significance applicable to aviation or commercial space launch projects given the small percentage of emissions they contribute. CEQ has noted that "it is not currently useful for the NEPA analysis to attempt to link specific climatological changes, or the

environmental impacts thereof, to the particular project or emissions, as such direct linkage is difficult to isolate and to understand.[12]"

However, the FAA has developed guidance for considering GHGs and climate under NEPA, as published in the Desk Reference to Order 1050.1F (FAA 2020). An FAA NEPA review should follow the basic procedure of considering the potential incremental change in CO_2 emissions that would result from the Proposed Action and alternative(s) compared to the No Action alternative for the same timeframe and discussing the context for interpreting and understanding the potential changes. For such reviews, this consideration could be qualitative (e.g., explanatory text), but may also include quantitative data (e.g., calculations of estimated project emissions). This analysis is consistent with EO 13990, *Protecting Public Health and the Environment and Restoring Science to Tackle the Climate Crisis* (86 FR 7037), as well as EO 14008, *Tackling the Climate Crisis at Home and Abroad* (86 FR 7619).

Most of the GHG emissions occurring during operation of the Proposed Project would result from the Carrier Aircraft transit flights, the safety Chase Aircraft, the maritime recovery vessel, a support generator to power a mobile trailer on VSFB (if needed), and employee daily commute at MHV. GHG emissions calculations are presented in Appendix D and summarized in Table 4-2.

Table 4-2. Proposed Project Annual Operation GHG Emissions

Proposed Project Phase and Thresholds	GHG (MT)
Operation Emissions	1,702.9
Kern Proposed Threshold	22,680
Significance?	No
2019 State of California Emissions (x Million)	6,558.3
2019 U.S. Emissions (x Million)	412.2

Notes: GHG = greenhouse gas, MT = metric ton.

Climate change is a cumulative impact to which a project contributes as its GHG emissions combine with all other GHG sources globally. Thus, operation GHG emissions resulting from the Proposed Project would combine with GHG emissions from other sources within MHV and VSFB and together would add to the emissions of GHG in the Kern and Santa Barbara Counties and globally. GHG emissions from the Proposed Project would have a low probability of occurring at SNI, since an unpowered glide flight to SNI would only occur in the event of an engine-out scenario early in the flight profile. Emissions of GHGs resulting from unpowered glide flight would occur from ground and maritime transportation of the Talon-A to MHV. These emissions are accounted for in Table 4-2.

Emissions of GHG of the Proposed Project would originate mainly in Kern County. The EKCAPCD has proposed a threshold of 25,000 tons (22,680 MT) per year when determining individual and cumulative significance of project specific GHG emissions on climate change. This threshold is used as a reference to assess the level of impact of the Proposed Project.

Santa Barbara County and Ventura County APCDs have not adopted thresholds of significance for land use developments or mobile sources. Ventura County is considering adopting thresholds of significance consistent with those adopted by the South Coast Air Quality Management District (SCAQMD), which include an interim GHG threshold applicable for stationary sources (SCAQMD 2008). Under the interim thresholds of significance, a project can emit up to 10,000 MT per year

[12] U.S. Department of Transportation, Federal Aviation Administration – Office of Environment and Energy, 1050.1F Desk Reference, Version 2, Chapter 3, Climate, February 2020: Available: https://www.faa.gov/about/office_org/headquarters_offices/apl/environ_policy_guidance/policy/faa_nepa_order/desk_ref/.

of CO_2e before being deemed as having significant impacts. The Proposed Project does not exceed this threshold. Santa Barbara County has adopted a GHG threshold applicable to stationary source projects; these projects would not have a significant impact if their operational emissions of GHGs are less than 10,000 MT per year of CO_2e (SBCAPCD 2015). Emissions of GHGs resulting from operation of the Proposed Project would be below the 10,000 MT of CO_2e.

Factors affected by climate change in California, such as increased wildfires and sea level rise, have the potential to impact the study area. However, MHV and VSFB are evaluating management considerations and adaptation strategies to ensure that these factors would not impact the military mission, which includes the Proposed Action.

Airspace closures associated with the Proposed Project would result in additional aircraft emissions, mainly from aircraft being re-routed and expending more fuel. These emissions include CO_2, which is a GHG. Airspace closures would be required for all launch operations and would last for up to five hours. Closures would be relatively infrequent at first but would pick up in frequency as launch operations increase. Approximately two launches requiring airspace closures would occur in Year 1 (2022), four in Year 2, 20 in Year 3, 40 in Year 4, and 52 in Year 5. The added time that affected aircraft spend being re-routed would be short-term. In addition, the number of aircraft impacted per launch would not be expected to produce additional emissions that would have a notable impact on climate. Therefore, the increases in GHGs caused by short-term airspace closures during commercial space operations is not expected to result in significant climate-related impacts.

Overall, the Proposed Project is expected to produce a maximum of approximately 1,702.9 MT of CO_2e per year from its operation. Most of the operational emissions would occur in the Mojave area and are well below the Kern County's proposed significance threshold of 22,680 MT of CO_2e per year. Emissions of CO_2e in Ventura and Santa Barbara Counties are not anticipated to have a significant impact.

4.2.2 No Action Alternative

Under the No Action Alternative, Stratolaunch's testing and operations of the Talon-A hypersonic research testbed vehicle would not be performed and current GHG emissions would remain unchanged.

4.3 BIOLOGICAL RESOURCES

The USSF conducted Section 7 informal consultation with NMFS for federally listed species and designated Critical Habitat with the potential to be affected by the Proposed Project. The USSF determined that the Proposed Project ***"may affect, but is not likely to adversely affect"*** or would have ***"no effect"*** on federally listed species under NMFS' purview. In addition, the USSF determined that the Proposed Project would have ***"no effect"*** on designated Critical Habitat. On 4 February 2022, the NMFS concurred with the USSF's conclusions that the Proposed Project is not likely to adversely affect NMFS ESA-listed species and/or designated Critical Habitat.

The USSF determined that no effect to federally listed species or Critical Habitat administered by the USFWS would occur due to the Proposed Project.

The USSF conducted consultation with NMFS for EFH, HAPCs, and federally managed fish species. The USSF determined that the Proposed Project would not have adverse effects on EFH, HAPCs, or federally managed species, and that potential impacts to these resources would not exceed the minimal threshold (67 FR 2343-2383). NMFS concurred on 4 February 2022 that the Proposed Project would result in impacts that are no more than minimal.

ARCTOS used PCBoom (version 6.6, Page et al. 2010), an FAA-approved model, to predict the location and magnitude of the sonic boom generated during launch operations (ARCTOS 2021a,

2021b). Sonic boom levels are discussed below to assess impacts to biological resources. These levels are from the ARCTOS (2021a) noise study and ARCTOS (2021b) sonic boom contours for runway operations for the Proposed Project.

4.3.1 Significance Criteria

Significant impacts to biological resources depend on the extent or degree to which implementation of an alternative would result in the following:

- Unmitigable loss of important quantities of wildlife habitat;
- Impacts to special-status species; or
- Impacts to EFH, HAPCs, or federally managed fish species.

Impacts to biological resources would occur if special-status species or their habitats would be affected directly or indirectly by the Proposed Project. Impacts to biological resources can include loss, reduction, degradation, disturbance, or fragmentation of native species populations or their habitats. These impacts can be short- or long-term, such as short-term noise or long-term impacts from the loss of wildlife habitat. FAA Order 1050.1F states that a significant impact on biological resources would occur if the USFWS or NMFS determines that the action would be likely to jeopardize the continued existence of a federally listed threatened or endangered species or would result in the destruction or adverse modification of federally designated Critical Habitat.

4.3.2 Proposed Action

No impacts to terrestrial special-status species would occur due to the Proposed Action. The Proposed Action is not likely to adversely affect NMFS ESA-listed species and/or designated Critical Habitat and will not exceed the minimum threshold for EFH, HAPCs or federally managed species under NMFS prevue.

No impacts to biological resources from the USSF's Proposed Action of using its range assets and fulfilling its role as launch control authority would occur. No significant impacts to biological resources would occur from the FAA's Proposed Action of issuing a commercial space launch license or temporarily closing airspace; 0.5 psf or less sonic booms would be generated during launch operations over land, would be temporary and short in duration, and would not result in impacts to biological resources. Similarly, no impacts to biological resources would occur from the DoN's Proposed Action of authorizing use of SNI for the alternate landing of the Talon-A since the small number of Talon-A glide landings on SNI would have a negligible effect on bird strikes and no noise would be generated.

Biological resources analyzed in this EA include terrestrial and marine wildlife, special-status terrestrial and marine wildlife, marine reserves and conservation areas, and EFH and marine habitat. Terrestrial and marine wildlife are discussed in the context of special-status terrestrial and marine wildlife since potential impacts would be equivalent.

Special-status Terrestrial Wildlife Species

Pre-flight Ground Operations at MHV, Alternate Landing at SNI Runway, Post-flight Ground Operations

All pre-flight, runway landing, and post-flight activities would occur at established facilities on MHV, VSFB, or SNI and would be conducted in accordance with existing operations. Noise levels would be consistent with current uses at these facilities. No ground disturbance is included as part of the Proposed Project. To ensure that invasive species are not introduced to SNI during landing operations, pre-flight inspections of the Talon-A would be conducted as part of Stratolaunch's quality control program and in compliance with the NBVC SNI Biosecurity Plan (DoN 2018). In addition, the Talon-A would be stored in a hangar at MHV, all pre-flight operations

would occur on pavement, and payloads would be sealed in a clean room before use, which would further minimize biosecurity risks. While alternate landing of the Talon-A on the SNI runway may increase the risk of Bird Airstrike Hazards and aircraft strikes on avian and bat species, only up to three events per year of this activity would occur. Between eight and 12 roundtrip commuter flights from NBVC Point Mugu to SNI are currently conducted daily from Monday through Friday (DoN 2018). The increase of up to three Talon-A glide landings per year on the SNI runway would be insignificant compared to existing operations and would have a negligible effect on bird strikes. No impact to special-status terrestrial wildlife species would occur as a result of these activities.

Carrier Aircraft Transit Flights, Captive Carry of Talon-A, Talon-A Glide Flights

The Carrier Aircraft transit flights, captive carry tests, and glide flights would have no potential effects that could impact terrestrial biological resources. No hazardous materials would be deposited on land and no sonic booms would be generated. The glide flights would land on established runways and would be conducted in accordance with existing operations. In addition, the Carrier Aircraft transit flights would occur at a high altitude and would not be heard by terrestrial species. Therefore, no impacts to special-status terrestrial wildlife species would occur as a result of these activities.

Talon-A Separation Test and Recovery

A sonic boom would not be generated during the separation test because the Talon's rocket engines would not be operated. Therefore, no impact to special-status terrestrial wildlife species would occur as a result of the separation test.

Expendable Talon-A Hypersonic Flight and Recovery

The sonic boom generated during expendable hypersonic test flight would be over water. There would be no impact to special-status terrestrial wildlife species as a result of the expendable hypersonic test flight.

Reusable Talon-A Launch Operations over BOA with Runway Landings

During launch operations over the BOA with runway landings, a 0.5 psf or less sonic boom would be generated over water or over land on the California coast or the NCI (ARCTOS 2021b). Figures 4-1A through 4-1H show the sonic boom contours for each trajectory. The highest sonic boom contour of 0.5 psf is located over water for all trajectories. The sonic boom contour associated with the flight trajectory with alternate landing option on SNI hits the California coast and the NCI at 0.1 psf (Figure 4-1H). For all trajectories, the sonic boom level of 0.5 psf represents when the Talon-A accelerates past the speed of sound, and then the sonic boom level falls to 0.1 psf or less. The higher sonic boom levels of 0.2 and 0.3 psf represent the subsequent deceleration when the Talon-A goes transonic for all trajectories. While the sonic boom could occur at different locations over the BOA and coast depending on the specific Talon-A trajectory, it would always be at levels of 0.5 psf or less on the coast and the loudest sonic boom contours would occur in very small areas. The number of flights would be relatively infrequent at first but would pick up in frequency as operations increase, including up to weekly events by Year 5. Approximately two launches with a sonic boom would occur in Year 1 (2022), four in Year 2, 20 in Year 3, 40 in Year 4, and 52 in Year 5.

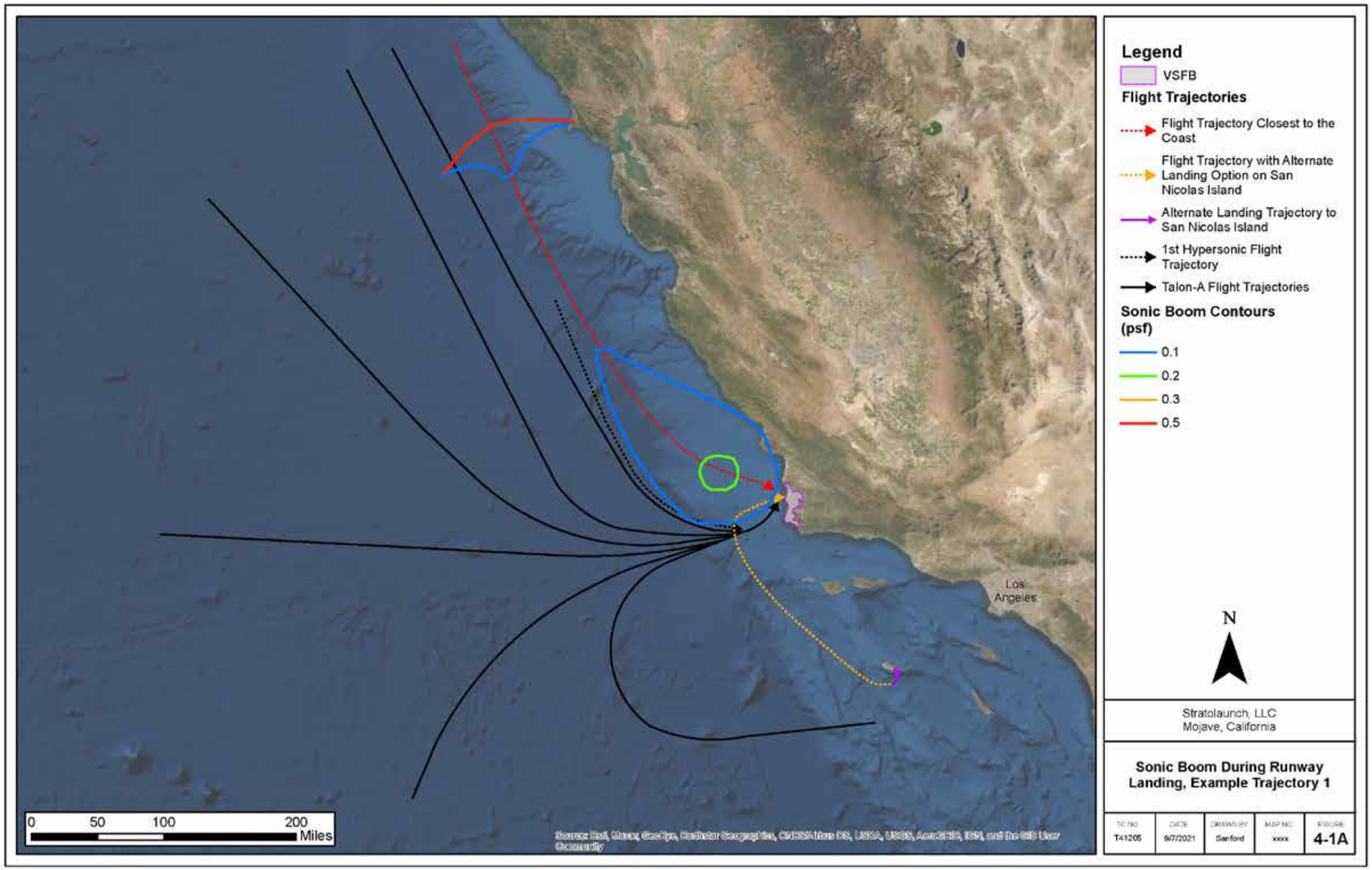

Figure 4-1A. Sonic Boom During Runway Landing, Example Trajectory 1

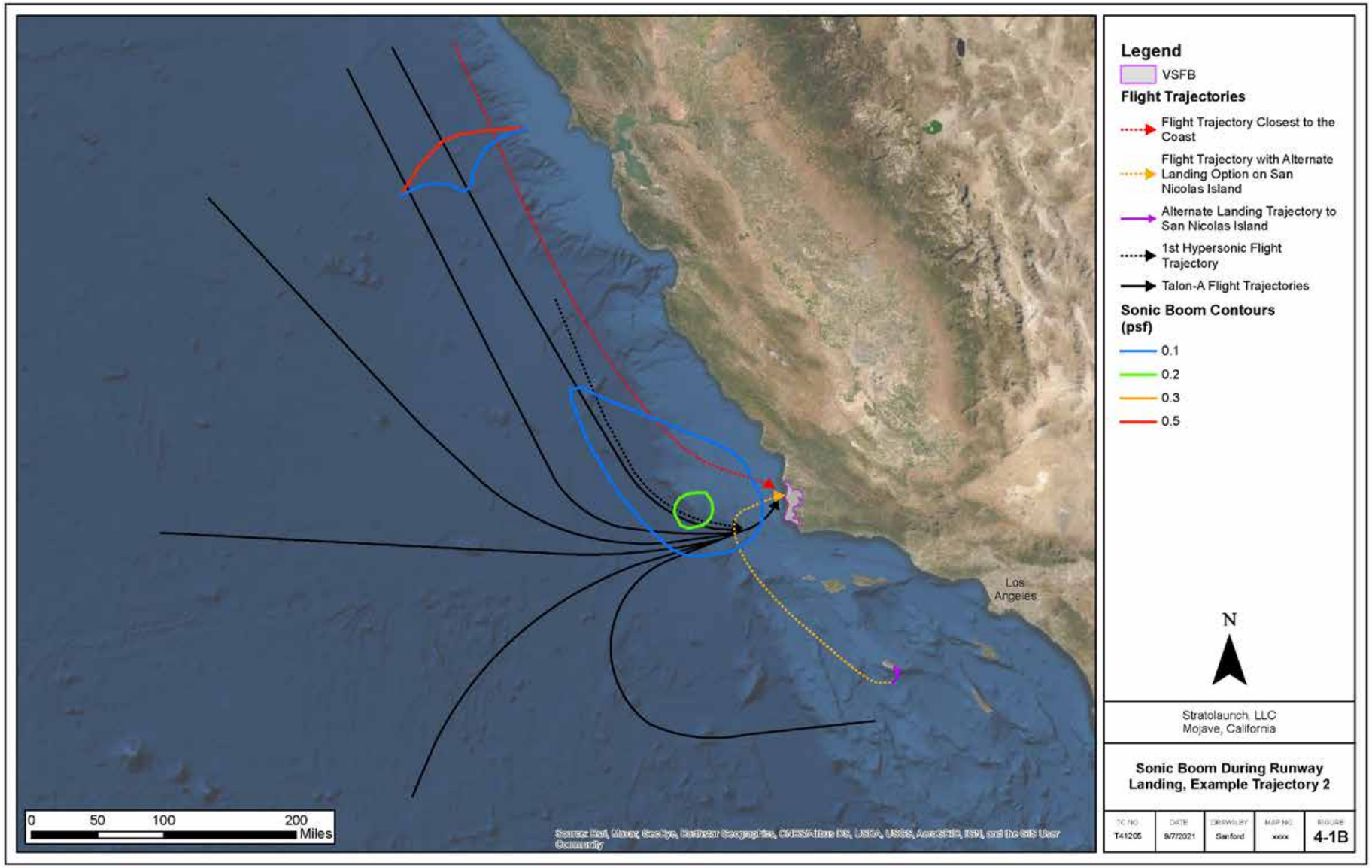

Figure 4-1B. Sonic Boom During Runway Landing, Example Trajectory 2

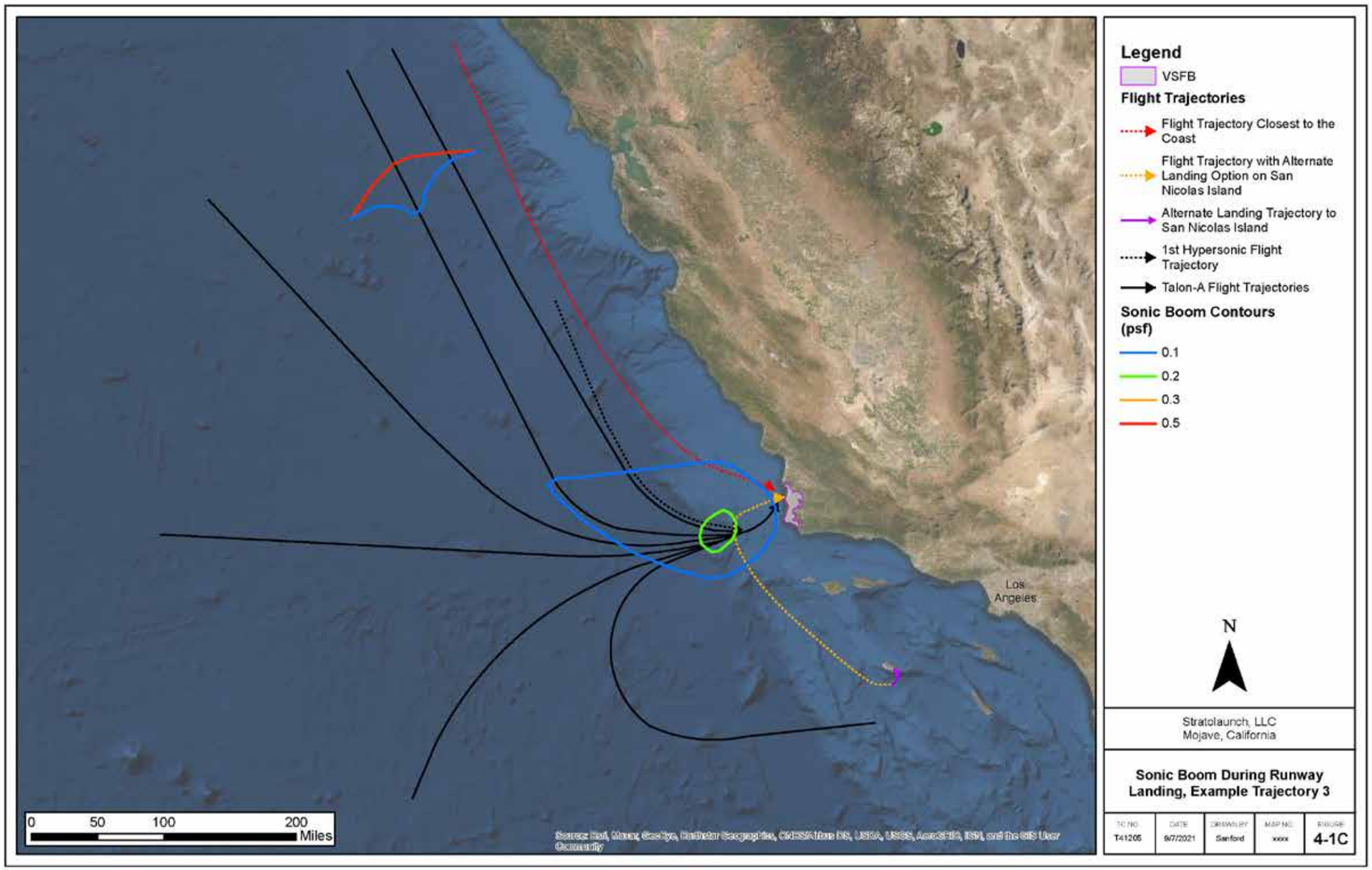

Figure 4-1C. Sonic Boom During Runway Landing, Example Trajectory 3

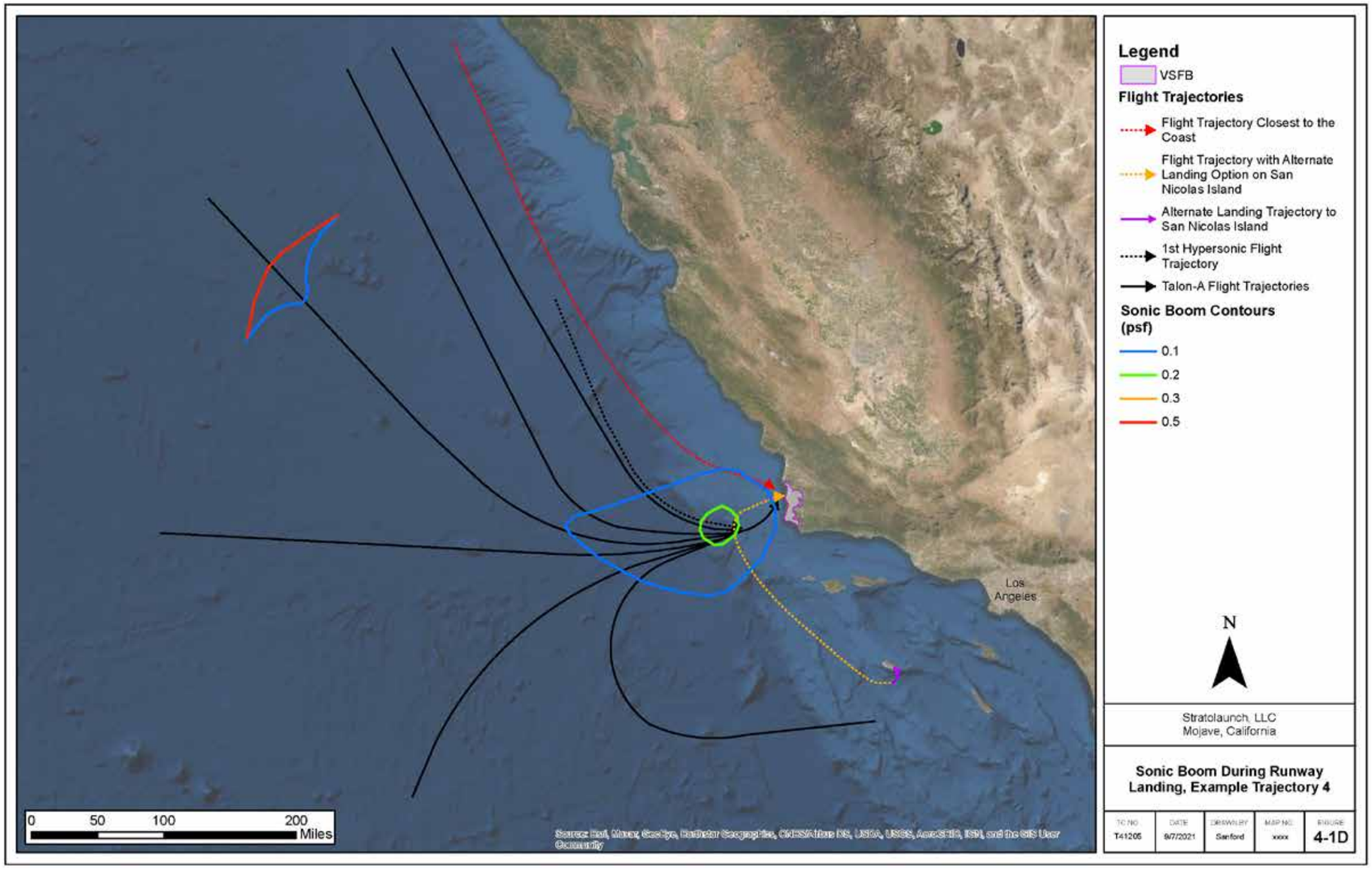

Figure 4-1D. Sonic Boom During Runway Landing, Example Trajectory 4

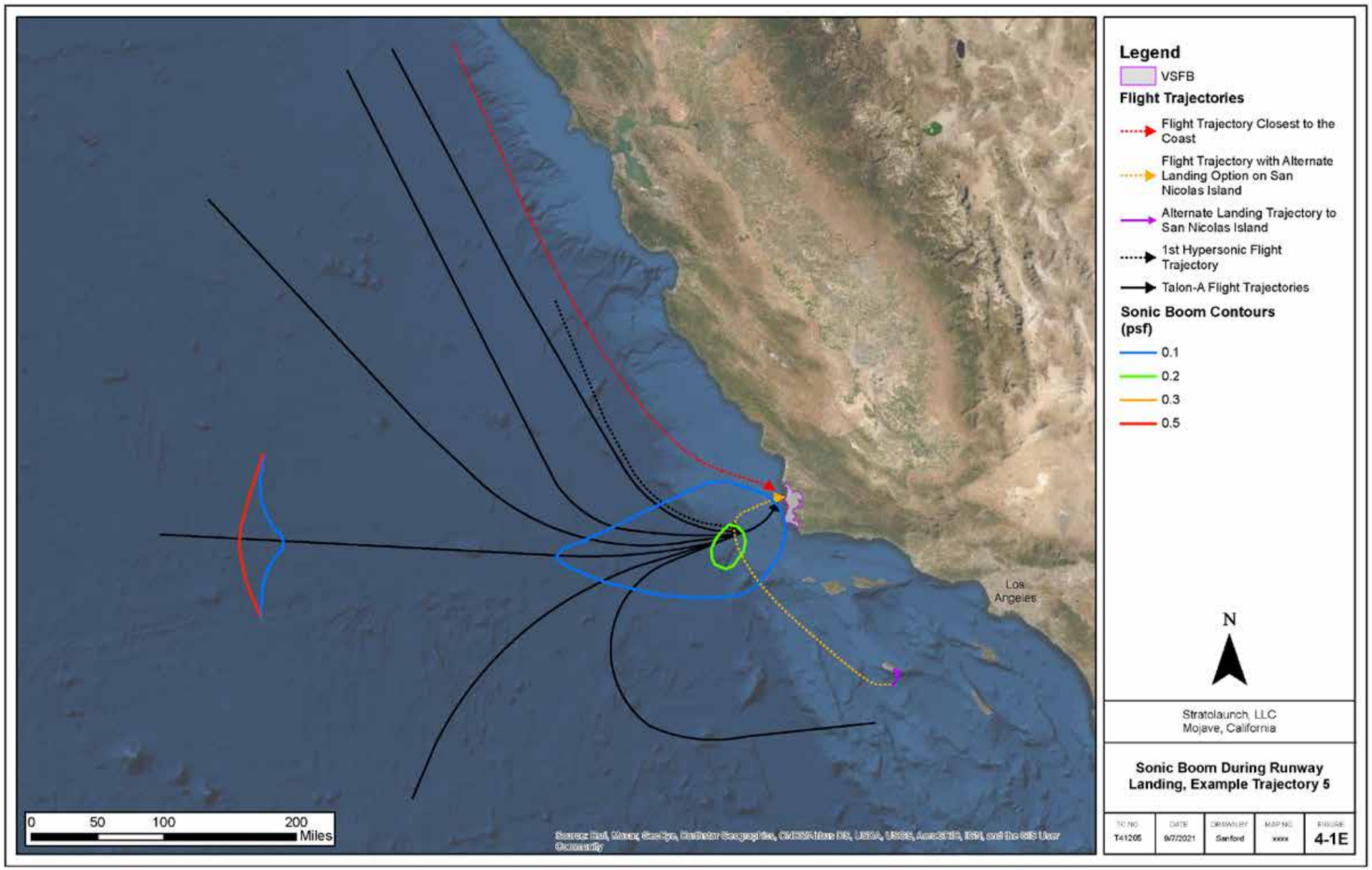

Figure 4-1E. Sonic Boom During Runway Landing, Example Trajectory 5

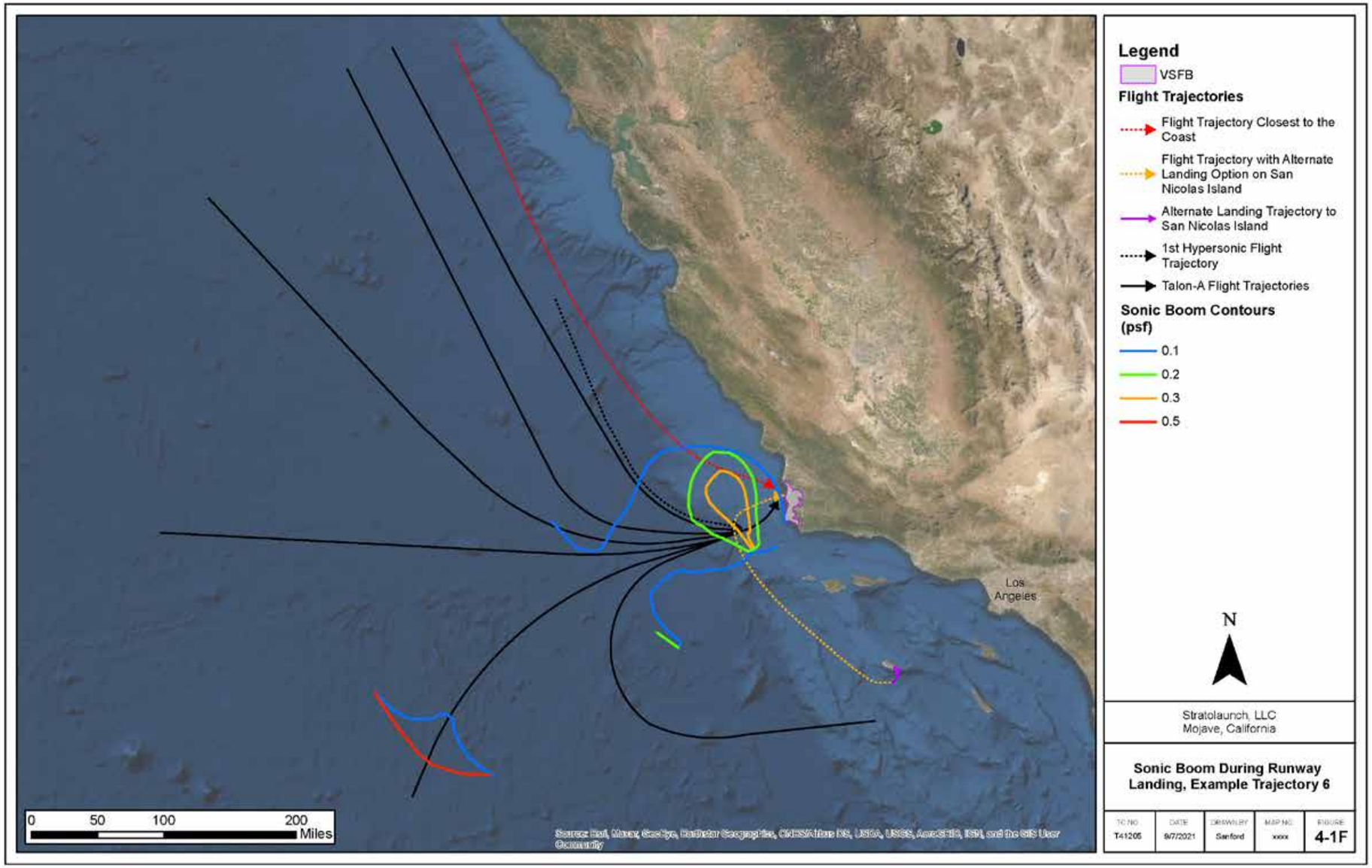

Figure 4-1F. Sonic Boom During Runway Landing, Example Trajectory 6

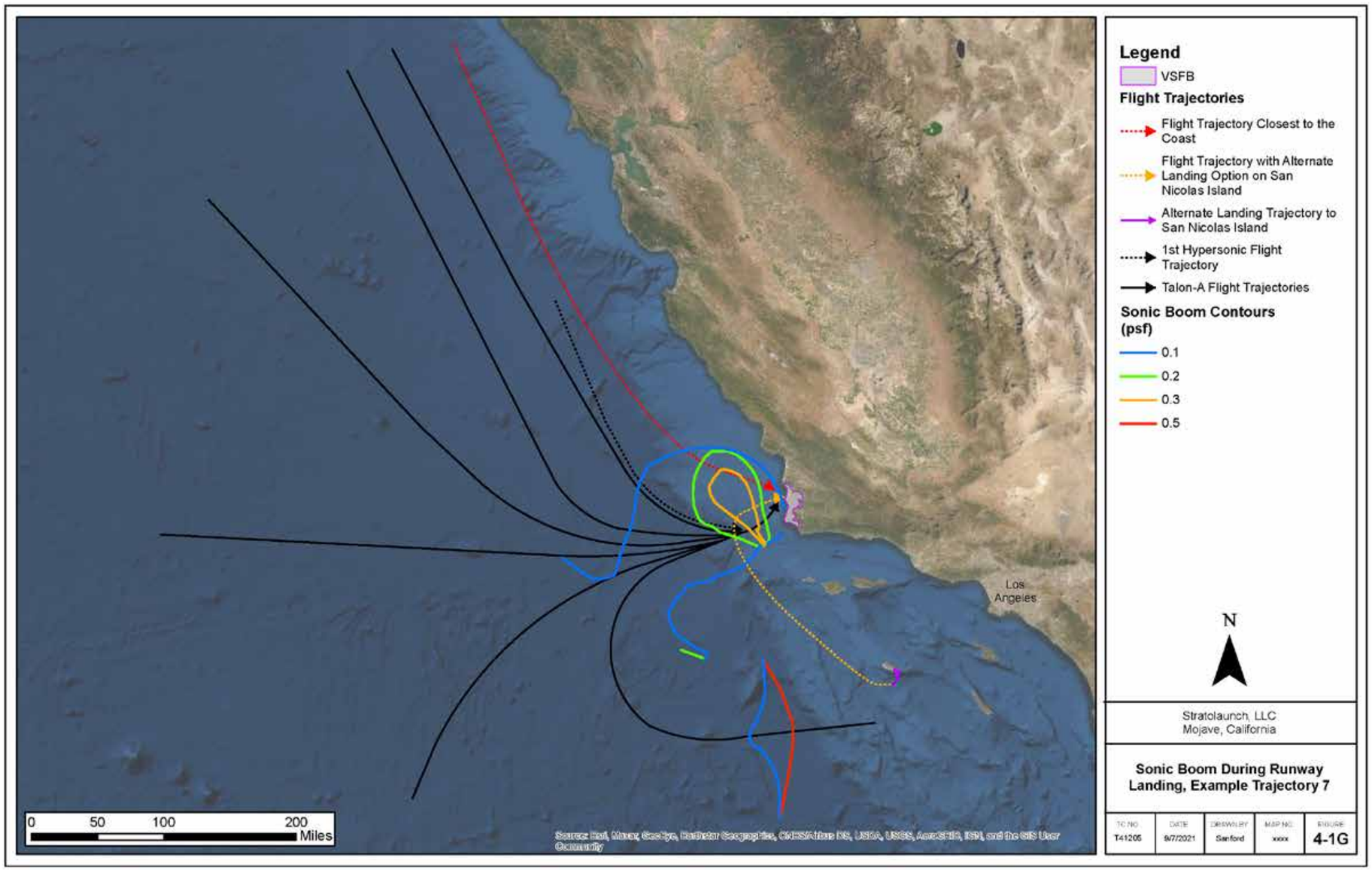

Figure 4-1G. Sonic Boom During Runway Landing, Example Trajectory 7

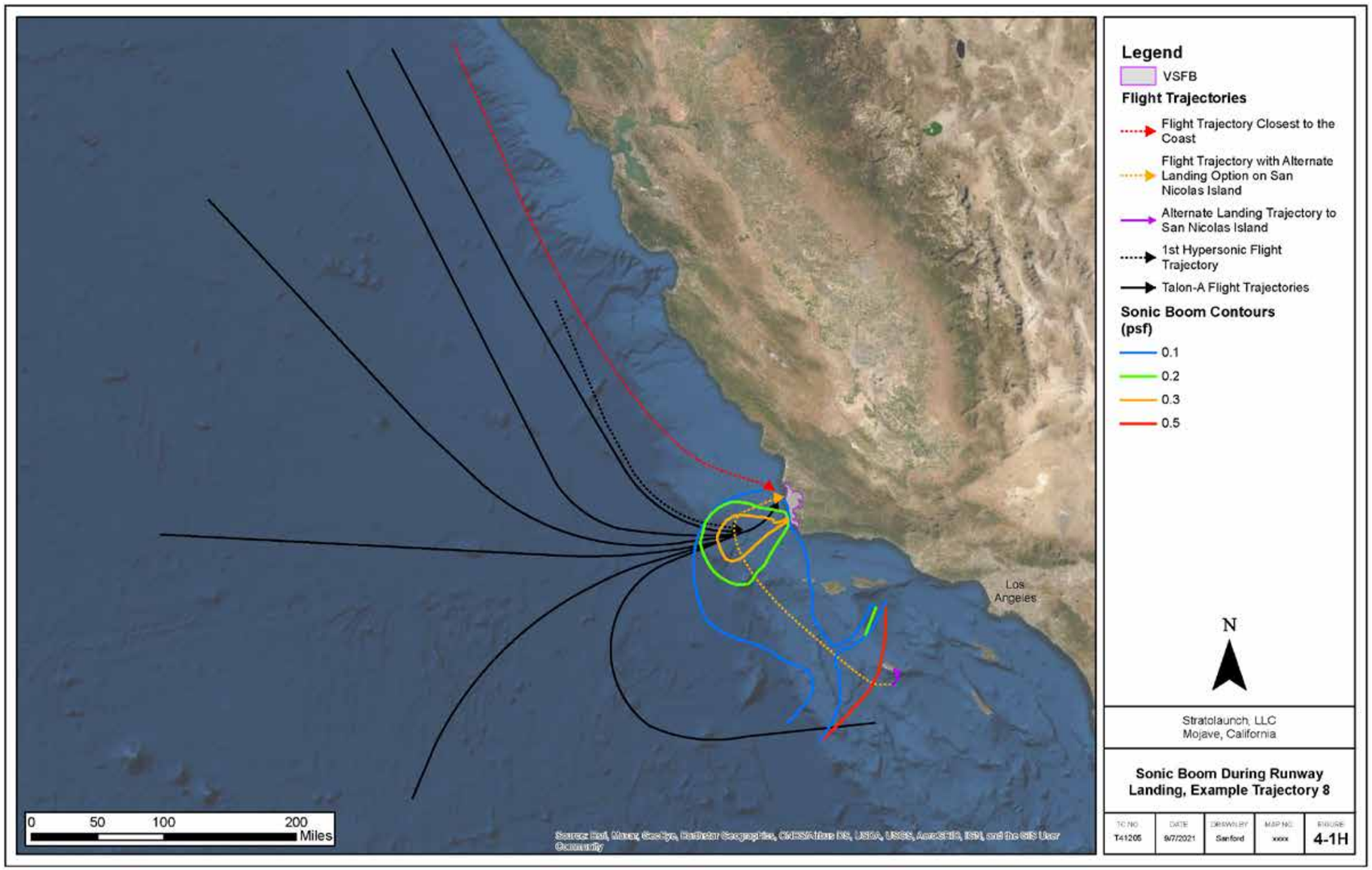

Figure 4-1H. Sonic Boom During Runway Landing, Example Trajectory 8

The majority of potential trajectories (6 out of 8 trajectories) would not produce sonic booms over land. Figures 4-2 and 4-3 show the potential Talon-A trajectories closest to the coast that would have potential sonic booms over land. During these trajectories, the highest sonic boom levels modeled over land would be 0.3 psf over a small portion of south VSFB and 0.5 psf over a small portion of land north of San Francisco. These low level sonic booms would resemble distant thunder (FAA 2002). Although there is limited data on sonic boom impacts to specific species, startle responses are not seen in humans as a physiological effect of a single sonic boom until they reach 0.6 psf or greater (FAA 2002). No evidence of impacts to CRLF has been observed after previous launch activities on VSFB, which includes sonic booms with much higher overpressures (SRS 2001). Therefore, the Proposed Project would have no effect on special-status terrestrial wildlife species. Moreover, there would be no visual impacts to California least tern or western snowy plover during the Proposed Action, including runway landing of the Talon-A on VSFB. Visual impacts to these species would not occur since the Talon-A would be above 5,000 ft (1,524 m) AGL when it crosses beach habitat to the west of the approach end of the runway. Therefore, there would be no impacts to special-status terrestrial wildlife species from launch operations over the BOA with runway landings.

Critical Habitat

There is no designated Critical Habitat at MHV; therefore, operations on MHV would have no effect on Critical Habitat. The sonic booms (0.5 psf or less) associated with this Proposed Project may occur over CRLF or western snowy plover Critical Habitat on the California coast (Figures 4-2 and 4-3). These low-level sonic booms would have no effect on Critical Habitat and are consistent with existing launch activities in the area. Critical Habitat would not be removed due to the Proposed Project and there would be no long-term reduction in the quantity or quality of Critical Habitat.

Special-status Marine Wildlife Species

Pre-flight Ground Operations at MHV, Alternate Landing at SNI Runway, Post-flight Ground Operations

All pre-flight, runway landing, and post-flight activities would occur at established facilities on MHV, VSFB, or SNI and would not occur near marine habitats or wildlife. Marine mammal species such as pinnipeds (seals and sea lions) may haul out on the coast of SNI that is over 3,000 feet from the existing SNI runway. The proposed alternate landing of the Talon-A on the SNI runway would be a glide approach that would not generate engine noise. While there may be a temporary visual effect from this activity, only up to three events per year would occur, each event would last for only a short duration, and marine mammals that haul out on NCI are likely habituated to the existing flights at the airfield. Therefore, no significant impacts to special-status marine wildlife species would occur as a result of these activities.

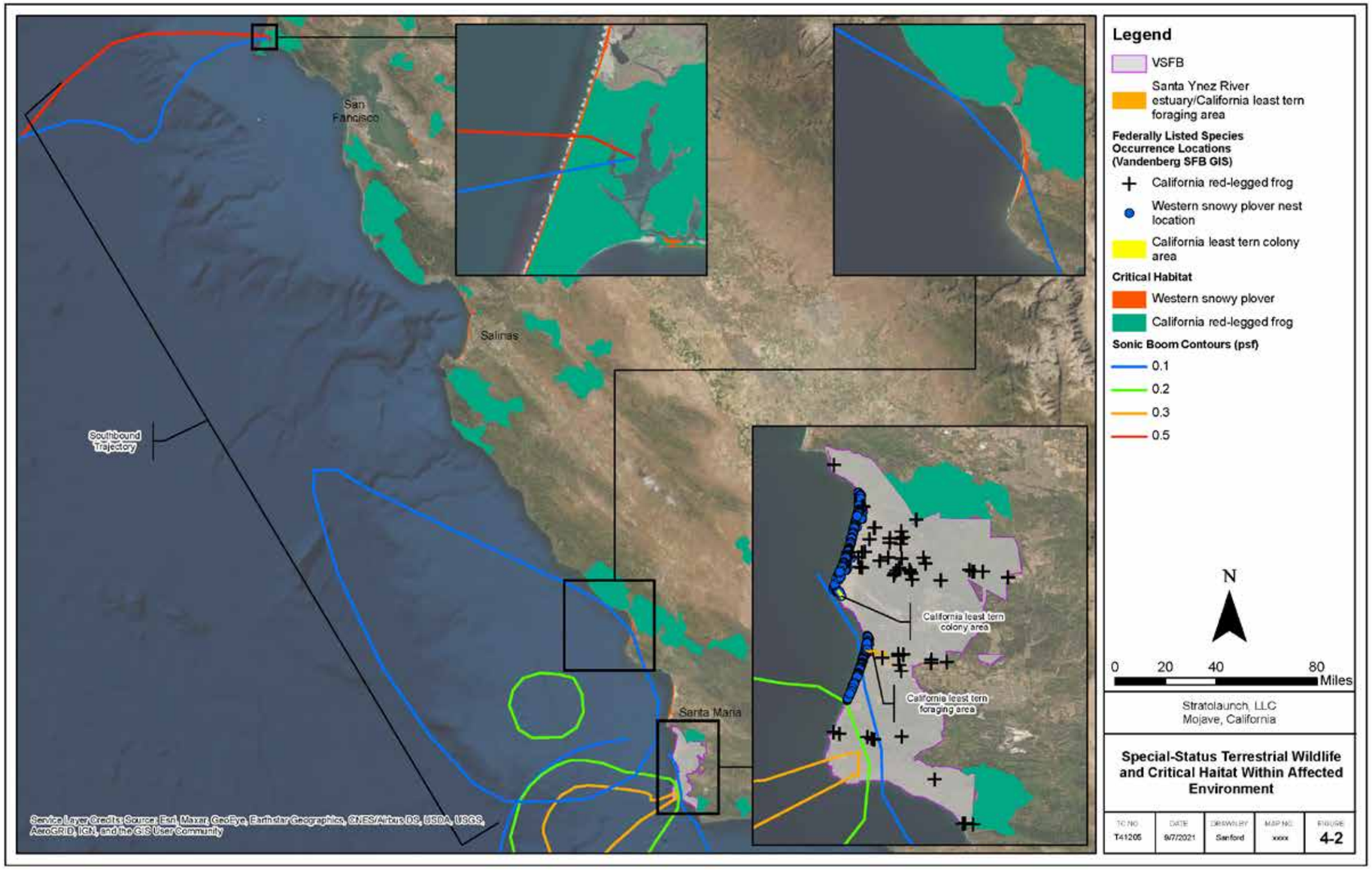

Figure 4-2. Special-status Terrestrial Wildlife and Critical Habitat Within Affected Environment

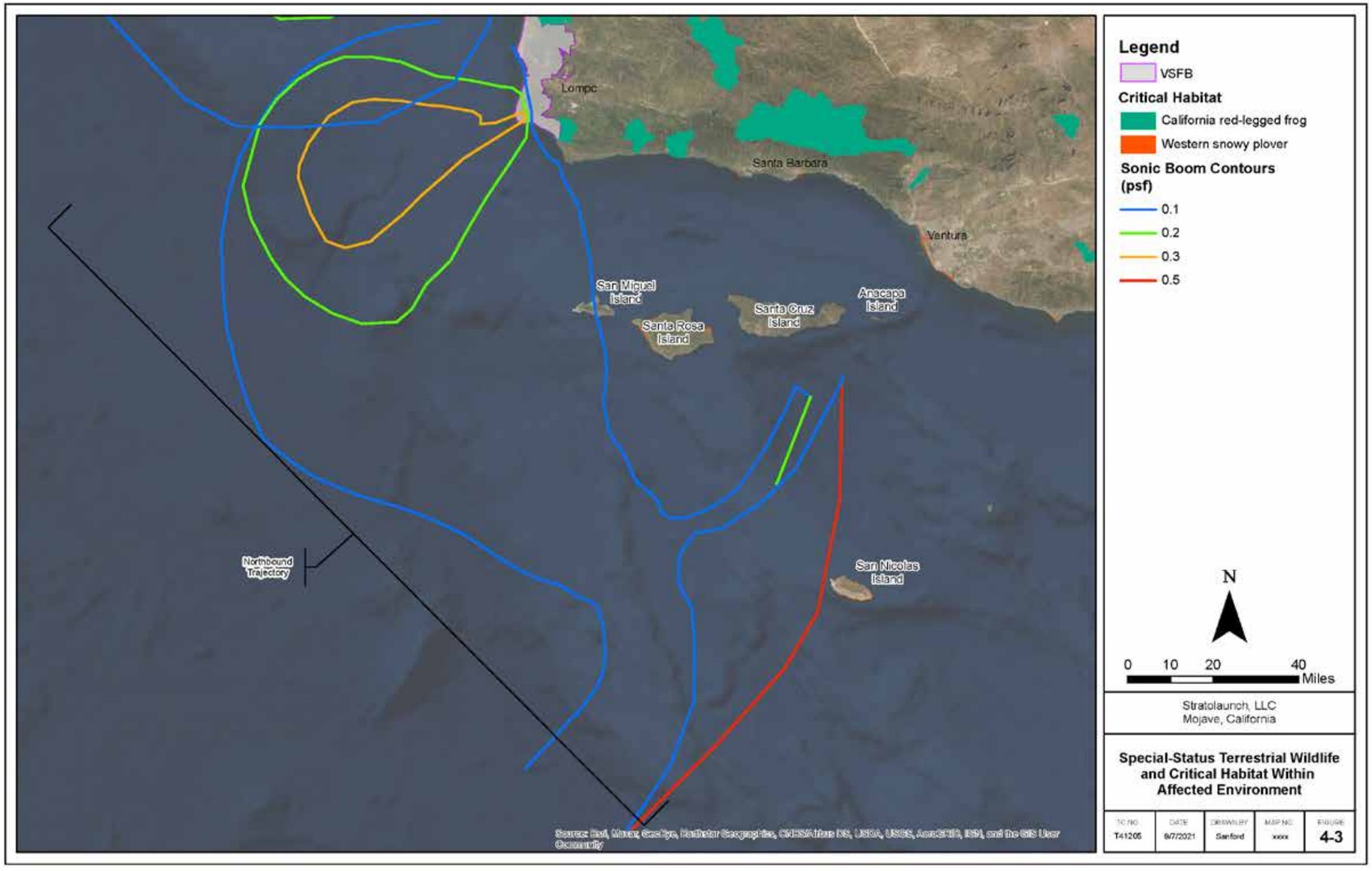

Figure 4-3. Special-status Terrestrial Wildlife and Critical Habitat Within Affected Environment

Carrier Aircraft Transit Flights, Captive Carry of Talon-A, Talon-A Glide Flights

The Carrier Aircraft transit flights, captive carry tests, and glide flights would have no potential effects that could impact biological resources. No ocean entry of the Talon-A vehicle or other debris would occur, no hazardous materials would be deposited on land or in the ocean, no sonic booms would be generated, and no vessel recovery operations would be required. The glide flights would land on established runways and would not occur near marine habitats or wildlife. In addition, the Carrier Aircraft transit flights would use an established transit corridor at a high altitude and would be consistent with current flight operations in the area. Therefore, no impacts to special-status marine wildlife species would occur as a result of these activities.

Talon-A Separation Test and Recovery

Potential impacts to special-status marine wildlife species as a result of the Talon-A separation test and recovery include ingestion of post-splashdown test article components, strike by the test article or fragments during ocean impact, vessel strike by ocean recovery vessel, and exposure to hazardous materials after ocean impact (i.e., calcium chloride, propylene glycol, colored dye solution). A sonic boom would not be generated during the separation test. The Talon-A test article is likely to break into fragments of various sizes after water impact during the separation test (Tables 2-3, 2-4, and 2-5). The potential debris impact area would be approximately 4,000 ft^2 (372 m^2) and would occur in an area with a seafloor depth of 414 to 15,203 ft (126 to 4,634 m). Approximately 97 percent of the debris by mass would be large fragments that sink or are too large to be ingested by marine species. The total quantity and mass of unrecovered floating debris is expected to be less than 41 fragments at an approximate total mass of less than 15 lbs.

Ingestion

At least half of the total test article fragments would sink to the seafloor. Special-status marine species in the affected environment predominantly forage in the water column and are unlikely to encounter a fragment after it has settled. While sperm whales and scalloped hammerhead sharks may forage in deep waters, these species are anticipated to have a low density in the affected environment (DoN 2017, 2020), and therefore are unlikely to occur. The density of all sea turtles in the affected environment is also expected to be low (DoN 2017, 2020). Foraging marine species at or near the ocean surface could ingest the smaller Talon-A fragments that float in the water. While approximately half the fragments would float, many fragments would be recovered within hours and are unlikely to be ingested since they would remain at the ocean surface only for a short period. In addition, the impact area (4,000 ft^2 [372 m^2]) represents a small fraction of total suitable habitat in the eastern Pacific for these species. Some species are typically not found, and the separation tests would be infrequent and low in number (up to two events over the course of 12 months; typically spaced 6 months apart), which limits the possibility of these species encountering the fragments. Therefore, the probability of special-status marine species encountering and ingesting Talon-A fragments is very unlikely.

Strike by Talon-A Test Article

Special-status marine species may be affected if struck by the Talon-A test article fragments during ocean impact. However, due to the relatively small size of the test article fragments compared to the open ocean, the limited number and frequency of the tests, and the expected low density of these species in the Pacific, it is highly unlikely they would be struck directly by the fragments. In addition, ocean surface impact from expended materials near VSFB has been occurring for decades with no known interactions with any of these species (FAA et al. 2021). Special-status fish species with potential to occur spend a majority of time below the shallow surface depths where the test article strike would occur. While marine mammals and sea turtles spend time basking and breathing at the ocean surface and may be at a slightly greater risk of

being struck, they similarly spend a majority of their time submerged underwater, making the risk extremely low. Therefore, a test article strike on special-status marine species is very unlikely. In addition, the USSF has determined that an IHA under the MMPA is not required based on the results of the take analysis, which calculated that no marine mammals would be taken by Level B harassment (i.e., potential behavioral disturbance) from falling Talon-A debris in the Pacific Ocean (Appendix B-2).

Vessel Strike

Ocean-going vessels would be used to recover the Talon-A test article and fragments after the separation tests. As such, recovery operations would have the potential to result in a vessel strike on special-status marine species that may occur near the surface of the water. These include the marine mammals and sea turtles. However, these species spend a majority of their time submerged underwater. The recovery vessel would be approximately 94 ft (29 m) long and 24 ft (7 m) wide and would be similar to vessels that are regularly used in the area. In addition, vessels would only be used for approximately one day during recovery operations, which would be infrequent and low in number, and operations would be focused within the relatively small test article recovery area (4,000 ft^2 [372 m^2]). Therefore, a vessel strike on special-status marine species is very unlikely.

Exposure to Hazardous Materials

Approximately 5 gallons of propylene glycol, 38 gallons of calcium chloride, and up to 25 lbs of dye solution would be released into the ocean upon impact. Release of these materials would occur up to two times over the course of 12 months. These materials would be immediately diluted by the large volume of seawater and rapidly disperse since they are all soluble in water. In addition, these materials are not classified as environmentally hazardous. It is unlikely that special-status marine species would be present in the small test article impact area, and consequently, it is also unlikely that they would be in the area exposed to these materials immediately after impact. Therefore, exposure of special-status marine species to hazardous materials is very unlikely.

Therefore, for the reasons described above, impacts to special-status marine wildlife species from the separation test and recovery would not be significant.

Expendable Talon-A Hypersonic Flight and Recovery

Potential impacts to special-status marine wildlife species as a result of the expendable hypersonic flight and recovery include ingestion of post-splashdown vehicle components, strike by the vehicle or fragments during ocean impact, vessel strike by ocean recovery vessel, exposure to hazardous materials after ocean impact (i.e., Jet-A fuel, colored dye solution), and exposure to sonic booms at levels of 0.4 psf or less over water. The Talon-A vehicle is anticipated to remain intact after water impact during the expendable hypersonic test flight and impact approximately 4,000 ft^2 (372 m^2). However, there is a small chance that the vehicle could break up into large fragments that sink or are too large to be ingested. No small or negligible fragments are anticipated during the expendable hypersonic test flight.

Ingestion

Even in the unlikely case of a severe breakup as described above for the separation test, special-status marine species in the affected environment predominantly forage in the water column and are unlikely to encounter a sunken vehicle fragment after it has settled. Foraging marine mammals, sea turtles, or fishes at or near the ocean surface could ingest the smaller Talon-A fragments that float in the water. Fragments that are recovered after impact are unlikely to be ingested since they would only remain at the ocean surface for a short period (i.e., hours). In

addition, the impact area represents a small fraction of total suitable habitat in the eastern Pacific for marine species, which reduces their likelihood of occurrence, and although the project is in the range of these species, some are not typically found. The tests would also only occur up to two times over the course of 12 months. Therefore, the probability of the special-status marine species encountering and ingesting Talon-A fragments is very unlikely.

Strike by Talon-A Vehicle

Special-status marine species may be affected if struck by the Talon-A vehicle or fragments during ocean impact. However, it is highly unlikely that these species would be struck directly by the vehicle or fragments. The vehicle is 30 ft (9 m) long, 15 ft (5 m) wide, and 6 ft (2 m) tall, which is a relatively small area of impact. Special-status fish species with potential to occur spend a majority of time below the shallow surface depths where the vehicle strike would occur. While marine mammals and sea turtles spend time basking and breathing at the ocean surface and may be at a slightly greater risk of being struck, they similarly spend a majority of their time submerged underwater, making the risk extremely low. Therefore, a vehicle strike on special-status marine species is very unlikely.

Vessel Strike

Ocean-going vessels would be used to recover the Talon-A vehicle (and fragments if breakup occurs) after the expendable hypersonic test flights. Since the vehicle is very unlikely to breakup during the expendable hypersonic test flight, and in the low chance that breakup occurs, is likely to break into fewer fragments as compared to the separation test, recovery operations would be brief (i.e., one day or less). The recovery vessel would be approximately 94 ft (29 m) long and 24 ft (7 m) wide and would be similar to vessels that are regularly used in the area. In addition, the special-status marine species spend a majority of time underwater, vessels would only be used for less than one day during recovery operations that would be infrequent and low in number (two times per year; typically spaced 6 months apart), and operations would be focused within the relatively small vehicle recovery area (4,000 ft^2 [372 m^2]). Therefore, a vessel strike on special-status marine species is very unlikely.

Exposure to Hazardous Materials

Up to 200 lbs of residual propellant (136 lbs/14.3 gallons of LOX, 62 lbs/9.3 gallons of Jet-A) would remain in the Talon-A tanks during ocean impact of the expendable hypersonic test flight. In the event that the fuselage ruptures on ocean impact, approximately 10 gallons of Jet-A fuel would be released into the ocean during the test flights, which would be infrequent and low in number. Up to 25 lbs of dye solution, which is not environmentally hazardous and would dissolve in water, would also be released upon impact. Jet-A fuel released into the ocean would evaporate or naturally disperse within a day or less, and the rapid evaporation would reduce the exposure to aquatic organisms (NOAA 2019). In addition, it is extremely unlikely that special-status marine species would be present in the small vehicle impact area, and consequently, it is also unlikely that they would be in the area exposed to the materials listed above immediately after impact. Therefore, exposure of special-status marine species to hazardous materials is very unlikely.

Sonic Boom

During the expendable hypersonic test flight, a sonic boom would be generated over water at levels of 0.38 psf or less (Figure 4-4), which would be less than that of a thunderclap (approximately 1 psf). In addition, the 0.35 psf and 0.30 psf sonic boom contours would occur in very small areas. Acoustic energy from in-air noise (e.g., sonic booms) is not expected to effectively cross the air/water interface (Richardson et al. 1995), and is therefore not expected to affect marine species underwater. USAF research has confirmed that there is no risk of harassment from in-air noise for special-status marine species underwater (USAF Research

Laboratory 2000). Since sonic booms would not be generated over land during the expendable hypersonic flight, marine mammal or sea turtle haul-outs would not be affected by in-air noise. In the unlikely event that a marine species is present at the surface of the water within the sonic boom footprint, the maximum overpressure would be 0.38 psf, which is a very low-level sonic boom that would not result in significant impacts. In addition, NMFS has previously concluded that sonic booms only have the potential to result in harassment of marine mammals that are hauled out of the water (82 FR 60954).

Therefore, for the reasons described above, impacts to special-status marine wildlife species from the expendable hypersonic flight and recovery would not be significant.

Reusable Talon-A Launch Operations over BOA with Runway Landings

During launch operations over the BOA with runway landings, a sonic boom would be generated over water or over land on the coast of California or the NCI at levels well below 1 psf (ARCTOS 2021b). The highest sonic boom contour of 0.5 psf is located over water for all trajectories. While the sonic boom could occur at different locations over the BOA and coast depending on the specific Talon-A trajectory, it would always be at 0.5 psf or less on the coast and the loudest sonic boom contours would occur in very small areas. The sonic booms closest to the coast along with special-status marine wildlife are shown in Figure 4-5.

Acoustic energy from sonic booms is not expected to effectively cross the air/water interface (Richardson et al. 1995) and USAF research has confirmed that there is no risk of harassment to protected marine species underwater (USAF Research Laboratory 2000). In addition, NMFS has previously concluded that sonic booms only have the potential to result in harassment of marine mammals that are hauled out of the water (82 FR 60954). A low-level sonic boom (0.5 psf or less) may be generated over land where marine mammal or sea turtle haul-outs occur. However, the loudest sonic boom contours would occur in very small areas, would be below the 1 psf threshold of effects for hauled out species from in-air noise, and would not be anticipated to result in adverse effects. Therefore, the USSF has determined that potential effects associated with exposure to sonic booms as a result of the launch operations over the BOA ***"may affect, but are not likely to adversely affect"*** all pertinent special-status marine species and would be discountable and insignificant since sonic booms would be below 1 psf and only occur over a small area. Therefore, impacts to special-status marine wildlife species from launch operations over the BOA with runway landings would not be significant.

Critical Habitat

Humpback whale and leatherback sea turtle Critical Habitat occur along the west coast of the United States (Figure 4-6). The separation test and expendable hypersonic test flight, which have ocean strikes, would each occur up to twice over the course of 12 months, typically spaced 6 months apart, and would not occur in coastal areas. The essential habitat feature of humpback whale Critical Habitat is prey, including euphausiids (e.g., krill) and small pelagic fishes. The essential habitat feature of leatherback sea turtle Critical Habitat is also prey, including jellyfish and other gelatinous prey. The ocean strike and recovery operations are short-term and have the potential to occur outside of designated Critical Habitat, depending on where the ocean strike occurs during the tests. None of the proposed activities would have the potential to affect humpback whale or leatherback sea turtle PCEs (abundant prey items). Therefore, the Proposed Project would have no impact to humpback whale and leatherback sea turtle Critical Habitat.

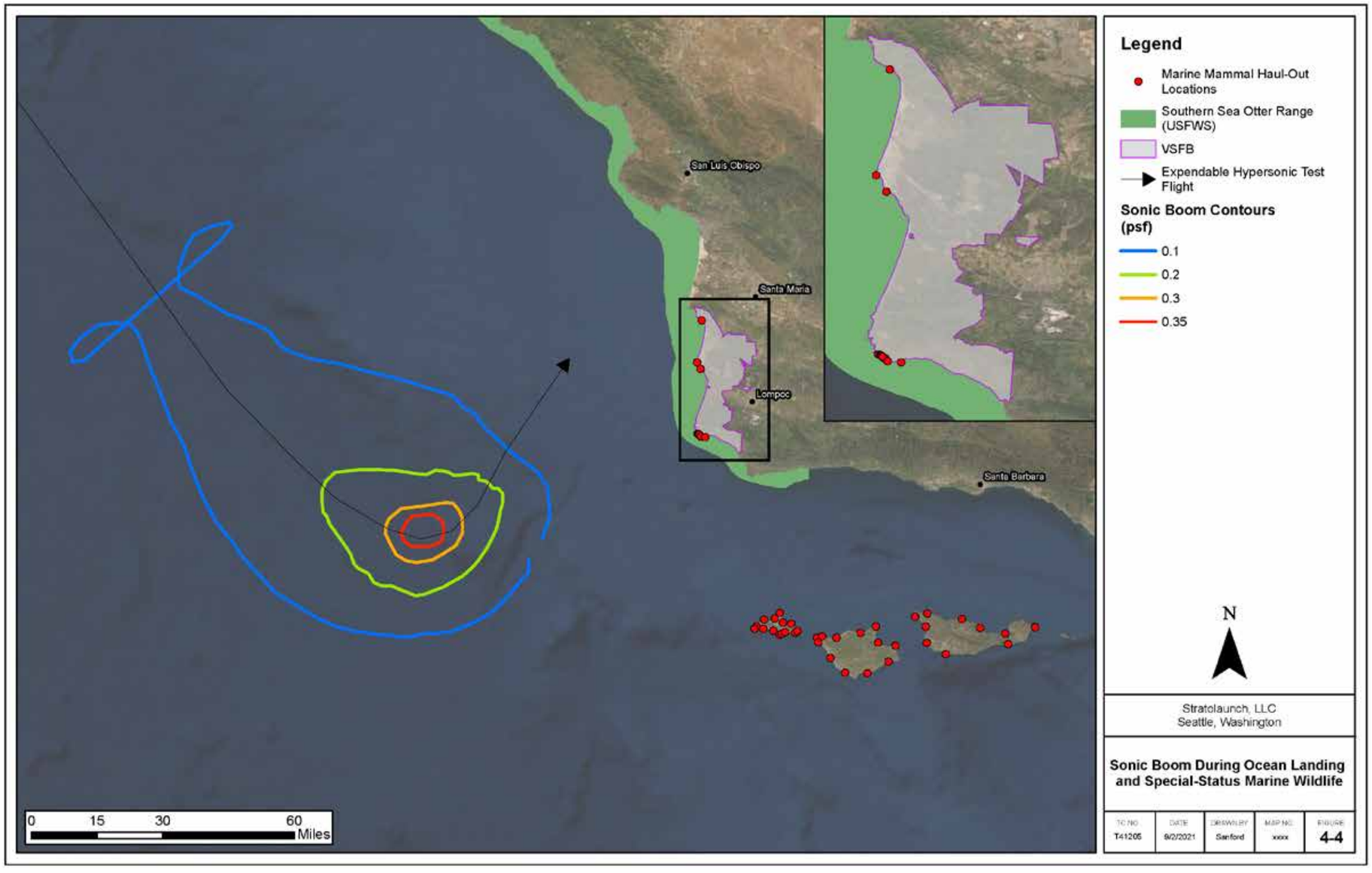

Figure 4-4. Sonic Boom During Ocean Landing and Special-Status Marine Wildlife

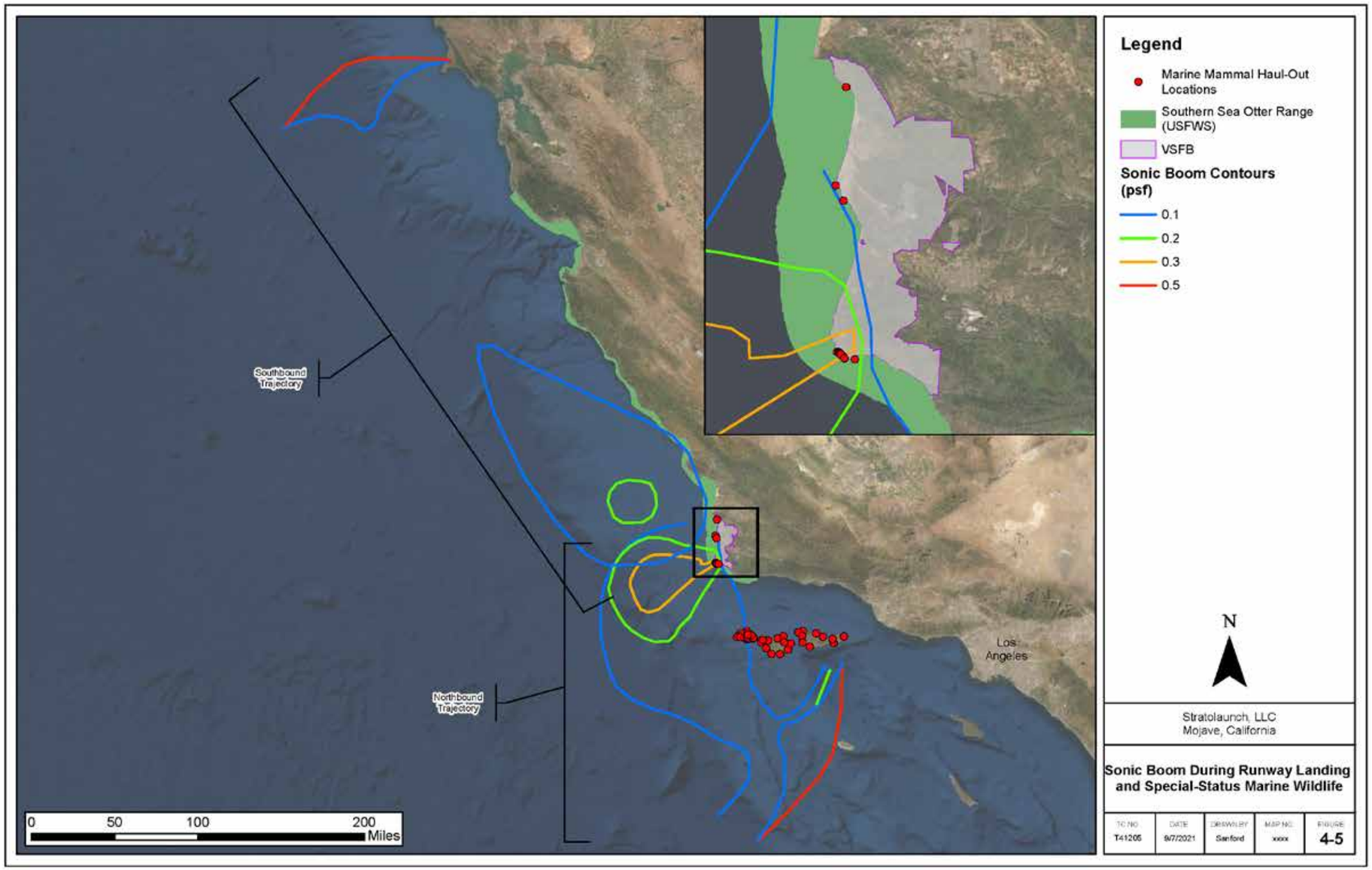

Figure 4-5. Sonic Boom During Runway Landing and Special-Status Marine Wildlife

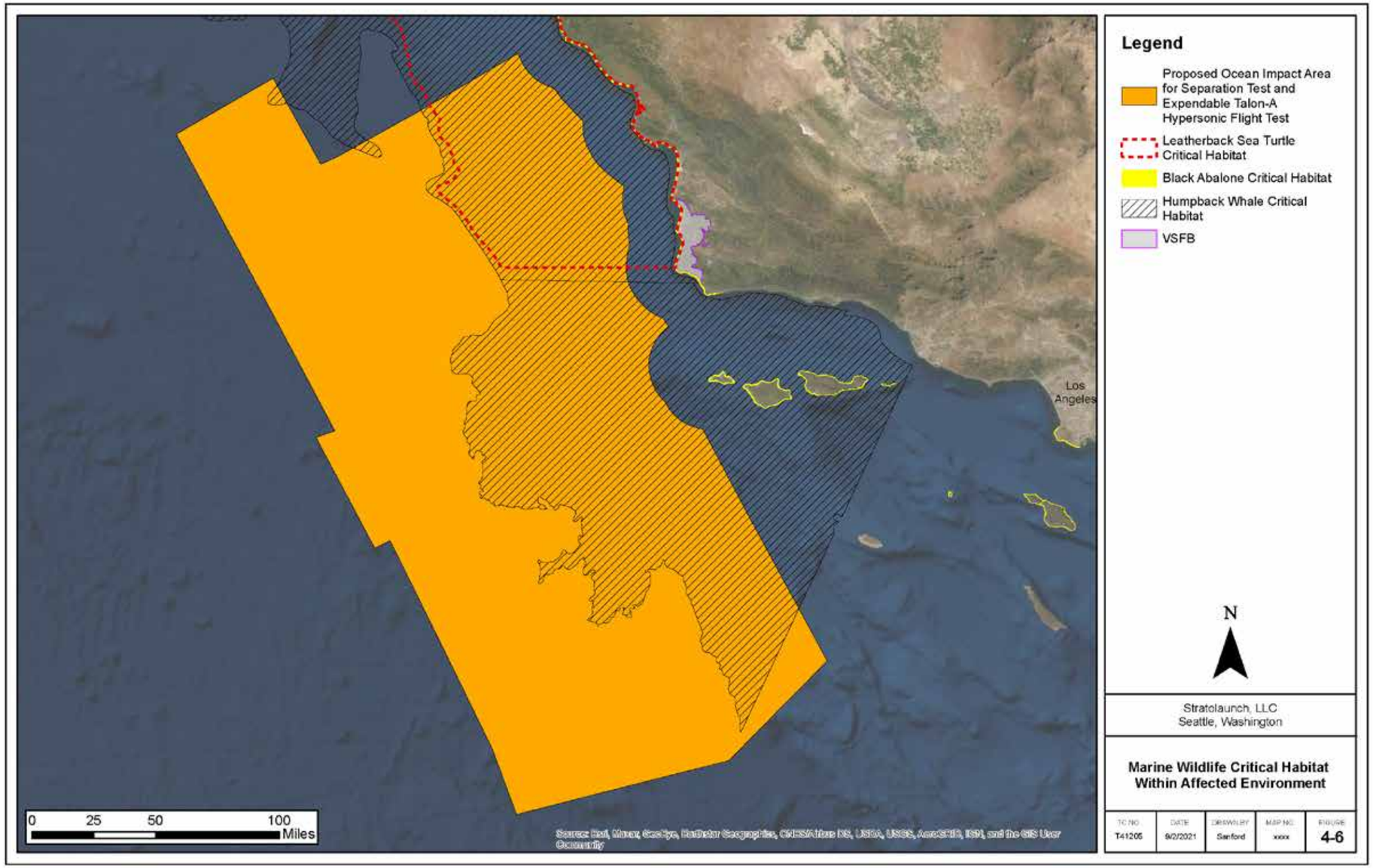

Figure 4-6. Marine Wildlife Critical Habitat Within Affected Environment

Marine Reserves and Conservation Areas

Marine Reserves and Conservation Areas are shown with the proposed ocean impact and sonic boom areas in Figure 4-7.

Channel Islands National Marine Sanctuary

The prohibitions of the CINMS do not apply to military activities carried out by the DoD as of the effective date of the revised regulations (15 CFR § 922.72[b][1]). This is specifically identified for DoD pre-existing activities in Section 3.5.9 of the NMFS CINMS Final Management Plan/Final Environmental Impact Statement (FMP/FEIS) (NMFS 2007). Potential impacts to the CIMNS are not evaluated further in this EA because the Proposed Action is a DoD military activity in the CINMS FMP/FEIS.

Vandenberg State Marine Reserve

A Memorandum of Understanding was established between the CDFW and VSFB for the VSMR. Within the VSMR (Figure 4-7), no take of living marine resources is permitted except take incidental to the mission critical activities of VSFB. Potential impacts to the VSMR are not evaluated further in this EA because the Proposed Action is considered a mission critical activity under the Memorandum of Understanding for the VSMR.

Essential Fish Habitat and Marine Habitat

The Magnuson-Stevens Fishery Conservation and Management Act defines an adverse effect as "any impact which reduces quality and/or quality of EFH" and may include direct or indirect, and site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810(a)). Potential impacts from the separation test and expendable hypersonic flight test to EFH and federally managed species include strike by the Talon-A or fragments during ocean impact, ingestion of post-splashdown Talon-A components, physical disturbance to marine bottom habitats from Talon-A components, and exposure to hazardous materials after ocean impact. Groundfish EFH and HAPCs along with the proposed ocean impact areas are shown in Figures 4-8 and 4-9. Launches over the BOA with runway landings would have no impacts to EFH and federally managed species because only sonic booms would occur. In addition, landing and takeoff activities would not affect EFH because they would occur at a distance from the ocean.

Strike by the Talon-A

The two separation tests and two hypersonic flight tests, which would be infrequent and low in number (each up to two events over the course of 12 months; typically spaced 6 months apart), have the potential to result in strike to federally managed fish species during ocean impact. Each splashdown event from the separation tests and hypersonic flight tests is estimated to impact up to 4,000 ft^2 (372 m^2) at the ocean surface. There is a remote possibility that individual fish at or near the surface may be struck directly, which has the potential to cause injury or mortality. However, limited fish species swim at or near the surface of the water other than pelagic sharks, jacks, tuna, mackerels, billfishes, and other similar species. The strike would be a temporary (seconds) localized impact, and the expected reaction from a fish exposed to the splashdown would be to immediately evacuate the area. This would reduce the possibility of a fish strike. Moreover, fragments that sink in the water column would do so slowly, which would allow fish time to swim away and avoid potential injury. The fragments would also ultimately reach the seafloor such that they would not cause any long-lasting impacts to the water column.

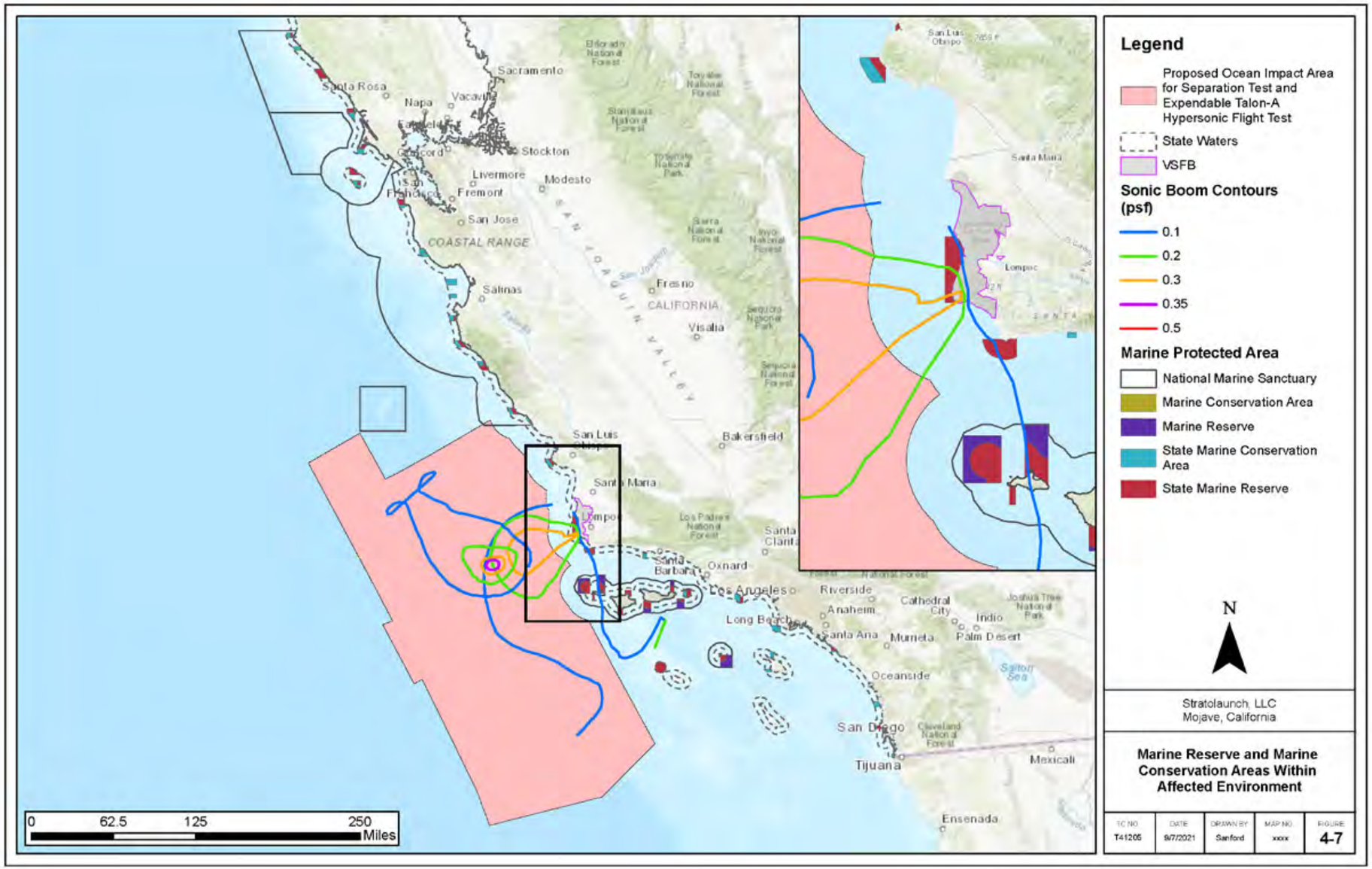

Figure 4-7. Marine Reserve and Marine Conservation Areas Within Affected Environment

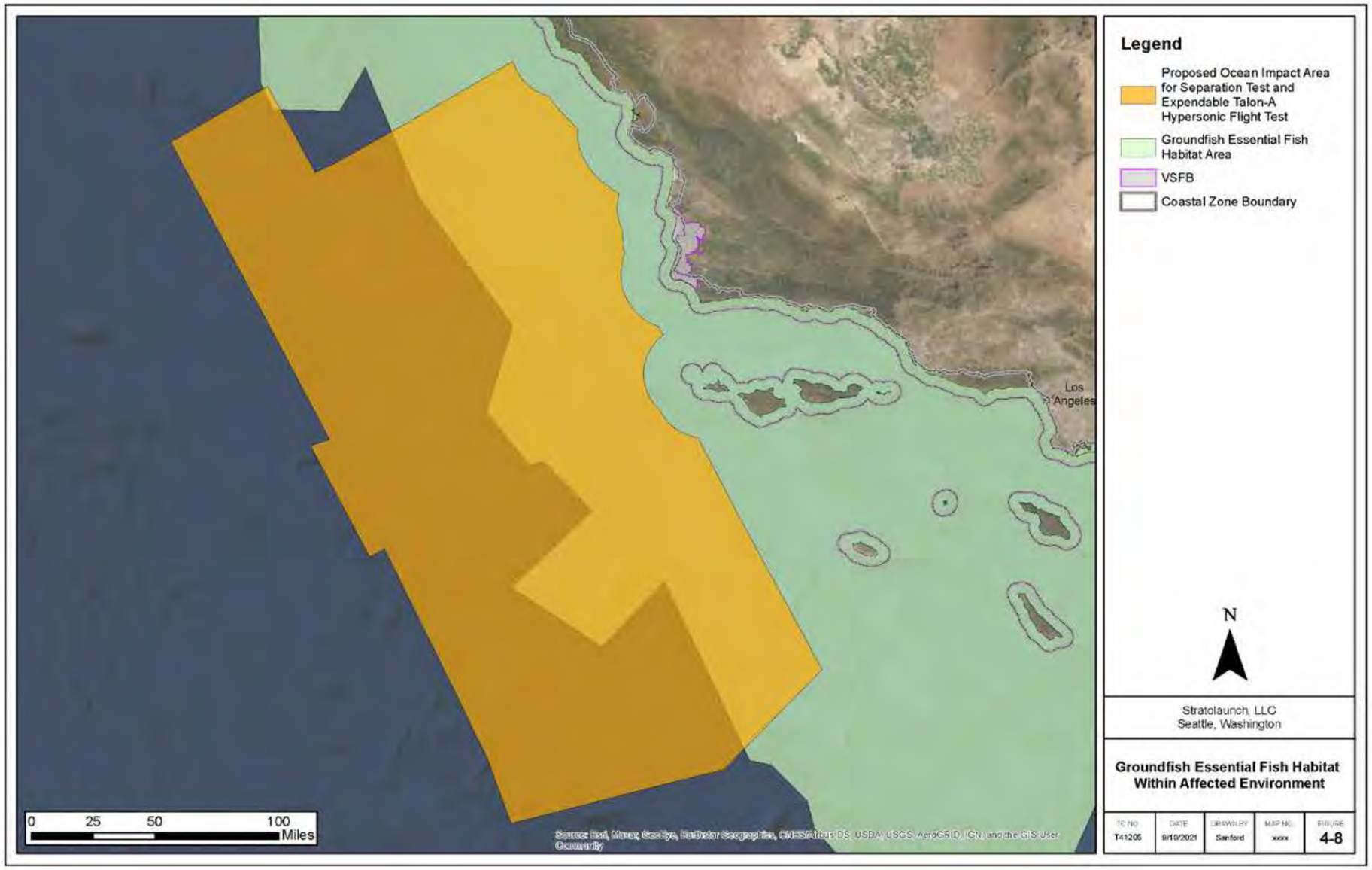

Figure 4-8. Groundfish Essential Fish Habitat Within Affected Environment

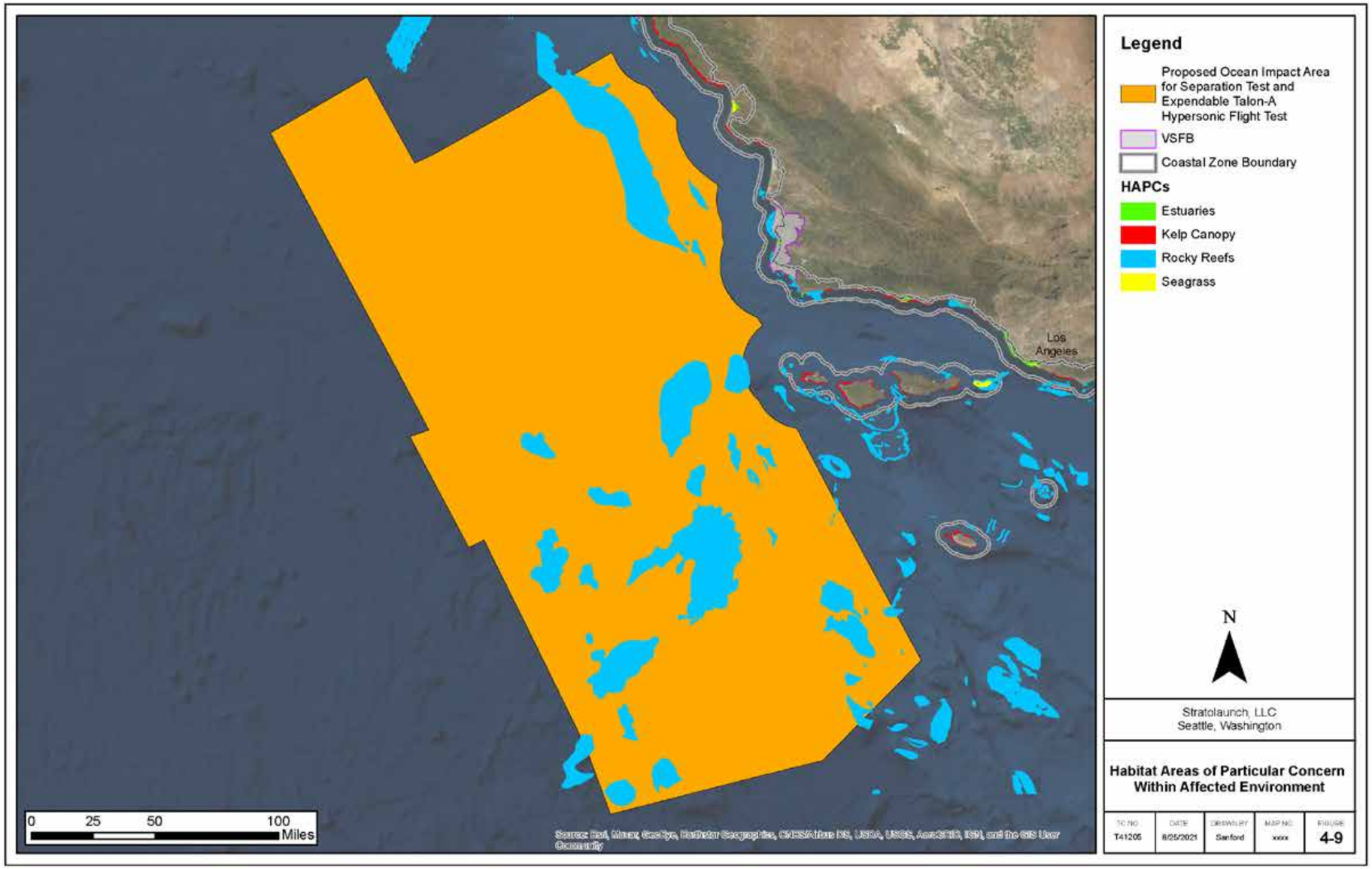

Figure 4-9. Habitat Areas of Particular Concern Within Affected Environment

After splashdown, it is expected that the area would be repopulated with the normal fish stock, with no long-term behavioral effects or lasting effects on survival, growth, recruitment, or reproduction at the population level (Lundquist et al. 2010). Therefore, while the Talon-A ocean surface strike could adversely affect federally managed fish species in the impact area, these effects would be minimal (limited in duration or resulting in small and insignificant changes to EFH and its ecological functions) since strike of a fish is highly unlikely, would be temporary in duration, and would have no long-lasting behavioral effects.

Ingestion

During the separation test, the Talon-A test article is likely to break into fragments of various sizes within the 4,000 ft^2 (372 m^2) ocean impact area and would occur in an area with a seafloor depth of 414 to 15,203 ft (126 to 4,634 m). Approximately 97 percent of the debris by mass would be large fragments that sink or are too large to be ingested. The Talon-A vehicle is anticipated to remain intact after water impact during the expendable hypersonic test flight and impact approximately 4,000 ft^2 (372 m^2) at the ocean surface. No small or negligible fragments are anticipated during the expendable hypersonic test flight. Ingestion of Talon-A fragments by fishes could occur at or just below the surface, in the water column, or at the seafloor depending on the size and buoyancy of the fragment and its ability to be recovered, plus the feeding behavior of the fish. Floating material is more likely to be eaten by fish that feed at or near the surface (e.g., basking sharks) and fragments that sink are more likely to be consumed by bottom-feeding fishes (e.g., rockfishes, skates, and flatfishes).

While ingestion of the Talon-A fragments could adversely affect federally managed fish species after ocean strike, these effects would be minimal and are unlikely to occur since fragments would be recovered to the extent feasible. There would be limited exposure to fragments at the surface/water column, low possibility for fragments to disperse in ocean currents, and the size and material of the fragment may discourage ingestion by fish (e.g., too large, unpalatable). Similarly, effects would be temporary in duration. No potential ingestion impacts are expected for early life stages (eggs and early-stage larvae) and ingestion impacts at the population level are unlikely to occur.

Physical Disturbance to Marine Bottom Habitats

Sinking Talon-A fragments have the potential to physically disturb marine substrate. An adverse effect would be when the substrate is disturbed to the point that it can no longer function as habitat (e.g., physical impact to the substrate, covering the substrate, or converting soft bottom substrate into hard bottom substrate). All sinking fragments are anticipated to slowly sink to the seafloor and the total bottom area that could be impacted is approximately 1,800 ft^2 (167 m^2). This was calculated by multiplying the area of the Talon-A by the maximum number of test flights per year (four) and is a very conservative calculation that does not account for the angular shape of the Talon-A or recovery of fragments. Direct strike to hard bottom surface is not expected given the seafloor depths within the potential impact area. Even if the fragments alter the hard bottom structure at the seafloor after sinking, they would not necessarily reduce habitat value (e.g., the seafloor would still be a hard bottom surface after the fragment settles). Organisms associated with hard bottom environments would still be able to persist. However, if fragments land on a soft seafloor surface, converting the habitat from a soft to hard surface, this has the potential to reduce the habitat's ability to support soft bottom communities. In shallower soft bottom habitats closer to shore, fragments may eventually be covered over by sediments due to currents and other coastal processes, but the seafloor in the deeper waters off the continental slope in the affected environment would have minimal changes to the substrate over a long period of time. However, full colonization of the fragments by organisms would be expected to occur over a relatively short period of time (e.g., 18 months) (Carter and Prekel 2008). Therefore, while fragments could

adversely affect bottom substrates designated as EFH in areas where these activities occur, these effects would be minimal given the small size of the total bottom area that could be impacted, the recovery of many fragments and possibly the entire vehicle during the expendable hypersonic flight test, and the possibility that the fragments would land on existing hard bottom surface and not reduce habitat value. Similarly, these effects would be temporary given that organisms would recolonize the surface floor over a short period of time.

Exposure to Hazardous Materials

The release of hazardous materials into marine habitats can have both acute and chronic effects on fish resources and their prey, depending on the substance and how it long it persists in the marine environment (PFMC 2019). Direct physical contact to released hazardous substances or indirect exposure from interrupted food chain processes can produce a number of biological responses. During the separation test, approximately 5 gallons of propylene glycol, 38 gallons of calcium chloride, and up to 25 lbs of colored dye solution would be used and could be released into the ocean. In the event that the fuselage ruptures on ocean impact during the expendable hypersonic flight test, approximately 10 gallons of Jet-A would be released into the ocean. Up to 25 lbs of dye solution would also be released during the expendable hypersonic test. Release of these materials into the ocean would be infrequent and low in number (up to two times over the course of 12 months for each test; same tests typically spaced 6 months apart). Jet-A fuel released into the ocean would evaporate or naturally disperse within a day or less (NOAA 2019). The rapid evaporation of jet fuel on open water reduces the exposure to aquatic organisms and is unlikely to cause fish kills (NOAA 2019). While exposure to hazardous materials could adversely affect EFH and/or managed fish species, these effects would be minimal because Jet-A would float on water where less fish are present and is unlikely to adhere to fine-grained suspended sediment that could impact seafloor habitat. Moreover, effects would be temporary as Jet-A would likely evaporate or disperse into the water column in less than one day. Given this temporary impact, no effects to food chain processes would be expected. Similarly, the effects of dye solution, propylene glycol, and calcium chloride on EFH and managed fish species would be minimal and temporary, as these fluids are not environmentally hazardous and would disperse over a short period of time.

Overall, there would be temporary or no impacts to habitats designated as EFH and federally managed species and no permanent impacts would occur. The total impact area to bottom habitat would conservatively be 1,800 ft^2 (167 m^2). Given the total size of bottom habitat in the proposed ocean impact area of 3,573,293,779,902 ft^2 (331,969,854,966 m^2) (i.e., the total area within which an ocean strike could occur), only 5.04 X 10^{-8} percent would be impacted. This low percentage of bottom habitat impacted suggests that there would be no significant impact to marine habitat. Therefore, for these and the reasons described in the analysis above, impacts to EFH and marine habitat would not be significant.

4.3.3 No Action Alternative

Under the No Action Alternative, Stratolaunch's testing and operations of the Talon-A hypersonic research testbed vehicle would not be performed. Therefore, no impacts to biological resources would occur under the No Action Alternative.

4.4 HAZARDOUS MATERIALS AND WASTE MANAGEMENT

4.4.1 Significance Criteria

Impacts to hazardous materials and hazardous waste would be considered significant if their transport, use, or disposal under the Proposed Project were to pose a serious hazard to the public or the environment. The FAA has not established a significance threshold for hazardous materials. However, based on guidance in FAA Order 1050.1F, the FAA has identified factors to

consider in evaluating the context and intensity of potential environmental impacts for hazardous materials, solid waste, and pollution prevention. These factors are whether an action would:

- Violate applicable federal, state, tribal, or local laws or regulations regarding hazardous materials and/or solid waste management;
- Involve a contaminated site;
- Produce an appreciably different quantity or type of hazardous waste;
- Generate an appreciably different quantity or type of solid waste or use a different method of collection or disposal and/or would exceed local capacity; or
- Adversely affect human health and the environment.

Additional issues would include the potential for accidental releases of hazardous materials, emissions of hazardous materials especially within 0.25 mile (0.4 km) of a school, and the violation of any associated federal, state, or county regulation or applicable permit condition.

4.4.2 Proposed Action

Hazardous materials and waste management impacts from the USSF's Proposed Action of using its range assets and fulfilling its role as launch control authority would not occur. No significant impacts to hazardous materials and waste management would occur from the FAA's Proposed Action of issuing a commercial space launch license or temporarily closing airspace, or the DoN's Proposed Action of authorizing use of SNI for the alternate landing of the Talon-A. All hazardous materials and waste would be handled and disposed of in accordance with state, federal, DoD, and contract-specific requirements and management plans.

Hazardous Materials

Compliance with federal, state, and local laws and regulations would govern all actions involving hazardous materials and wastes associated with implementing the Proposed Project. Compliance with these regulations and plans would minimize the potential for significant impacts.

The testing and operation of the Talon-A would include the use of propellants and chemicals. Stratolaunch would develop site-specific SPCC Plans for pre- and post-flight operations at MHV, VSFB, and SNI to allow for the quick containment of any spills during transport, use, or disposal of any petroleum-based chemicals, consistent with existing procedures. Emissions generated by the use of hazardous materials would not impact schools. The closest school to MHV, Mojave High School, is located approximately 1.25 miles (2.01 km) west of the proposed pre-flight operations area at the MHV. No school facilities are located near the proposed post-flight operations areas at VSFB and SNI.

The Proposed Project would comply with existing policies, procedures, and plans, and would implement the EPMs described in Section 2.6.2. Therefore, impacts to hazardous materials management would not be significant.

Hazardous Waste

Hazardous waste generated from the Proposed Project would be handled and disposed of in accordance with state, federal, DoD, and contract-specific requirements. Some propellants would remain in the Talon-A vehicle upon runway landing; a residual of 14.3 gallons of LOX (136 lbs) and 9.3 gallons Jet-A (62 lbs). Residual LOX would be vented and evaporated immediately after

landing[13], and Jet-A would be drained from the Talon-A vehicle before transport to MHV. Jet-A would be drained into a dedicated 50 gallon drum located on the SNI flightline and eventually transported off the Island via barge in accordance with the 2020 NBVC Hazardous Waste Management Plan. All hazardous waste collection, storage, and transportation at SNI would be coordinated with the NBVC Hazardous Waste Program Manager.

The Proposed Project would comply with policies, procedures, and plans developed for the project and would implement the EPMs described in Section 2.6.2. Therefore, impacts to hazardous waste management would not be significant.

4.4.3 No Action Alternative

Under the No Action Alternative, no testing or operating the Talon-A hypersonic testbed vehicle would occur. Therefore, no additional waste would be generated and there would be no impacts involving hazardous materials and hazardous waste management under the No Action Alternative.

4.5 OCCUPATIONAL SAFETY AND HEALTH[14]

4.5.1 Significance Criteria

An impact would be considered significant if the Proposed Project created a potential direct public health hazard or if it adversely affected personnel safety during construction or operation activities. A significant occupational safety and health impact would also occur if the Proposed Project were to create a serious risk of fire, such as wildland fires, or were to cause a potential obstruction to evacuation routes or emergency response in the study area and surrounding areas. The FAA has not established a significance threshold for occupational safety and health.

4.5.2 Proposed Action

Impacts to occupational safety and health from the USSF's Proposed Action of using its range assets and fulfilling its role as launch control authority would not occur. No significant impacts to occupational safety and health would occur from the FAA's Proposed Action of issuing a commercial space launch license or temporarily closing airspace, or the DoN's Proposed Action of authorizing use of SNI for the alternate landing of the Talon-A. Compliance with OSHA regulations, USAF requirements, and other recognized standards would be implemented during all distinct events of the Stratolaunch Talon-A program.

The Proposed Project would have short- and long-term minimal impacts to occupational safety and health. Short-term impacts would be associated with Carrier Aircraft transit flights, captive carry events, separation tests, and expendable hypersonic flight tests. Long-term impacts would be associated with increased takeoffs and landings and reusable Talon-A launch operations.

Compliance with OSHA regulations and other recognized standards would be implemented during all 11 distinct events of the Stratolaunch Talon-A program. A Site-Specific Health and Safety Plan would be developed to outline the procedures and models Stratolaunch would implement for applicable tasks including unique personnel training such as ordnance operations. Site fueling policies, SPCC plans, emergency response and firefighting plans, launch site accident

[13] LOX boil off would be rapid since it would be pushed by pressure from the tank on the Talon-A. This small quantity could evaporate in as little as 5 minutes. The entire LOX tank venting process would take approximately 30 to 45 minutes.

[14] This impact category is defined in 32 CFR § 989.27.

investigation planning, and occupational and environmental safety regulations would be followed. Stratolaunch would also appoint a safety officer to act as a point of contact for all applicable tasks.

The use of live ordinance would be limited to times when personnel would install the ordinance and when it is used to terminate a flight for public safety. Requirements defined by the Space Force Command Manual would be implemented for personnel working with live ordnance. PPE used during handling and operation would also be subject to approval by DAF Wing Safety.

Under the Proposed Project, operation noise would be intermittent, occurring primarily during takeoff and landing. Noise levels at the runway are consistent with normal operation. Landing noise in areas surrounding airfields would be anticipated to be less than the minimum thresholds set by OSHA. Noise impacts on the human environment are provided in Section 4.6.

Advance NOTAMs as well as range safety clearance would be performed prior to conducting any tests or launch activities over the NCI or Western Missile Test Range.

Implementation of EPMs, as outlined in Section 2.6.3, would ensure minimal potential health risks to project personnel and the public. Therefore, impacts from operation activities would not be significant to occupational safety and health.

4.5.3 No Action Alternative

Under the No Action Alternative, operation of the Stratolaunch Talon-A would not occur. Therefore, there would be no impacts to occupational safety and health.

4.6 NOISE

This section addresses potential noise impacts on the human environment in the vicinity of MHV and VSFB from the Proposed Project. For the purpose of this EA, the area of concern includes MHV, VSFB, SNI, the NCI, and California coastline.

The primary factor considered in determining potential noise impacts is the extent to which the Proposed Project would affect the existing noise environment and exceed the noise threshold over noise sensitive land uses. Concerns over noise include land use compatibility and annoyance, speech interference, and damage to hearing and structures. This section addresses the potential for these impacts on populations and individuals near areas affected by the Proposed Project. ARCTOS used PCBoom (version 6.6, Page et al. 2010), an FAA-approved model, to predict the location and magnitude of the sonic boom generated during launch operations (ARCTOS 2021a, 2021b). The results of the ARCTOS (2021a) noise study and the ARCTOS (2021b) sonic boom contours for runway operations were used to assess potential impacts of the Proposed Project. The impacts of noise on wildlife are addressed in Section 4.3, and the impact of noise on occupational safety and health is addressed in Section 4.5.

4.6.1 Significance Criteria

The DoD and USAF do not have a significance threshold for noise; however, this noise section evaluates whether the Proposed Project would exceed the existing noise contours due to airfield operations. Also, potential noise impacts to sensitive receptors within the increased noise zones as a result of the Proposed Project were assessed.

FAA Order 1050.1F identifies significance thresholds for aircraft noise. It states that a significant noise impact would occur if analysis shows that a Proposed Project would increase noise levels by DNL (CNEL in California) as follows: an increase of 1.5 dBA or more for a noise sensitive area that is exposed to noise at or above the CNEL 65 dBA noise exposure level, or that will be exposed at or above the CNEL 65 dBA level due to a CNEL 1.5 dBA or greater increase, when compared to the No Action Alternative for the same timeframe.

4.6.2 Proposed Action

Noise impacts from the USSF's Proposed Action of using its range assets and fulfilling its role as launch control authority would not occur. No significant noise impacts would occur from the FAA's Proposed Action of issuing a commercial space launch license or temporarily closing airspace; sonic booms generated during launch operations would always be well below 1 psf on the coast. Noise impacts would not occur from the DoN's Proposed Action of authorizing use of SNI for the alternate landing of the Talon-A since no additional noise to the human environment would be generated from these landings.

The Proposed Project would have short- and long-term negligible impacts to the noise environment. Short-term impacts would be from the initial phases of testing (i.e., captive carry tests, separation tests, expendable hypersonic flight tests, and glide flight tests). Long-term impacts would from pre- and post-flight ground operations, Carrier Aircraft transit flights, and launch operations over the BOA with runway landings and alternate landings at SNI.

Pre-flight Ground Operations at MHV

Pre-flight ground operations at MHV would include Talon-A fueling, FTS checkouts, COPV pressurization, Carrier Aircraft fueling, and pre-flight checklists and procedures. Long-term impacts due to noise from pre-flight ground operations would be within the boundaries of and consistent with current activities at MHV.

Carrier Aircraft Transit Flights

Noise from increased takeoffs and landings of the Carrier Aircraft and Chase Aircraft would have long-term negligible impacts. The increase in takeoffs and landings would occur gradually overtime with approximately six launch and non-launch flights during the first year and increasing to a maximum of one takeoff and landing per week during the fifth year. The takeoff, transit, and landing phases for both launch and non-launch operations would not require low altitude transit of noise sensitive areas (i.e., below 2,000 ft [610 m]). Noise sensitive areas within the Carrier Aircraft transit corridor include Death Valley National Park, John Muir Wilderness, Domeland Wilderness, Sequoia National Park, Kings Canyon National Park, Bitter Creek National Wildlife Area, Carrizo Plain National Monument, and San Rafael Wilderness Area (Figure 2-7). Stratolaunch plans to transit between Mojave and the coast above 15,000 ft (4,572 m) mean sea level except when climbing or descending into Mojave's Class D Airspace. Stratolaunch would not require low altitude transit of these areas and would never plan to operate the Carrier Aircraft below 2,000 ft (610 m) AGL over noise sensitive areas in accordance with the FAA Aeronautical Information Manual (FAA 2021).

Carrier Aircraft transit flights and Chase Aircraft flights from the Proposed Project would not be sufficient to change the noise contours at MHV or increase noise by 1.5 dBA DNL[15] for a noise sensitive area that is exposed to noise at or above 65 dBA DNL. Noise from individual Stratolaunch overflights and Chase Aircraft would be consistent with that from current Stratolaunch Carrier Aircraft operations at MHV that began flying in 2019 and would also be consistent with other fleet activities at MHV. Although the Carrier Aircraft has six airplane engines, the increase in noise from the Carrier Aircraft transit flights would not extend the CNEL[15] 65 dBA contour over noise sensitive areas. MHV currently supports over 21,000 flights per year (FAA

[15] DNL is the average sound energy in a 24-hour period with a penalty added to the nighttime levels. CNEL is a variant of DNL used in California, where in addition to the penalty during nighttime, it also includes a penalty during the evening. CNEL is always equal to or greater than DNL and may be used in lieu of DNL for FAA actions in California per FAA Order 1050.F1 Paragraph B-1 of Appendix B.

2022). Under the Proposed Project, the Carrier Aircraft would be used at most once per week, or 52 times per year. This increase in flights at MHV, and the noise associated with these flights, is negligible relative to the existing conditions at MHV.

Captive Carry of Talon-A

No additional noise to the human environment would be generated during captive carry tests of the Talon-A. Although the Carrier Aircraft would generate sound (as discussed in the text above) during the captive carry events, the Carrier Aircraft would not release the Talon-A and no Talon-A overflight noise, ocean surface impacts, or sonic booms would occur. The Talon-A would not be powered during the captive carry events. Therefore, there would be no additional noise impact to the human environment from captive carry tests of the Talon-A.

Talon-A Separation Test

No additional noise to the human environment would be generated during separation tests of the Talon-A. Separation tests would remain completely subsonic; therefore, no sonic booms would occur. No engines would be used, and no Talon-A aircraft engine noise would be generated (the Carrier Aircraft would generate sound, as discussed above). There would be no additional noise impact to the human environment from Talon-A separation tests.

Recovery of Talon-A Test Article

Noise impacting the human environment from recovery of floating debris would be consistent with vessel operations from a commercial water vehicle and would be over 14 nm (26 km) away from any noise sensitive environments such as the Channel Islands National Park and National Marine Sanctuary. After splashdown, a single vessel originating from a commercial port would pursue recovery of floating debris. The vessel would position itself in a safe staging area, navigate to the impact location following splashdown, and return to a predetermined commercial port for offloading of the recovered items. Up to two events would be performed over the course of 12 months, typically spaced 6 months apart.

Expendable Talon-A Hypersonic Flight

The Stratolaunch Talon-A launch system would perform hypersonic flight tests as part of this action with the expendable Talon-A vehicle impacting the Pacific Ocean off the coast of VSFB. Up to two expendable Talon-A hypersonic test flights would occur over the course of 12 months, typically spaced 6 months apart. Noise from expendable Talon-A hypersonic flight tests would stay over open water and not reach the NCI or California coastline (Figure 4-4) (ARCTOS 2021a). The Talon-A would be released from the Carrier Aircraft, its engines would be ignited, and a flight profile would be executed to generate hypersonic speeds. Talon-A release conditions from the Carrier Aircraft would be from approximately 15,000 to 45,000 ft (4,572 to 13,716 m) at 400 +/- 100 mph (179 +/- 45 m/s). The Talon-A would make an approach to land at the planned water impact point at a minimum of 14 nm (26 km) off the coast of VSFB. Noise from the expendable Talon-A hypersonic test flights would occur over the BOA at levels less than 1 psf, and completely off the coast in the BOA (with no nearby sensitive receptors).

Recovery of the Expendable Talon-A Hypersonic Test Vehicle

Noise impacting the human environment from recovery of the Talon-A hypersonic test vehicle would be consistent with vessel operations from a commercial water vehicle. After splashdown, a single ship originating from a commercial port would pursue recovery of floating debris. The ship would position itself in a safe staging area, navigate to the impact location following splashdown, and return to a predetermined commercial port for offloading of the recovered vehicle.

Talon-A Glide Flights

No additional noise to the human environment would be generated from Talon-A glide flights. Talon-A glide flights would remain completely subsonic; therefore, no sonic booms would occur. No engines would be used, and no Talon-A aircraft engine noise would be generated (the Carrier Aircraft would generate sound, as discussed above). There would be no additional noise impact to the human environment from Talon-A glide flights.

Reusable Talon-A Launch Operations Over BOA with Runway Landings

During launch operations over the BOA with runway landings, a sonic boom would be generated over water or over land on the NCI or along the California coastline near VSFB at levels well below 1 psf (ARCTOS 2021b). Figures 4-1A through 4-1H show the sonic boom contours for each example trajectory. The highest sonic boom contour of 0.5 psf is located over water for all trajectories. The sonic boom contour associated with the flight trajectory with alternate landing option on SNI hits the California coast and the NCI at 0.1 psf (Figure 4-1H). For all trajectories, the first red sonic boom level of 0.5 psf represents when the Talon-A accelerates past the speed of sound, and then the sonic boom level falls to 0.1 psf or less. The higher sonic boom levels of 0.2 and 0.3 psf closer to VSFB represent the subsequent deceleration when the Talon-A goes transonic for all trajectories. Sonic booms of 0.5 psf or less could occur at different locations over the BOA and coast depending on the specific Talon-A trajectory.

The number of flights would be relatively infrequent at first but would pick up frequency as operations increase. The estimated general schedule of flights is as follows (the term "launch" in the list below is defined as an event that would release the Talon-A from the Carrier Aircraft, have the Talon-A conduct a powered flight trajectory reaching hypersonic speeds, and generate a sonic boom):

- Year 1 (2022) – two launches (six or more total, including non-launch events)
- Year 2 – four launches (12 or more total, including non-launch events)
- Year 3 – 20 launches (30 or more total, including non-launch events)
- Year 4 – 40 launches
- Year 5 – 52 launches

All trajectories that would be flown would be subject to review and approval by the FAA and the Western Missile Test Range Safety Office. Sonic boom analysis would be performed on any trajectory that has potential for noise impacts to the NCI or California coastline to ensure no noise thresholds are exceeded when compared to the impacts analyzed in this EA. In addition, all flights over Mach 1 would be a minimum of 30 nm (56 km) away from the coast to ensure sonic boom levels are below 1 psf at the NCI or California coastline.

No additional noise to the human environment would be generated during the runway landings at VSFB. After main engine cutoff, the Talon-A vehicle would decelerate and execute an unpowered glide to the VSFB runway.

Alternate Landing at SNI Runway

No additional noise to the human environment would be generated from alternate landings at SNI runway. Alternate landings of the Talon-A would be unpowered glide flights and would remain completely subsonic; therefore, no sonic booms would occur. No engines would be used, and no Talon-A aircraft engine noise would be generated (the Carrier Aircraft would generate sound, as discussed above). The Carrier Aircraft would not land at SNI, and the Talon-A would return to MHV via barge and truck transportation. Shipping of the Talon-A off SNI would occur via the harbor and transport barge used for conventional resupply and operations of the Island.

Post-flight Ground Operations

Noise from post-flight checklists and procedures would be consistent with pre-flight ground operations and current activities at MHV, VSFB, and SNI.

Therefore, short-term and long-term impacts to the noise environment from the Proposed Project would not be significant. The Proposed Project is consistent with the existing operations occurring at MHV and would not extend the CNEL 65 dBA contour over noise sensitive areas. Similarly, the Proposed Project would not exceed the existing noise contours at VSFB or SNI since the Talon-A would glide into these runways during glide flights, reusable Talon-A operations over the BOA with runway landings, and alternate landings at SNI. Sensitive noise receptors near MHV, VSFB, or SNI would not be significantly impacted by the Proposed Project.

4.6.3 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be implemented, and there would be no changes to the noise environment when compared to existing conditions.

4.7 SOCIOECONOMICS

4.7.1 Significance Criteria

Socioeconomic impacts would be considered significant if they substantially altered the location and distribution of the local population, caused the population to exceed historic growth rates, decreased jobs so as to substantially raise the regional unemployment rates, or reduced income generation. They would also be considered significant if they substantially affected the local housing markets and vacancy rates or resulted in the need for new social services and support facilities. FAA Order 1050.1F, Exhibit 4-1 states that the FAA has not established significance thresholds for socioeconomics. However, the FAA has identified factors to consider when evaluating the context and intensity of potential environmental impacts of an action for socioeconomics.

4.7.2 Proposed Action

Socioeconomic impacts from the USSF's Proposed Action of using its range assets and fulfilling its role as launch control authority would not occur. No significant impacts to socioeconomics would occur from the FAA's Proposed Action of issuing a commercial space launch license or temporarily closing airspace. Although the launch license issuance would allow for an increase in the Stratolaunch workforce at MHV and VSFB due to more flights being conducted, this change would result in a minimal but positive impact to the local economy. No impacts to socioeconomics would occur from the DoN's Proposed Action of authorizing use of SNI for the alternate landing of the Talon-A.

Stratolaunch plans to add administrative, engineering, and operations workforce as part of the Proposed Project. A permanent workforce of up to 200 personnel, depending on program tempo, would be maintained primarily at MHV. Approximately 10 percent of the 200 personnel may be located offsite for regional support related to distance operations, including administrative and operational needs. This minor increase in permanent contractor personnel in the Mojave is a small fraction of the civilian workforce at the MHV and in Kern County. The increase would not be expected to alter the existing levels of service for housing and social services in the surrounding communities, as some of the new hires may be hired from the current population of Mojave. Some of the approximately 20 offsite personnel may be located on VSFB to support the proposed operations. Similar to MHV, this is a very minor increase and would have a negligible impact on local socioeconomics.

The addition of economic activity from the Proposed Project would result in a small but positive impact to the local economy. Therefore, the Proposed Project would generate no negative socioeconomic impacts on the region and would generate a small positive impact.

4.7.3 No Action Alternative

Under the No Action Alternative, operation of the Stratolaunch Talon-A program would not occur out of MHV. Therefore, there would be no impact to the socioeconomic outlook for the affected area.

4.8 SOLID WASTE MANAGEMENT

Solid waste impacts are evaluated using federal, state, and local laws and regulations, and permit conditions. Adverse impacts would occur from noncompliance with applicable regulatory requirements or an increase in the amount of waste disposal that would exceed available waste management capacities. The FAA has not established a significance threshold for solid waste.

4.8.1 Proposed Action

Solid waste management impacts from the USSF's Proposed Action of using its range assets and fulfilling its role as launch control authority would not occur. No significant impacts to solid waste management would occur from the FAA's Proposed Action of issuing a commercial space launch license or temporarily closing airspace, or the DoN's Proposed Action of authorizing use of SNI for the alternate landing of the Talon-A. All solid waste would be handled and disposed of in accordance with state, federal, DoD, and contract-specific requirements and management plans.

The amount of hazardous waste and solid waste generated at MHV, VSFB, and SNI would increase as a result of pre- and post-flight ground operations. However, wastes that would be generated are similar to those already handled at these facilities and the amount would be minimal. Up to 200 additional employees would be required at MHV, which is anticipated to generate approximately 0.89 tons of solid waste per day (8.93 lbs per day for each employee [CalRecycle 2006]). This increase is a small fraction of the civilian workforce at MHV and would not affect solid waste management. Hazardous wastes would not be released into the environment. Stratolaunch would contract or perform in-house removal of any solid waste to an offsite recycling or disposal facility. Implementation of existing waste management and diversion procedures currently used during similar operations at MHV, VSFB, and SNI would limit or eliminate the potential for impacts. In addition, the Proposed Project would comply with all applicable federal, state, and local regulations related to hazardous waste. Therefore, there would not be significant impacts to solid waste management.

4.8.2 No Action Alternative

Under the No Action Alternative, the proposed Talon-A program would not occur. Therefore, there would be no changes to solid waste levels or management under this alternative.

4.9 TRANSPORTATION

This section addresses potential impacts to transportation resources in the vicinity of MHV and VSFB from the Proposed Project. The limited amount of construction and proposed additional personnel for flights and testing would have both short- and long-term negligible impacts on transportation and traffic surrounding MHV and VSFB. Land transport of the Talon-A from VSFB to MHV would also require coordination and permits from Caltrans and CHP but would not require road modifications. Vehicle access for construction, personnel, and Talon-A transport to Stratolaunch would primarily enter Airport Boulevard from SR58 and use Riccomini Avenue to limit traffic demands in other areas of MHV.

4.9.1 Significance Criteria

Impacts to transportation resources would be considered significant if:

- The traffic demands of a primary road could no longer be met due to project traffic;
- Project traffic on primary or secondary road would create an unsafe situation or require a new traffic signal or major revisions to an existing traffic signal; or
- The Proposed Project disrupts local traffic patterns and substantially reduces the levels of service of roads serving an airport and its surrounding communities.

FAA Order 1050.1F is the source of the federal criteria for impacts to (surface) transportation resources.

4.9.2 Proposed Action

No transportation or traffic impacts would occur from the USSF's Proposed Action of using its range assets and fulfilling its role as launch control authority. Likewise, no transportation impacts would occur from the FAA's Proposed Action of issuing a commercial space launch license or temporarily closing airspace. No transportation impacts would occur from the DoN's Proposed Action of authorizing use of SNI for the alternate landing of the Talon-A. The Talon-A would be transported via a barge that is regularly used for conventional resupply and operations and would not require additional trips.

The long-term transportation and traffic impacts of the Proposed Project would not exceed the significance criteria. The traffic demands on existing roads would be met without safety problems and would not require a new traffic signal or major revisions to an existing traffic signal.

Long-term impacts to transportation would result from an increase in personnel traveling to MHV and VSFB. Hiring of an additional 200 personnel at MHV with an estimated commute of 20 miles (32 km) both to and from MHV would increase vehicle trips by 200 compared with existing conditions. California City Chamber of Commerce estimated that 1,341 people made the 16-mile (26-km) daily commute to and from Mojave in 2020 (California City 2020). Personnel would also be located at VSFB to operate the communications trailer during test flights, as needed, and to coordinate landings and transport of the Talon-A.

Long-term impacts would also result from the Talon-A as it is transported 195 miles (314 km) from VSFB to MHV on an up to weekly basis by Year 5. Approximately six or more events (launch and non-launch) would occur in Year 1 (2022), 12 or more in Year 2, 30 or more in Year 3, 40 in Year 4, and 52 in Year 5. The Talon-A would be transported from VSFB along SR1 to Highway 1 north to SR166 to just south of Bakersfield where vehicles would connect to SR58 via SR223. Additional access routes would be identified to transport the Talon-A material recovered from the ocean. Stratolaunch would coordinate with Caltrans and CHP when necessary for the transportation of recovered materials to MHV.

A maximum of three alternate landings would occur annually. Ground operations on SNI would include shipping the Talon-A off the Island via the harbor on a transport barge used for conventional resupply and operations. No special scheduling or modifications to the transport vessel or harbor would be necessary to support Talon-A post flight-processing and transport back to the mainland. The Talon-A would then be transported from Port Hueneme back to MHV along SR1 or Highway 101 to two-lane SR150 or SR33 that would connect to SR 166. As described above, Stratolaunch would coordinate with Caltrans and CHP when necessary for the transportation of the Talon-A back to MHV.

The impacts to transportation resources would not be significant. Primary roads would be expected to continue to meet traffic demands and be compatible with the long-term increase in personnel at MHV and VSFB. No unsafe situations would be expected from the long-term impact

of transporting the Talon-A from VSFB to MHV or transporting the Talon-A from SNI to MHV if alternate landings occur. No new traffic signals would be expected from short- or long-term impacts.

4.9.3 No Action Alternative

Under the No Action Alternative, the Stratolaunch Talon-A program would not be operated at MHV or VSFB. Therefore, there would be no impact to transportation resources when compared to the existing conditions.

4.10 WATER RESOURCES

4.10.1 Significance Criteria

Adverse impacts to water resources would occur if the Proposed Project either caused substantial flooding or erosion or adversely affected surface or groundwater quality or quantity. An adverse effect to water resources would also be considered significant if it contributed to a shortage of water supply. FAA Order 1050.1F states that surface water impacts would be significant if the action would (1) exceed water quality standards established by federal, state, local, and tribal regulatory agencies; or (2) contaminate public drinking water supply such that public health may be adversely affected. Groundwater impacts would be significant if the action would (1) exceed groundwater quality standards established by federal, state, local, and tribal regulatory agencies; or (2) contaminate an aquifer used for public water supply such that public health may be adversely affected.

4.10.2 Proposed Action

Impacts to water resources from the USSF's Proposed Action of using its range assets and fulfilling its role as launch control authority would not occur. Similarly, no water resources impacts would occur from the FAA's Proposed Action of issuing a commercial space launch license or temporarily closing airspace since no ground disturbance would occur and pre- and post-flight activities would not affect water resources. No water resources impacts would occur from the DoN's Proposed Action of authorizing use of SNI for the alternate landing of the Talon-A. These landings on SNI would not impact marine surface waters.

The Proposed Project would not have any ground disturbance. All land-based operations would occur at existing facilities and runways on MHV, VSFB, and SNI. Any accidental spills associated with pre-flight and post-flight activities at these locations would be addressed by existing Spill Plans. Therefore, terrestrial surface water and groundwater would not be affected by the Proposed Project. Impacts to marine surface water is analyzed below.

Marine Surface Water

During a maximum of two separation tests and two hypersonic flight tests per year, the Talon-A would impact the surface of the ocean between 14 nm (26 km) from the coast (including islands) and the extent of Warning Areas W532, W537, and W289. The Talon-A would likely break into fragments during the separation test but may remain intact or break into fewer fragments after the hypersonic flight test. The fragments that float would be likely be recovered and those that sink would ultimately reach the seafloor. The fragments would be composed of inert materials that are not chemically or biologically reactive, so they would not affect water quality.

During the separation test, 5 gallons of propylene glycol, 38 gallons of calcium chloride, and up to 25 lbs of colored dye solution would be used as ballast within the Talon-A. These quantities of materials may be released into the ocean. Release of these materials into the ocean would be infrequent and low in number (up to two times per year; typically spaced 6 months apart). During the expendable hypersonic flight test, up to 200 lbs of residual propellant (approximately 136

lbs/14.3 gallons of LOX, 62 lbs/9.3 gallons of Jet-A) would remain in the Talon-A tanks during ocean impact. The fuselage section of the vehicle, which contains the tanks with propellant, is anticipated to float and would likely be recovered intact during ocean retrieval of the expendable Talon-A vehicle. In the event that the fuselage ruptures on ocean impact, approximately 10 gallons of Jet-A would be released into the ocean during expendable hypersonic test flights, which would be infrequent and low in number (two times per year; typically spaced 6 months apart). In addition, up to 25 lbs of dye would be released upon impact.

The dye is not classified as environmentally hazardous, is non-carcinogenic, does not contain any substances regulated as pollutants pursuant to the CWA, and is soluble in water. Propylene glycol has low aquatic toxicity, is rapidly biodegradable and soluble in water, and is not expected to bioaccumulate. Calcium chloride has low aquatic toxicity and is not expected to persist or bioaccumulate, because it is readily dissociated into calcium and chloride ions. In addition, these materials would be immediately diluted by the large quantity of seawater and degrade/disperse rapidly by wind driven currents and waves. Jet-A fuel released into the ocean would evaporate or naturally disperse within a day or less (NOAA 2019). NOAA modeled a jet fuel spill of 100 barrels (approximately 4,200 gallons) with wind speeds of 5 knots, and results indicated the majority of the jet fuel evaporated within one day of release. With wind speeds of 7 knots, approximately half of the jet fuel evaporated in less than one day and the other half was dispersed in the same time period (NOAA 2019). Higher wind speeds would cause more water mixing and the Jet-A fuel would disperse faster (NOAA 2019). These results indicate that evaporation of the much smaller amount of Jet-A fuel (up to 10 gallons) released during the expendable hypersonic test flight (only if the fuselage ruptures) would occur quickly (likely less than a day).

Overall, Jet-A fuel would likely evaporate or disperse into the water column in less than one day. The dye solution, propylene glycol, and calcium chloride are not environmentally hazardous and would also disperse over a short period of time. In addition, the relatively small quantity of these materials that may be released into the ocean would be immediately diluted by the large quantity of seawater. No established water quality standards, including the California Ocean Plan criteria and the National Ambient Water Quality criteria, would be exceeded. Therefore, impacts to water resources would be negligible.

4.10.3 No Action Alternative

Under the No Action Alternative, the Stratolaunch Talon-A program would not occur and no impacts to water resources would occur.

4.11 CUMULATIVE IMPACTS

This section addresses cumulative impacts in accordance with the new CEQ regulations on cumulative effects that were issued on 20 April 2022 (effective 20 May 2022; 87 FR 23453-23470). For this EA, spatial and temporal boundaries were delineated to determine the area and projects that the cumulative analysis would address. For this cumulative analysis, the spatial boundary is Kern County and western Santa Barbara County, California. The temporal boundary includes past actions that have occurred within the last 3 years, and reasonably foreseeable future actions include those that are planned to occur within the next 5 years. Past, present, and reasonably foreseeable actions at MHV and VSFB and the surrounding areas include current and future aircraft operations at the airports, rocket launches, rocket engine testing, development in the local area related to activities at MHV and VSFB, and any other development that may occur as a result of economic growth in the area.

Existing annual aircraft operations on MHV are over 21,000 (Table 3-10). The additional Proposed Project takeoff and landing operations on MHV (up to weekly flights, or an additional 52 flights per year) would be a negligible increase over past, present, and reasonably foreseeable

operations. Similarly, VSFB supports many launch programs and existing aircraft operations, including approximately 120 fixed-wing aircraft flights and about 6,000 takeoffs and landings per year (USAF 2011). Proposed Project operations (Talon-A landings and associated recovery equipment) at VSFB would also constitute a negligible increase over past, present, and reasonably foreseeable operations. Only up to three landings per year would occur on SNI, which would not significantly increase overall operations on SNI. The Environmental Protection Measures associated with the Proposed Project and other projects in the study area also protect against adverse cumulative impacts by reducing overall adverse effects on environmental resources. Since the Carrier Aircraft with the Talon-A vehicle would be above 30,000 ft for most of its operations outside of Kern and Santa Barbara Counties over the Pacific Ocean, past, present, or reasonably foreseeable future projects in the areas of overflight were not included in the cumulative impacts analysis. Therefore, the Proposed Project, when combined with other past, present, and reasonably foreseeable operations, would not result in cumulative impacts on the human environment.

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APPENDIX A: Interagency and Intergovernmental Coordination for Environmental Planning

California Coastal Commission Concurrence

From: WHITSITT-ODELL, TIFFANY A GS-12 USSF SSC 30 CES/CEIEA
To: Noddings, Amy; Daniel Sternberg
Cc: Hauenstein, John; KAISERSATT, SAMANTHA O CIV USSF SSC 30 CES/CEIEA; EVANS, RHYS M CIV USSF SSC 30 CES/CEIEA
Subject: FW: Inquiry - Stratolaunch Activites 14 nm from coast
Date: Wednesday, March 9, 2022 9:16:37 AM

Hello All –

See below confirmation of CCC concurrence. Thanks for your coordination on this. I have sent this to the Navy as well.

V/r
Tiffany

From: Teufel, Cassidy@Coastal <Cassidy.Teufel@coastal.ca.gov>
Sent: Tuesday, March 1, 2022 10:34 AM
To: WHITSITT-ODELL, TIFFANY A GS-12 USSF SSC 30 CES/CEIEA <tiffany.whitsitt-odell@spaceforce.mil>
Cc: KAISERSATT, SAMANTHA O CIV USSF SSC 30 CES/CEIEA <samantha.kaisersatt@spaceforce.mil>; YORK, DARRYL L GS-14 USSF SSC 30 CES/CEIE <darryl.york@spaceforce.mil>; KEPHART, BEATRICE L CIV USSF SSC 30 CES/CEI <beatrice.kephart@spaceforce.mil>; EVANS, RHYS M CIV USSF SSC 30 CES/CEIEA <rhys.evans@spaceforce.mil>; CURRY-BUMPASS, TRACY L CIV USSF SSC 30 CES/CEIEA <tracy.curry-bumpass@spaceforce.mil>
Subject: [URL Verdict: Neutral][Non-DoD Source] RE: Inquiry - Stratolaunch Activities 14 nm from coast

Hi Tiffany –
Sorry about that, I thought I responded to this already but it looks like that message didn't go out. Anyway, with the clarification provided in your email below, Commission staff agrees that the proposed Stratolaunch project would not adversely affect coastal resources and thus, no additional Commission review is needed. Thank you for the close coordination with us on this and for your help clarifying the marine debris mitigation measures that will be implemented as part of the project.
Regards,
Cassidy

Cassidy Teufel
Manager
Energy, Ocean Resources and Federal Consistency
California Coastal Commission
455 Market Street, Suite 228
San Francisco, CA 94105-2219
(805) 585-1825
http://www.coastal.ca.gov/

From: WHITSITT-ODELL, TIFFANY A GS-12 USSF SSC 30 CES/CEIEA <tiffany.whitsitt-odell@spaceforce.mil>
Sent: Monday, February 28, 2022 4:33 PM
To: Teufel, Cassidy@Coastal <Cassidy.Teufel@coastal.ca.gov>
Cc: KAISERSATT, SAMANTHA O CIV USSF SSC 30 CES/CEIEA <samantha.kaisersatt@spaceforce.mil>; YORK, DARRYL L GS-14 USSF SSC 30 CES/CEIE <darryl.york@spaceforce.mil>; KEPHART, BEATRICE L CIV USSF SSC 30 CES/CEI <beatrice.kephart@spaceforce.mil>; EVANS, RHYS M CIV USSF SSC 30 CES/CEIEA <rhys.evans@spaceforce.mil>; CURRY-BUMPASS, TRACY L CIV USSF SSC 30 CES/CEIEA <tracy.curry-bumpass@spaceforce.mil>
Subject: RE: Inquiry - Stratolaunch Activities 14 nm from coast

Good Afternoon Cassidy –

I was wondering if you have had a moment to review the email below and concur that we don't need to coordinate any further with the CCC on this project?

Thank you so much for your time!

v/r,
Tiffany

From: WHITSITT-ODELL, TIFFANY A GS-12 USSF SSC 30 CES/CEIEA
Sent: Thursday, February 17, 2022 9:57 AM
To: Teufel, Cassidy@Coastal <Cassidy.Teufel@coastal.ca.gov>
Cc: KAISERSATT, SAMANTHA O CIV USSF SSC 30 CES/CEIEA <samantha.kaisersatt@spaceforce.mil>; YORK, DARRYL L GS-14 USSF SSC 30 CES/CEIE <darryl.york@spaceforce.mil>; KEPHART, BEATRICE L CIV USSF SSC 30 CES/CEI <beatrice.kephart@spaceforce.mil>; EVANS, RHYS M CIV USSF SSC 30 CES/CEIEA <rhys.evans@spaceforce.mil>; CURRY-BUMPASS, TRACY L CIV USSF SSC 30 CES/CEIEA <tracy.curry-bumpass@spaceforce.mil>
Subject: RE: Inquiry - Stratolaunch Activities 14 nm from coast

Hello Cassidy –

Thank you again for staying engaged on this project. Following up on our discussion yesterday RE: Stratolaunch, I have confirmed they are on board with updating the values in the measures to offset marine debris that is unable to be recovered with a donation to the California Lost Fishing Gear Recovery Program. The areas highlighted below have been updated from $0.75/$2,300 to $7.50/$23,000.

- All recovered items would be weighed to determine the approximate total weight of items not recovered. For every 3 lbs of unrecovered debris, a compensatory donation to the California Lost Fishing Gear Recovery Program will be made sufficient to recover 1 lb of lost gear. The specific donation ratio (3:1) may be adjusted based on coordination with NMFS.
- The Talon-A will have an estimated maximum weight of 2,300 lbs at the time of each test flight. Based on

the Talon-A maximum weight and a compensatory donation of $7.50/lb to recover 1 lb of lost gear for every 3 lbs of unrecovered debris, the maximum donation Stratolaunch may be obligated to pay for any unrecovered debris for all four test flights will be no more than $73,000.

FYSA – and as we discussed during our call, we came up with these values based on discussions with the California Lost Fishing Gear Recovery Project lead (https://ohi.vetmed.ucdavis.edu/whc/ca-lost-fishing-gear) where she indicated that it generally costs $7,500 for every 1,000 pounds recovered = $7.50/lb (this is a per day average).

v/r,
Tiffany

Tiffany Whitsitt-Odell
Environmental Planner, 30 CES/CEIEA
1028 Iceland Ave B#11146
COMM: 805-606-2044/276-2044
Tiffany.Whitsitt-Odell@spaceforce.mil
(she, her, hers)

From: Teufel, Cassidy@Coastal <Cassidy.Teufel@coastal.ca.gov>
Sent: Wednesday, February 9, 2022 3:55 PM
To: WHITSITT-ODELL, TIFFANY A GS-12 USSF SSC 30 CES/CEIEA <tiffany.whitsitt-odell@spaceforce.mil>
Subject: [Non-DoD Source] RE: Inquiry - Stratolaunch Activities 14 nm from coast

Hi Tiffany –
I wanted to circle back with you on this, NMFS staff clarified for me that the conservation recommendations I've been asking about were developed by VSFB and included in the EFH assessment it provided to NMFS. So, can you share with me VSFB's thinking on why only one of every three pounds of debris would need to be offset and how the rate of $0.75/lb for fishing gear recovery was derived? Over the years, the Commission has directed over $640,000 to the Lost Fishing Gear Recovery Project with an average per pound cost of $13.15. I understand that the cost of their efforts can be variable but this is a significant deviation from the data we've collected.

I'm open to reviewing the information supporting the approach you've proposed in the EFH assessment but would also be interested in VSFB's willingness to have Stratolaunch offset for each pound of debris it generates at a rate closer to the one supported by the data we have.

Thanks,
Cassidy

From: WHITSITT-ODELL, TIFFANY A GS-12 USSF SSC 30 CES/CEIEA <tiffany.whitsitt-odell@spaceforce.mil>
Sent: Monday, February 7, 2022 10:41 AM

To: Teufel, Cassidy@Coastal <Cassidy.Teufel@coastal.ca.gov>
Subject: RE: Inquiry - Stratolaunch Activities 14 nm from coast

Understood! Let me know if there is anything you need from me.

From: Teufel, Cassidy@Coastal <Cassidy.Teufel@coastal.ca.gov>
Sent: Monday, February 7, 2022 10:30 AM
To: WHITSITT-ODELL, TIFFANY A GS-12 USSF SSC 30 CES/CEIEA <tiffany.whitsitt-odell@spaceforce.mil>
Subject: [Non-DoD Source] RE: Inquiry - Stratolaunch Activities 14 nm from coast

Got it – thanks. I'd like to touch base with her briefly to make sure I understand NMFS' thinking. We're certainly on board with the offset approach in general but it would be helpful to know how they decided some of the details (ratio and rate, specifically). Such a low rate and negative ratio seem unusual.

From: WHITSITT-ODELL, TIFFANY A GS-12 USSF SSC 30 CES/CEIEA <tiffany.whitsitt-odell@spaceforce.mil>
Sent: Monday, February 7, 2022 9:45 AM
To: Teufel, Cassidy@Coastal <Cassidy.Teufel@coastal.ca.gov>
Subject: RE: Inquiry - Stratolaunch Activities 14 nm from coast

We worked with Jhenevieve (Jhen) Cabasal. It was our first time working with her.

From: Teufel, Cassidy@Coastal <Cassidy.Teufel@coastal.ca.gov>
Sent: Monday, February 7, 2022 9:43 AM
To: WHITSITT-ODELL, TIFFANY A GS-12 USSF SSC 30 CES/CEIEA <tiffany.whitsitt-odell@spaceforce.mil>
Subject: [Non-DoD Source] RE: Inquiry - Stratolaunch Activities 14 nm from coast

Thanks, Tiffany. Have you been working with Eric Chavez at NMFS on this or one of his colleagues?

From: WHITSITT-ODELL, TIFFANY A GS-12 USSF SSC 30 CES/CEIEA <tiffany.whitsitt-odell@spaceforce.mil>
Sent: Monday, February 7, 2022 9:38 AM
To: Teufel, Cassidy@Coastal <Cassidy.Teufel@coastal.ca.gov>
Cc: KEPHART, BEATRICE L CIV USSF SSC 30 CES/CEI <beatrice.kephart@spaceforce.mil>; YORK, DARRYL L GS-14 USSF SSC 30 CES/CEIE <darryl.york@spaceforce.mil>; KAISERSATT, SAMANTHA O CIV USSF SSC 30 CES/CEIEA <samantha.kaisersatt@spaceforce.mil>; Ngo, Anh T CIV USN (USA) <anh.t.ngo4.civ@us.navy.mil>; Kessler, Dave (FAA) <Dave.Kessler@faa.gov>
Subject: RE: Inquiry - Stratolaunch Activities 14 nm from coast

Hi Cassidy –

Here is the specific language from the EFH consultation for what has currently been agreed upon:

These measures were included in the EFH consultation to be implemented by Stratolaunch:

- All recovered items would be weighed to determine the approximate total weight of items not recovered. For every 3 lbs of unrecovered debris, a compensatory donation to the California Lost Fishing Gear Recovery Program will be made sufficient to recover 1 lb of lost gear. The specific donation ratio (3:1) may be adjusted based on coordination with NMFS.
- The Talon-A will have an estimated maximum weight of 2,300 lbs at the time of each test flight. Based on the Talon-A maximum weight and a compensatory donation of $0.75/lb to recover 1 lb of lost gear for every 3 lbs of unrecovered debris, the maximum donation Stratolaunch may be obligated to pay for any unrecovered debris for all four test flights will be no more than $7,300.

Thank you,
Tiffany

From: Teufel, Cassidy@Coastal <Cassidy.Teufel@coastal.ca.gov>
Sent: Monday, February 7, 2022 9:34 AM
To: WHITSITT-ODELL, TIFFANY A GS-12 USSF SSC 30 CES/CEIEA <tiffany.whitsitt-odell@spaceforce.mil>
Cc: KEPHART, BEATRICE L CIV USSF SSC 30 CES/CEI <beatrice.kephart@spaceforce.mil>; YORK, DARRYL L GS-14 USSF SSC 30 CES/CEIE <darryl.york@spaceforce.mil>; KAISERSATT, SAMANTHA O CIV USSF SSC 30 CES/CEIEA <samantha.kaisersatt@spaceforce.mil>; Ngo, Anh T CIV USN (USA) <anh.t.ngo4.civ@us.navy.mil>; Kessler, Dave (FAA) <Dave.Kessler@faa.gov>
Subject: [Non-DoD Source] RE: Inquiry - Stratolaunch Activities 14 nm from coast

Hi Tiffany –
Thank you for the thorough response. It's great to hear that Stratolaunch will be offsetting the marine debris generated by the project through fishing gear removal efforts. However, I wanted to double-check that Stratolaunch is only proposing to offset 1/3 of the debris generated by the project (funding for one pound of fishing gear removal for every three pounds of project materials not able to be recovered). It would also be helpful to know the rate that would be used to calculate the funding for fishing gear removal ($/lb). We have extensive experience working with the Lost Fishing Gear Recovery Project so it would be helpful to know how the proposed rate aligns with the data we have.
Thanks again,
Cassidy

From: WHITSITT-ODELL, TIFFANY A GS-12 USSF SSC 30 CES/CEIEA <tiffany.whitsitt-odell@spaceforce.mil>
Sent: Monday, February 7, 2022 7:56 AM
To: Teufel, Cassidy@Coastal <Cassidy.Teufel@coastal.ca.gov>
Cc: KEPHART, BEATRICE L CIV USSF SSC 30 CES/CEI <beatrice.kephart@spaceforce.mil>; YORK, DARRYL L GS-14 USSF SSC 30 CES/CEIE <darryl.york@spaceforce.mil>; KAISERSATT, SAMANTHA O CIV USSF SSC 30 CES/CEIEA <samantha.kaisersatt@spaceforce.mil>; Ngo, Anh T CIV USN (USA) <anh.t.ngo4.civ@us.navy.mil>; Kessler, Dave (FAA) <Dave.Kessler@faa.gov>
Subject: RE: Inquiry - Stratolaunch Activities 14 nm from coast

Good Afternoon Cassidy –

Thank you for taking the time to coordinate with us on this project and provide additional information. I have addressed your comments in red below. Please let me know if you need anything else and if you agree that this project does not affect the coastal zone with no additional coordination required. We demonstrate below that Stratolaunch would prefer to collect as much of the glider as possible and if not will provide funding to the CA Lost Fishing Gear Recovery Program based on the amount of material they are unable to recover.

v/r,
Tiffany

From: Teufel, Cassidy@Coastal <Cassidy.Teufel@coastal.ca.gov>
Sent: Tuesday, February 1, 2022 1:06 PM
To: WHITSITT-ODELL, TIFFANY A GS-12 USSF SSC 30 CES/CEIEA <tiffany.whitsitt-odell@spaceforce.mil>
Cc: KEPHART, BEATRICE L CIV USSF SSC 30 CES/CEI <beatrice.kephart@spaceforce.mil>; YORK, DARRYL L GS-14 USSF SSC 30 CES/CEIE <darryl.york@spaceforce.mil>; KAISERSATT, SAMANTHA O CIV USSF SSC 30 CES/CEIEA <samantha.kaisersatt@spaceforce.mil>; Ngo, Anh T CIV USN (USA) <anh.t.ngo4.civ@us.navy.mil>; Kessler, Dave (FAA) <Dave.Kessler@faa.gov>
Subject: |Non-DoD Source| RE: Inquiry - Stratolaunch Activities 14 nm from coast

Hi Tiffany –
Thank you for reaching out on this, I certainly appreciate being able to provide input regarding the level of coordination or review that may be needed from the Coastal Commission on the project. Along those lines, I'm hoping you can provide some additional clarification to help me better understand the scope of the project and it's potential effects.

Please clarify if there would be four separation tests per year or four total for the entirety of the project.
There would be a maximum of four for the entire project and would typically be conducted 6 months or more apart.

Regarding marine debris from these tests, please clarify the amount (or percentage) of material expected to be recovered
Stratolaunch prefers to recover as much of the Talon-A vehicle as possible for post inspection. We anticipate that the sections that should remain buoyant will be recovered (approximately 1,224 pounds). The buoyant materials most likely not to be recovered would be 4.5 lb of negligible fragments & 4 lbs of low density structural components. Approximately 840 pounds will sink. All recovered items will be weighed to determine the weight of items not recovered.

Please also clarify the type/composition of solid material that would be released into the ocean (metals, plastics, rubber, etc.)
Below is a table that details the material of each component.

Items expected to sink are the wings (186 lb), nose (598 lb), Avionics (41 lb), high density structural components (10.26 lb), and negligible fragments including structural components, fasteners, and composite skin fragments (4.5 lb).
Items expected to float (and most likely be recovered) is the fuselage Section (1,215.7 lb), Low Density Structural Components (4 lbs), and negligible fragments including structural components, fasteners, and composite skin fragments (4.5 lb).

Component	Material
Wing Sections	Carbon Fiber Composite, Aluminum and Inconel structure
Nose Section	Carbon Fiber Composite
Avionics	Computer Components - Metal, silicon, fiberglass, plastic
Structural Components	Carbon Fiber Composite and Aluminum structure
Fuselage Section	Carbon Fiber Composite, Aluminum and Inconel structure
Low Density Structural Components	Carbon Fiber Composite
Small Fragments, fasteners	Carbon Fiber Composite, steel, and aluminum

and if clean-up or removal of other marine debris would be carried out to compensate for glider/separation test material that is not able to be successfully recovered.
For every 3 pounds of unrecovered debris, Stratolaunch will donate to the California Lost Fishing Gear Recovery Program sufficient to recover 1 pound of lost gear. NMFS has concurred with our EFH consultation and this measure.

If we're able to determine that the proposed project would not result in the release of additional marine debris – either through complete and effective clean-up of test material released into the ocean, total offset of debris generated by the project through removal of other marine debris (abandoned fishing gear and other debris along the SNI shoreline, etc.) or a combination of the two – we'll be able to agree that the project would not affect the coastal zone and additional coordination or review would not be needed.

Thanks again for reaching out and providing this additional information.

Regards,
Cassidy

Cassidy Teufel
Manager
Energy, Ocean Resources
and Federal Consistency
California Coastal Commission
455 Market Street, Suite 228
San Francisco, CA 94105-2219
(805) 585-1825
http://www.coastal.ca.gov/

From: WHITSITT-ODELL, TIFFANY A GS-12 USSF SSC 30 CES/CEIEA <tiffany.whitsitt-odell@spaceforce.mil>
Sent: Monday, January 31, 2022 8:51 AM
To: Teufel, Cassidy@Coastal <Cassidy.Teufel@coastal.ca.gov>
Cc: KEPHART, BEATRICE L CIV USSF SSC 30 CES/CEI <beatrice.kephart@spaceforce.mil>; YORK, DARRYL L GS-14 USSF SSC 30 CES/CEIE <darryl.york@spaceforce.mil>; KAISERSATT, SAMANTHA O CIV USSF SSC 30 CES/CEIEA <samantha.kaisersatt@spaceforce.mil>; Ngo, Anh T CIV USN (USA) <anh.t.ngo4.civ@us.navy.mil>; Kessler, Dave (FAA) <Dave.Kessler@faa.gov>
Subject: Inquiry - Stratolaunch Activities 14 nm from coast

Mr. Teufel –

VSFB is the lead agency on an EA and associated consultations for Stratolaunch's testing and operation of their Talon-A vehicle/glider. After review of the project description/DOPAA, VSFB determined the proposed activities would not require coordination with the Coastal Commission due to the location, type of activities, and analysis of impacts. Our partners at the Navy (Vicky Ngo, cc'd) requested that we explain the project to you and make you aware of our determination.

Basic components of the project:

- Terrestrial activities will involve take-off and landing of the plane or glider on existing runways.
- The Mojave Air and Space Port would be where the carrier aircraft and glider would originate.
- Aircraft and glider would land at VSFB.
- SNI would be an alternate landing site only for the glider (no more than 3 times a year).
- Ocean impacts will occur during a maximum of 4 separation tests of the Talon-A glider where it will be released over the ocean to test the release mechanism. The glider components will be recovered from the ocean to the extent possible by an ocean-going vessel.
    - Glider would impact ocean at least 14 nm from land up to 4,000 square feet area. A recovery vessel would pursue recovery of floating debris to remove items from ocean and complete post-test inspections. Please reference attachment for expected number of large, small, and negligible fragments due to impact.
    - It is expected that most debris will either be recovered or sink once saturated with seawater (see attachment for buoyancy information related to fragments).
    - Approximately 1,312 lbm, comprising 158 gallons of water, would be used to simulate Jet-A during the separation test. Up to 5 gallons of propylene glycol would be used to simulate valve antifreeze. Approximately 681 lbm, comprising 38 gallons of calcium chloride, and an additional 2,207 lbm, comprising 265 gallons of water (totaling 2,888 lbm/303 gallons), would be used to simulate LOX. These fluids would be dumped and dissipated above 5,000 ft (1,524 m) in the air or would remain in the tanks upon ocean impact, depending on the flight test requirements.
- We have determined an IHA is not required after analysis of potential impacts to manne mammals and the 0.5 individual take threshold associated with an IHA.

- We are completing an informal Section 7 NMFS consultation and Essential Fish Habitat Assessment.

We appreciate your time.

Respectfully,
Tiffany

Tiffany Whitsitt-Odell
Environmental Planner, 30 CES/CEIEA
1028 Iceland Ave B#11146
COMM: 805-606-2044
DSN: 276-2044

USSF Cooperating Agency Invitation Letter to U.S. Department of the Navy

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS UNITED STATES SPACE FORCE

25 Apr 22

MEMORANDUM FOR DEPARTMENT OF THE NAVY
COMMANDER NAVY REGION SOUTHWEST
ATTENTION N40
750 Pacific Highway
San Diego, CA 92132-0058

COMMANDING OFFICER NAVAL BASE VENTURA COUNTY
311 Main Road, Suite 1
Point Mugu, CA 93042-5033

FROM: UNITED STATES SPACE FORCE CHIEF OPERATIONS OFFICER/S4O
2020 Space Force Pentagon, Room 4C950
Washington, DC 20330-2000

SUBJECT: Cooperating Agency Invitation Letter For Stratolaunch Environmental Assessment

1. The Department of the Air Force (DAF) and the Federal Aviation Administration (FAA) are preparing an Environmental Assessment (EA) to evaluate the potential environmental impacts from the Proposed Action (PA): Testing and operating the Stratolaunch Talon-A hypersonic research testbed vehicle. The PA would include activities at Mojave Air and Space Port, Vandenberg Space Force Base, San Nicolas Island, and the Broad Ocean Area off California coast.

2. The DAF will act as the Lead Agency to prepare and coordinate the EA (Title 40, Code of Federal Regulations [CFR] § 1501.7) and to comply with Section 7, Endangered Species Act (Title 16 United States Code [USC] §1536), the Magnuson-Stevens Fishery Conservation and Management Act of 1976 (16 U.S.C. 1801 et seq.) as reauthorized by the Sustainable Fisheries Act (50 CFR 600), and similar regulatory consultation or coordination requirements. Pursuant to DAF and FAA agreements, the DAF is the lead agency and the FAA is a cooperating agency.

3. Per 40 CFR Part 1501.6, *Cooperating Agencies*, and Council on Environmental Quality guidance, the DAF requests the Department of the Navy's (DON's) formal participation as a cooperating agency to prepare the Stratolaunch EA. The DAF requests the DON participate in developing the EA, including:

a) Participate in the scoping process;
b) Assume responsibility, upon request by the DAF, for developing information and preparing analyses on issues that the DON has special expertise;
c) Make staff support available to enhance interdisciplinary review capability and provide specific comments (40 CFR §1503.3);

d) Review and provide comments within the program milestone schedule prescribed timelines; and
e) Respond to this request in writing.

4. For questions or concerns regarding the Stratolaunch EA or this request, please contact Samantha Kaisersatt at (805) 605-8684 or email samantha.kaisersatt@spaceforce.mil.

CURRY.REX.ALLEN.1103819365
Digitally signed by CURRY.REX.ALLEN.1103819365
Date: 2022.08.25 15:54:20 -04'00'
ohs
MICHAEL J. ZUHLSDORF, Colonel, USAF
Deputy Chief, Mission Sustainment
(Engineering, Logistics, & Force Protection)

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APPENDIX B-1: National Oceanic and Atmospheric Administration, National Marine Fisheries Consultations

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

February 4, 2022

Refer to NMFS No: WCRO-2021-03312

Beatrice L. Kephart
Chief, Installation Management Flight
30 CES/CEI
1028 Iceland Avenue
Vandenberg Air Force Base, CA 93437-6010

Re: Endangered Species Act Section 7(a)(2) Concurrence Letter and Magnuson-Steven Fishery Conservation and Management Act Essential Fish Habitat Response for the Test and Operation of the Stratolaunch Talon-A Hypersonic Research Testbed Vehicle

Dear Ms. Kephart:

This letter responds to your December 8, 2021, request for concurrence from the National Marine Fisheries Service (NMFS) pursuant to Section 7 of the Endangered Species Act (ESA) for the subject action. Your request qualified for our expedited review and concurrence because it contained all required information on your proposed action and its potential effects to listed species and designated critical habitat.

We reviewed the Vandenberg Air Force Base's (VAFB) consultation request document and related materials. Based on our knowledge, expertise, and your action agency's materials, we concur with the action agency's conclusions that the proposed action is not likely to adversely affect the NMFS ESA-listed species and/or designated critical habitat.

This letter underwent pre-dissemination review using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The concurrence letter will be available through NMFS' Environmental Consultation Organizer [https://appscloud.fisheries.noaa.gov]. A complete record of this consultation is on file at the NMFS Long Beach office.

Reinitiation of consultation is required and shall be requested by Vandenberg Air Force Base or by NMFS, where discretionary Federal involvement or control over the action has been retained or is authorized by law and (1) the proposed action causes take; (2) new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the written concurrence; or (4) a new species is listed or critical habitat designated that may be affected by the identified action (50 CFR 402.16). This concludes the ESA consultation.

NMFS also reviewed the proposed action for potential effects on essential fish habitat (EFH) designated under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), including conservation measures and any determination you made regarding the potential effects of the action. This review was pursuant to section 305(b) of the MSA, implementing regulations at 50 CFR 600.920, and agency guidance for use of the ESA consultation process to complete EFH consultation.

Section 305 (b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. Under the MSA, this consultation is intended to promote the conservation of EFH as necessary to support sustainable fisheries and the managed species' contribution to a healthy ecosystem. For the purposes of the MSA, EFH means "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity", and includes the associated physical, chemical, and biological properties that are used by fish (50 CFR 600.10). Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration 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 or quantity of EFH. Adverse effects may result from actions occurring within EFH or outside of it and may include direct, indirect, site-specific or habitat-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) of the MSA also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset the adverse effects of the action on EFH (50 CFR 600.0-5(b)).

The proposed project occurs in EFH for various federally managed fish species within the Pacific Coast Groundfish, Coastal Pelagic Species, Highly Migratory Species, and Pacific Coast Salmon Fishery Management Plans (FMPs). In addition, the project occurs within, or in the vicinity of, rocky reef, seagrass, and kelp habitat, which has been identified as habitat areas of particular concern (HAPC) for various federally managed fish species within the Pacific Coast Groundfish and Pacific Coast Salmon FMPs. Designated HAPC are not afforded any additional regulatory protection under MSA; however, federal projects with potential adverse impacts to HAPC are more carefully scrutinized during the consultation process.

NMFS determined the proposed action would adversely affect EFH due to direct impacts associated with the deployment of the Talon-A vehicle, as well as those resulting from the abandonment of vehicle fragments on the ocean floor (i.e., marine debris). However, the proposed project includes conservation measures to avoid or minimize adverse effects to EFH. Therefore, as long as these conservation measures are implemented, NMFS believes the proposed project will result in impacts that are no more than minimal and has no additional EFH Conservation Recommendations to provide at this time.

The VAFB must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations (50 CFR 600. 920(l)). This concludes the MSA consultation.

Please direct questions regarding this letter to Jhenevieve Cabasal at Jhenevieve.Cabasal@noaa.gov for ESA and to Thomas Coleman at Thomas.Coleman@noaa.gov for EFH.

Sincerely,

Dan Lawson
Long Beach Office Branch Chief
Protected Resources Division

cc: Rhys Evans, VAFB
Administrative File: 151422WCR2021PR00258

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APPENDIX B-2: Marine Mammal Take Estimates

Environmental Assessment
Test and Operation of the Stratolaunch Talon-A Hypersonic Testbed Vehicle
Appendix B-2: Marine Mammal Take Estimates

Species	Max Density in Impact Area (individuals / km^2)	Total Impact Area (km^2)*	Number Individuals Disturbed**	Source (Max Density)[1,2]
California sea lion *Zalophus californianus*	1.4919	0.0014864	0.00221763	U.S. Navy 2020
Pacific harbor seal *Phoca vitulina richardsi*	0.2719	0.0014864	0.00040417	U.S. Navy 2020
Northern elephant seal *Mirounga angustirostris*	0.076	0.0014864	0.00011297	U.S. Navy 2017, 2020
Steller sea lion *Eumetopias jubatus*	Very low or unknown	0.0014864	Less than 0.5	U.S. Navy 2017, 2020
Northern fur seal *Callorhinus ursinus*	0.021	0.0014864	0.00003122	U.S. Navy 2017, 2020
Guadalupe fur seal *Arctocephalus townsendi*	0.1232	0.0014864	0.00018313	U.S. Navy 2020
Humpback whale *Megaptera novaeangliae*	0.047853	0.0014864	0.00007113	U.S. Navy 2020
Blue whale *Balaenoptera musculus*	0.014314	0.0014864	0.00002128	U.S. Navy 2017
Fin whale *Balaenoptera physalus*	0.031044	0.0014864	0.00004615	U.S. Navy 2020
Sei whale *Balaenoptera borealis*	0.00005	0.0014864	0.00000007	U.S. Navy 2017, 2020
Bryde's whale *Balaenoptera edeni*	0.00002	0.0014864	0.00000003	U.S. Navy 2017, 2020
Minke whale *Balaenoptera acutorostrata*	0.000737	0.0014864	0.00000110	U.S. Navy 2020
Gray whale *Eschrichtius robustus*	0.13743	0.0014864	0.00020428	U.S. Navy 2020
North Pacific right whale *Eubalaena japonica*	Very low or unknown	0.0014864	Less than 0.5	U.S. Navy 2017, 2020
Sperm whale *Physeter macrocephalus*	0.003757	0.0014864	0.00000558	U.S. Navy 2020
Pygmy sperm whale *Kogia breviceps*	0.00373	0.0014864	0.00000554	U.S. Navy 2020

Species	Max Density in Impact Area (individuals / km^2)	Total Impact Area (km^2)*	Number Individuals Disturbed**	Source (Max Density)[1,2]
Dwarf sperm whale *Kogia sima*	0.00373	0.0014864	0.00000554	U.S. Navy 2020
Killer whale *Orcinus orca*	0.000253	0.0014864	0.00000038	U.S. Navy 2017, 2020
Short-finned pilot whale *Globicephala macrorhynchus*	0.00126	0.0014864	0.00000187	U.S. Navy 2017
Long-beaked common dolphin *Delphinus capensis*	1.104428	0.0014864	0.00164168	U.S. Navy 2020
Short-beaked common dolphin *Delphinus delphis*	4.099675	0.0014864	0.00609396	U.S. Navy 2017
Common bottlenose dolphin *Tursiops truncatus*	0.129498	0.0014864	0.00019249	U.S. Navy 2020
Striped dolphin *Stenella coeruleoalba*	0.100569	0.0014864	0.00014949	U.S. Navy 2020
Pacific white-sided dolphin *Lagenorhynchus obliquidens*	0.215462	0.0014864	0.00032027	U.S. Navy 2020
Northern right whale dolphin *Lissodelphis borealis*	0.13948	0.0014864	0.00020733	U.S. Navy 2017
Risso's dolphin *Grampus griseus*	0.22165	0.0014864	0.00032947	U.S. Navy 2017
Dall's porpoise *Phocoenoides dalli*	0.49393	0.0014864	0.00073420	U.S. Navy 2020
Harbor porpoise *Phocoena phocoena*	Very low or unknown	0.0014864	Less than 0.5	U.S. Navy 2017, 2020
Cuvier's beaked whale *Ziphius cavirostris*	0.063303	0.0014864	0.00009410	U.S. Navy 2020
Baird's beaked whale *Berardius bairdii*	0.016377	0.0014864	0.00002434	U.S. Navy 2017

Species	Max Density in Impact Area (individuals / km^2)	Total Impact Area (km^2)*	Number Individuals Disturbed**	Source (Max Density)[1,2]
Mesoplodont beaked whales (Blainville's beaked whale [*Mesoplodon densirostris*]; Ginkgo-toothed beaked whale [*Mesoplodon ginkgodens*]; Perrin's beaked whale [*Mesoplodon perrini*]; Stejneger's beaked whale, [*Mesoplodon stejnegeri*]; Hubbs' beaked whale [*Mesoplodon carlhubbsi*]; Pygmy beaked whale [*Mesoplodon peruvianus*])	0.063303	0.0014864	0.00009410	U.S. Navy 2020

Sources:

[1] U.S. Navy. 2017. U.S. Navy Marine Species Density Database Phase III for the Hawaii-Southern California Training and Testing Study Area. NAVFAC Pacific Technical Report. Naval Facilities Engineering Command Pacific, Pearl Harbor, HI. 274 pp.

[2] U.S. Navy. 2020. Quantifying Acoustic Impacts on Marine Species: Methods and Analytical Approach for Activities at the Point Mugu Sea Range. February 12.

Notes:

* The total impact area includes four ocean strike events that would each impact an area of approximately 4,000 ft^2 (0.0003716 km^2).

** The number of individuals disturbed for each species is calculated as maximum density multiplied by total impact area. Level B take for a species would occur if the threshold of 0.5 individuals disturbed is exceeded; at 0.5 or less, the number of individuals is rounded down to zero following conventional rounding rules (80 Federal Register 13264). The number of individuals disturbed would be less than 0.5 for all species.

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APPENDIX C: Proof of Delivery/Publication, Comments Received on Public Draft, and Responses

This is a placeholder for Appendix C, which will be included in the Final EA.

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APPENDIX D: Air Quality

AIR CONFORMITY APPLICABILITY MODEL REPORT
RECORD OF AIR ANALYSIS (ROAA)

1. General Information: The Air Force's Air Conformity Applicability Model (ACAM) was used to perform an analysis to assess the potential air quality impact/s associated with the action in accordance with the Air Force Manual 32-7002, Environmental Compliance and Pollution Prevention; the Environmental Impact Analysis Process (EIAP, 32 CFR 989); and the General Conformity Rule (GCR, 40 CFR 93 Subpart B). This report provides a summary of the ACAM analysis.

a. Action Location:

Base: VANDENBERG AFB
State: California
County(s): Santa Barbara
Regulatory Area(s): NOT IN A REGULATORY AREA

b. Action Title: Test and Operation of the Stratolaunch Talon-A-Hypersonic Research Testbed Vehicle

c. Project Number/s (if applicable):

d. Projected Action Start Date: 7 / 2022

e. Action Description:

Proposed Action includes launch control authority for Stratolaunch's flight tests and operations. USSF range assets would be used to support this mission to provide telemetry and optical data streams, and the Range Safety Office would provide flight safety analysis prior to mission execution and are a critical input for Go/No-Go launch decisions during flight. The FAA's Proposed Action is licensing Stratolaunch's launch operations and approving related airspace closures for launch operations.

The Proposed Project is the only alternative selected in this EA. The Stratolaunch Talon-A launch system is comprised of two air vehicles: the Stratolaunch Carrier Aircraft and the Talon-A research testbed vehicle. The Talon-A vehicle is an autonomous aircraft that generates thrust via a liquid fueled rocket engine that uses Jet-A as fuel and liquid oxygen (LOX) as its oxidizer. The launch system is supported from the Mojave Control Center (MCC) via radio, a line-of-sight (L/S)-band telemetry system, satellite communications (SATCOM) antennas mounted to the Carrier Aircraft, and a commercial internet service provider. The launch system is also supported by a safety chase aircraft (a Cessna Citation 550 Jet) and photograph chase aircraft (such as a Gulfstream III or an F-18) that remain in formation with the Carrier Aircraft. The safety chase aircraft also originates and returns to MHV and would be sourced internally by Stratolaunch. The photograph chase aircraft would take off and land at any nearby airport within a 2-hour flight time, such as Van Nuys Airport, Hollywood Burbank Airport, Edwards Air Force Base (AFB), etc. The plane would be sourced internally by Stratolaunch or contracted with either a public or private operation.

f. Point of Contact:

Name: Victor Velazquez
Title: Air Quality Engineer
Organization: Tetra Tech
Email: Victor.Velazquez@tetratech.com
Phone Number: 805-455-7439

2. Air Impact Analysis: Based on the attainment status at the action location, the requirements of the General Conformity Rule are:

_____ applicable
__X__ not applicable

AIR CONFORMITY APPLICABILITY MODEL REPORT
RECORD OF AIR ANALYSIS (ROAA)

Total net direct and indirect emissions associated with the action were estimated through ACAM on a calendar-year basis for the start of the action through achieving "steady state" (i.e., net gain/loss upon action fully implemented) emissions. The ACAM analysis used the latest and most accurate emission estimation techniques available; all algorithms, emission factors, and methodologies used are described in detail in the USAF Air Emissions Guide for Air Force Stationary Sources, the USAF Air Emissions Guide for Air Force Mobile Sources, and the USAF Air Emissions Guide for Air Force Transitory Sources.

"Insignificance Indicators" were used in the analysis to provide an indication of the significance of potential impacts to air quality based on current ambient air quality relative to the National Ambient Air Quality Standards (NAAQSs). These insignificance indicators are the 250 ton/yr Prevention of Significant Deterioration (PSD) major source threshold for actions occurring in areas that are "Clearly Attainment" (i.e., not within 5% of any NAAQS) and the GCR de minimis values (25 ton/yr for lead and 100 ton/yr for all other criteria pollutants) for actions occurring in areas that are "Near Nonattainment" (i.e., within 5% of any NAAQS). These indicators do not define a significant impact; however, they do provide a threshold to identify actions that are insignificant. Any action with net emissions below the insignificance indicators for all criteria pollutant is considered so insignificant that the action will not cause or contribute to an exceedance on one or more NAAQSs. For further detail on insignificance indicators see chapter 4 of the Air Force Air Quality Environmental Impact Analysis Process (EIAP) Guide, Volume II - Advanced Assessments.

The action's net emissions for every year through achieving steady state were compared against the Insignificance Indicator and are summarized below.

Analysis Summary:

2022

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.007	100	No
NOx	0.030	100	No
CO	0.020	250	No
SOx	0.006	250	No
PM 10	0.007	250	No
PM 2.5	0.007	250	No
Pb	0.000	25	No
NH3	0.000	250	No
CO2e	3.5		

2023 - (Steady State)

Pollutant	Action Emissions (ton/yr)	INSIGNIFICANCE INDICATOR	
		Indicator (ton/yr)	Exceedance (Yes or No)
NOT IN A REGULATORY AREA			
VOC	0.015	100	No
NOx	0.060	100	No
CO	0.040	250	No
SOx	0.012	250	No
PM 10	0.013	250	No
PM 2.5	0.013	250	No
Pb	0.000	25	No
NH3	0.000	250	No
CO2e	6.9		

AIR CONFORMITY APPLICABILITY MODEL REPORT
RECORD OF AIR ANALYSIS (ROAA)

None of estimated annual net emissions associated with this action are above the insignificance indicators, indicating no significant impact to air quality. Therefore, the action will not cause or contribute to an exceedance on one or more NAAQSs. No further air assessment is needed.

Victor Velazquez, Air Quality Engineer

1/24/2022
DATE

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

1. General Information

- **Action Location**
  Base: VANDENBERG AFB
  State: California
  County(s): Santa Barbara
  Regulatory Area(s): NOT IN A REGULATORY AREA

- **Action Title:** Test and Operation of the Stratolaunch Talon-A-Hypersonic Research Testbed Vehicle

- **Project Number/s (if applicable):**

- **Projected Action Start Date:** 7 / 2022

- **Action Purpose and Need:**
  The purpose of Stratolaunch's Proposed Project is to perform testing and operations of the Talon-A vehicle via a Carrier Aircraft based out of MHV. Testing and operations of the Talon-A vehicle must be performed safely in compliance with applicable Range Safety requirements and should be conducted near a site with telemetry capabilities necessary to acquire data from the Talon-A vehicle from the release altitude to the landing. The need for Stratolaunch's Proposed Project is to fulfill the needs of clients in the hypersonic technologies and warfare capabilities market. The industry is changing and leading to an interest in developing warfighting capability while utilizing a cost effective and reusable flight vehicle model.

- **Action Description:**
  Proposed Action includes launch control authority for Stratolaunch's flight tests and operations. USSF range assets would be used to support this mission to provide telemetry and optical data streams, and the Range Safety Office would provide flight safety analysis prior to mission execution and are a critical input for Go/No-Go launch decisions during flight. The FAA's Proposed Action is licensing Stratolaunch's launch operations and approving related airspace closures for launch operations.

  The Proposed Project is the only alternative selected in this EA. The Stratolaunch Talon-A launch system is comprised of two air vehicles: the Stratolaunch Carrier Aircraft and the Talon-A research testbed vehicle. The Talon-A vehicle is an autonomous aircraft that generates thrust via a liquid fueled rocket engine that uses Jet-A as fuel and liquid oxygen (LOX) as its oxidizer. The launch system is supported from the Mojave Control Center (MCC) via radio, a line-of-sight (L/S)-band telemetry system, satellite communications (SATCOM) antennas mounted to the Carrier Aircraft, and a commercial internet service provider. The launch system is also supported by a safety chase aircraft (a Cessna Citation 550 Jet) and photograph chase aircraft (such as a Gulfstream III or an F-18) that remain in formation with the Carrier Aircraft. The safety chase aircraft also originates and returns to MHV and would be sourced internally by Stratolaunch. The photograph chase aircraft would take off and land at any nearby airport within a 2-hour flight time, such as Van Nuys Airport, Hollywood Burbank Airport, Edwards Air Force Base (AFB), etc. The plane would be sourced internally by Stratolaunch or contracted with either a public or private operation.

- **Point of Contact**
  Name: Victor Velazquez
  Title: Air Quality Engineer
  Organization: Tetra Tech
  Email: Victor.Velazquez@tetratech.com
  Phone Number: 805-455-7439

- **Activity List:**

	Activity Type	Activity Title
2.	Emergency Generator	Communications Support Generator

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

Emission factors and air emission estimating methods come from the United States Air Force's Air Emissions Guide for Air Force Stationary Sources, Air Emissions Guide for Air Force Mobile Sources, and Air Emissions Guide for Air Force Transitory Sources.

2. Emergency Generator

2.1 General Information & Timeline Assumptions

- **Add or Remove Activity from Baseline?** Add

- **Activity Location**
  County: Santa Barbara
  Regulatory Area(s): NOT IN A REGULATORY AREA

- **Activity Title:** Communications Support Generator

- **Activity Description:**
  Generator powers the communication equipment at the rate of 8 hrs per week

- **Activity Start Date**
  Start Month: 7
  Start Year: 2022

- **Activity End Date**
  Indefinite: Yes
  End Month: N/A
  End Year: N/A

- **Activity Emissions:**

Pollutant	Emissions Per Year (TONs)
VOC	0.014508
SO_x	0.012220
NO_x	0.059800
CO	0.039936
PM 10	0.013052

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.013052
Pb	0.000000
NH_3	0.000000
CO_2e	6.9

2.2 Emergency Generator Assumptions

- **Emergency Generator**
  Type of Fuel used in Emergency Generator: Diesel
  Number of Emergency Generators: 1

- **Default Settings Used:** No

- **Emergency Generators Consumption**
  Emergency Generator's Horsepower: 25
  Average Operating Hours Per Year (hours): 416

2.3 Emergency Generator Emission Factor(s)

- **Emergency Generators Emission Factor (lb/hp-hr)**

VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

0.00279	0.00235	0.0115	0.00768	0.00251	0.00251			1.33

2.4 Emergency Generator Formula(s)

- Emergency Generator Emissions per Year

$AE_{POL} = (NGEN * HP * OT * EF_{POL}) / 2000$

AE_{POL}: Activity Emissions (TONs per Year)
NGEN: Number of Emergency Generators
HP: Emergency Generator's Horsepower (hp)
OT: Average Operating Hours Per Year (hours)
EF_{POL}: Emission Factor for Pollutant (lb/hp-hr)

AIR CONFORMITY APPLICABILITY MODEL REPORT
RECORD OF CONFORMITY ANALYSIS (ROCA)

1. General Information: The Air Force's Air Conformity Applicability Model (ACAM) was used to perform an analysis to assess the potential air quality impact/s associated with the action in accordance with the Air Force Manual 32-7002, Environmental Compliance and Pollution Prevention; the Environmental Impact Analysis Process (EIAP, 32 CFR 989); and the General Conformity Rule (GCR, 40 CFR 93 Subpart B). This report provides a summary of the ACAM analysis.

a. Action Location:

Base: EDWARDS AFB
State: California
County(s): Kern
Regulatory Area(s): East Kern Co, CA; Kern Co (Eastern Kern), CA

b. Action Title: Test and Operation of the Stratolaunch Talon-A-Hypersonic Research Testbed Vehicle

c. Project Number/s (if applicable):

d. Projected Action Start Date: 7 / 2022

e. Action Description:

Proposed Action includes launch control authority for Stratolaunch's flight tests and operations. USSF range assets would be used to support this mission to provide telemetry and optical data streams, and the Range Safety Office would provide flight safety analysis prior to mission execution and are a critical input for Go/No-Go launch decisions during flight. The FAA's Proposed Action is licensing Stratolaunch's launch operations and approving related airspace closures for launch operations.

The Proposed Project is the only alternative selected in this EA. The Stratolaunch Talon-A launch system is comprised of two air vehicles: the Stratolaunch Carrier Aircraft and the Talon-A research testbed vehicle. The Talon-A vehicle is an autonomous aircraft that generates thrust via a liquid fueled rocket engine that uses Jet-A as fuel and liquid oxygen (LOX) as its oxidizer. The launch system is supported from the Mojave Control Center (MCC) via radio, a line-of-sight (L/S)-band telemetry system, satellite communications (SATCOM) antennas mounted to the Carrier Aircraft, and a commercial internet service provider. The launch system is also supported by a safety chase aircraft (a Cessna Citation 550 Jet) and photograph chase aircraft (such as a Gulfstream III or an F-18) that remain in formation with the Carrier Aircraft. The safety chase aircraft also originates and returns to MHV and would be sourced internally by Stratolaunch. The photograph chase aircraft would take off and land at any nearby airport within a 2-hour flight time, such as Van Nuys Airport, Hollywood Burbank Airport, Edwards Air Force Base (AFB), etc. The plane would be sourced internally by Stratolaunch or contracted with either a public or private operation.

f. Point of Contact:

Name: Victor Velazquez
Title: Environmental Engineer
Organization: Tetra Tech
Email: Victor.Velazquez@tetratech.com
Phone Number: 805-455-7439

2. Analysis: Total combined direct and indirect emissions associated with the action were estimated through ACAM on a calendar-year basis for the "worst-case" and "steady state" (net gain/loss upon action fully implemented) emissions. General Conformity under the Clean Air Act, Section 1.76 has been evaluated for the action described above according to the requirements of 40 CFR 93, Subpart B.

Based on the analysis, the requirements of this rule are: _____ applicable

AIR CONFORMITY APPLICABILITY MODEL REPORT
RECORD OF CONFORMITY ANALYSIS (ROCA)

_X_ not applicable

Conformity Analysis Summary:

2022

Pollutant	Action Emissions (ton/yr)	GENERAL CONFORMITY	
		Threshold (ton/yr)	Exceedance (Yes or No)
East Kern Co, CA			
VOC	0.749		
NOx	5.148		
CO	2.413		
SOx	0.238		
PM 10	0.046	70	No
PM 2.5	0.029		
Pb	0.000		
NH3	0.014		
CO2e	911.6		
Kern Co (Eastern Kern), CA			
VOC	0.749	50	No
NOx	5.148	50	No
CO	2.413		
SOx	0.238		
PM 10	0.046		
PM 2.5	0.029		
Pb	0.000		
NH3	0.014		
CO2e	911.6		

2023 - (Steady State)

Pollutant	Action Emissions (ton/yr)	GENERAL CONFORMITY	
		Threshold (ton/yr)	Exceedance (Yes or No)
East Kern Co, CA			
VOC	1.499		
NOx	10.295		
CO	4.826		
SOx	0.476		
PM 10	0.093	70	No
PM 2.5	0.057		
Pb	0.000		
NH3	0.028		
CO2e	1823.2		
Kern Co (Eastern Kern), CA			
VOC	1.499	50	No
NOx	10.295	50	No
CO	4.826		
SOx	0.476		
PM 10	0.093		
PM 2.5	0.057		
Pb	0.000		
NH3	0.028		
CO2e	1823.2		

AIR CONFORMITY APPLICABILITY MODEL REPORT
RECORD OF CONFORMITY ANALYSIS (ROCA)

None of estimated emissions associated with this action are above the conformity threshold values established at 40 CFR 93.153 (b); Therefore, the requirements of the General Conformity Rule are not applicable.

Victor Velazquez, Environmental Engineer

3/2/2022
DATE

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

1. General Information

- **Action Location**
  Base: EDWARDS AFB
  State: California
  County(s): Kern
  Regulatory Area(s): East Kern Co. CA, Kern Co (Eastern Kern), CA

- **Action Title:** Test and Operation of the Stratolaunch Talon-A-Hypersonic Research Testbed Vehicle

- **Project Number/s (if applicable):**

- **Projected Action Start Date:** 7 / 2022

- **Action Purpose and Need:**
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- **Action Description:**
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- **Point of Contact**
  Name: Victor Velazquez
  Title: Environmental Engineer
  Organization: Tetra Tech
  Email: Victor.Velazquez@tetratech.com
  Phone Number: 805-455-7439

- **Activity List:**

	Activity Type	Activity Title
2.	Aircraft	Carrier Aircraft
3.	Aircraft	Safety chase aircraft (a Cessna Citation 550 Jet)

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

4.	Personnel	200 Personnel

Emission factors and air emission estimating methods come from the United States Air Force's Air Emissions Guide for Air Force Stationary Sources, Air Emissions Guide for Air Force Mobile Sources, and Air Emissions Guide for Air Force Transitory Sources.

2. Aircraft

2.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Kern
Regulatory Area(s): East Kern Co, CA; Kern Co (Eastern Kern), CA

- Activity Title: Carrier Aircraft

- Activity Description:
Carrier Aircraft

- Activity Start Date
Start Month: 7
Start Year: 2022

- Activity End Date
Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	0.472735
SO_x	0.453994
NO_x	9.991899
CO	1.870584
PM 10	0.030381

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.026138
Pb	0.000000
NH_3	0.000000
CO_2e	1372.2

- Activity Emissions [Flight Operations (includes Trim Test & APU) part]:

Pollutant	Emissions Per Year (TONs)
VOC	0.472735
SO_x	0.453994
NO_x	9.991899
CO	1.870584
PM 10	0.030381

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.026138
Pb	0.000000
NH_3	0.000000
CO_2e	1372.2

2.2 Aircraft & Engines

2.2.1 Aircraft & Engines Assumptions

- Aircraft & Engine
Aircraft Designation: KC-767A
Engine Model: PW4062

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

Primary Function: Transport - Bomber
Aircraft has After burn: No
Number of Engines: 2

- Aircraft & Engine Surrogate
Is Aircraft & Engine a Surrogate? Yes
Original Aircraft Name: Boeing 747-400
Original Engine Name: PW4056

2.2.2 Aircraft & Engines Emission Factor(s)

- Aircraft & Engine Emissions Factors (lb/1000lb fuel)

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	1666.68	12.49	1.07	3.78	42.61	0.11	0.10	3234
Approach	5698.45	0.10	1.07	12.17	1.93	0.05	0.04	3234
Intermediate	16865.19	0.08	1.07	25.98	0.50	0.07	0.06	3234
Military	21627.13	0.09	1.07	34.36	0.61	0.08	0.07	3234
After Burn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3234

2.3 Flight Operations

2.3.1 Flight Operations Assumptions

- Flight Operations
Number of Aircraft: 3
Number of Annual LTOs (Landing and Take-off) cycles for all Aircraft: 52
Number of Annual TGOs (Touch-and-Go) cycles for all Aircraft: 0
Number of Annual Trim Test(s) per Aircraft: 12

- Default Settings Used: Yes

- Flight Operations TIMs (Time In Mode)
Taxi/Idle Out [Idle] (mins): 9.2 (default)
Takeoff [Military] (mins): 0.4 (default)
Takeoff [After Burn] (mins): 0 (default)
Climb Out [Intermediate] (mins): 1.2 (default)
Approach [Approach] (mins): 5.1 (default)
Taxi/Idle In [Idle] (mins): 6.7 (default)

Per the Air Emissions Guide for Air Force Mobile Sources, the defaults values for military aircraft equipped with after burner for takeoff is 50% military power and 50% afterburner. (Exception made for F-35 where KARNES 3.2 flight profile was used)

- Trim Test
Idle (mins): 12 (default)
Approach (mins): 27 (default)
Intermediate (mins): 9 (default)
Military (mins): 12 (default)
AfterBurn (mins): 0 (default)

2.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for LTOs per Year
$AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * LTO / 2000$

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
LTO: Number of Landing and Take-off Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for LTOs per Year

$AE_{LTO} = AEM_{IDLE\_IN} + AEM_{IDLE\_OUT} + AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{LTO}: Aircraft Emissions (TONs)
AEM_{IDLE_IN}: Aircraft Emissions for Idle-In Mode (TONs)
AEM_{IDLE_OUT}: Aircraft Emissions for Idle-Out Mode (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for TGOs per Year

$AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * TGO / 2000$

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
TGO: Number of Touch-and-Go Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for TGOs per Year

$AE_{TGO} = AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{TGO}: Aircraft Emissions (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for Trim per Year

$AEPS_{POL} = (TD / 60) * (FC / 1000) * EF * NE * NA * NTT / 2000$

$AEPS_{POL}$: Aircraft Emissions per Pollutant & Power Setting (TONs)
TD: Test Duration (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
NA: Number of Aircraft
NTT: Number of Trim Test
2000: Conversion Factor pounds to TONs

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

- Aircraft Emissions for Trim per Year

$AE_{TRIM} = AEPS_{IDLE} + AEPS_{APPROACH} + AEPS_{INTERMEDIATE} + AEPS_{MILITARY} + AEPS_{AFTERBURN}$

AE_{TRIM}: Aircraft Emissions (TONs)
$AEPS_{IDLE}$: Aircraft Emissions for Idle Power Setting (TONs)
$AEPS_{APPROACH}$: Aircraft Emissions for Approach Power Setting (TONs)
$AEPS_{INTERMEDIATE}$: Aircraft Emissions for Intermediate Power Setting (TONs)
$AEPS_{MILITARY}$: Aircraft Emissions for Military Power Setting (TONs)
$AEPS_{AFTERBURN}$: Aircraft Emissions for After Burner Power Setting (TONs)

2.4 Auxiliary Power Unit (APU)

2.4.1 Auxiliary Power Unit (APU) Assumptions

- Default Settings Used: Yes

- Auxiliary Power Unit (APU) (default)

Number of APU per Aircraft	Operation Hours for Each LTO	Exempt Source?	Designation	Manufacturer

2.4.2 Auxiliary Power Unit (APU) Emission Factor(s)

- Auxiliary Power Unit (APU) Emission Factor (lb/hr)

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e

2.4.3 Auxiliary Power Unit (APU) Formula(s)

- Auxiliary Power Unit (APU) Emissions per Year

$APU_{POL} = APU * OH * LTO * EF_{POL} / 2000$

APU_{POL}: Auxiliary Power Unit (APU) Emissions per Pollutant (TONs)
APU: Number of Auxiliary Power Units
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2000: Conversion Factor pounds to tons

3. Aircraft

3.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Kern
Regulatory Area(s): East Kern Co, CA; Kern Co (Eastern Kern), CA

- Activity Title: Safety chase aircraft (a Cessna Citation 550 Jet)

- Activity Description:
Safety chase aircraft (a Cessna Citation 550 Jet)

- Activity Start Date

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

Start Month: 7
Start Year: 2022

- **Activity End Date**
  Indefinite: Yes
  End Month: N/A
  End Year: N/A

- **Activity Emissions:**

Pollutant	Emissions Per Year (TONs)
VOC	0.680715
SO_x	0.018247
NO_x	0.115385
CO	0.714381
PM 10	0.008405

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.007565
Pb	0.000000
NH_3	0.000000
CO_2e	55.2

- **Activity Emissions [Flight Operations (includes Trim Test & APU) part]:**

Pollutant	Emissions Per Year (TONs)
VOC	0.680715
SO_x	0.018247
NO_x	0.115385
CO	0.714381
PM 10	0.008405

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.007565
Pb	0.000000
NH_3	0.000000
CO_2e	55.2

3.2 Aircraft & Engines

3.2.1 Aircraft & Engines Assumptions

- **Aircraft & Engine**
  Aircraft Designation: T-1A
  Engine Model: JT15D-5B
  Primary Function: Trainer
  Aircraft has After burn: No
  Number of Engines: 2

- **Aircraft & Engine Surrogate**
  Is Aircraft & Engine a Surrogate? No
  Original Aircraft Name:
  Original Engine Name:

3.2.2 Aircraft & Engines Emission Factor(s)

- **Aircraft & Engine Emissions Factors (lb/1000lb fuel)**

	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e
Idle	235.50	136.97	1.07	1.66	119.20	0.82	0.74	3234
Approach	524.00	13.46	1.07	4.93	38.60	0.73	0.66	3234
Intermediate	1371.00	1.50	1.07	10.08	1.15	0.23	0.21	3234
Military	1630.00	0.00	1.07	11.13	0.00	0.13	0.12	3234
After Burn	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3234

3.3 Flight Operations

3.3.1 Flight Operations Assumptions

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

- Flight Operations

Number of Aircraft:	1
Number of Annual LTOs (Landing and Take-off) cycles for all Aircraft:	52
Number of Annual TGOs (Touch-and-Go) cycles for all Aircraft:	0
Number of Annual Trim Test(s) per Aircraft:	12

- Default Settings Used: Yes

- Flight Operations TIMs (Time In Mode)

Taxi/Idle Out [Idle] (mins):	12.8 (default)
Takeoff [Military] (mins):	0.4 (default)
Takeoff [After Burn] (mins):	0 (default)
Climb Out [Intermediate] (mins):	0.9 (default)
Approach [Approach] (mins):	3.8 (default)
Taxi/Idle In [Idle] (mins):	6.4 (default)

Per the Air Emissions Guide for Air Force Mobile Sources, the defaults values for military aircraft equipped with after burner for takeoff is 50% military power and 50% afterburner. (Exception made for F-35 where KARNES 3.2 flight profile was used)

- Trim Test

Idle (mins):	12 (default)
Approach (mins):	27 (default)
Intermediate (mins):	9 (default)
Military (mins):	12 (default)
AfterBurn (mins):	0 (default)

3.3.2 Flight Operations Formula(s)

- Aircraft Emissions per Mode for LTOs per Year

$AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * LTO / 2000$

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
LTO: Number of Landing and Take-off Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for LTOs per Year

$AE_{LTO} = AEM_{IDLE\_IN} + AEM_{IDLE\_OUT} + AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{LTO}: Aircraft Emissions (TONs)
AEM_{IDLE_IN}: Aircraft Emissions for Idle-In Mode (TONs)
AEM_{IDLE_OUT}: Aircraft Emissions for Idle-Out Mode (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for TGOs per Year

$AEM_{POL} = (TIM / 60) * (FC / 1000) * EF * NE * TGO / 2000$

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

AEM_{POL}: Aircraft Emissions per Pollutant & Mode (TONs)
TIM: Time in Mode (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
TGO: Number of Touch-and-Go Cycles (for all aircraft)
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for TGOs per Year

$AE_{TGO} = AEM_{APPROACH} + AEM_{CLIMBOUT} + AEM_{TAKEOFF}$

AE_{TGO}: Aircraft Emissions (TONs)
$AEM_{APPROACH}$: Aircraft Emissions for Approach Mode (TONs)
$AEM_{CLIMBOUT}$: Aircraft Emissions for Climb-Out Mode (TONs)
$AEM_{TAKEOFF}$: Aircraft Emissions for Take-Off Mode (TONs)

- Aircraft Emissions per Mode for Trim per Year

$AEPS_{POL} = (TD / 60) * (FC / 1000) * EF * NE * NA * NTT / 2000$

$AEPS_{POL}$: Aircraft Emissions per Pollutant & Power Setting (TONs)
TD: Test Duration (min)
60: Conversion Factor minutes to hours
FC: Fuel Flow Rate (lb/hr)
1000: Conversion Factor pounds to 1000pounds
EF: Emission Factor (lb/1000lb fuel)
NE: Number of Engines
NA: Number of Aircraft
NTT: Number of Trim Test
2000: Conversion Factor pounds to TONs

- Aircraft Emissions for Trim per Year

$AE_{TRIM} = AEPS_{IDLE} + AEPS_{APPROACH} + AEPS_{INTERMEDIATE} + AEPS_{MILITARY} + AEPS_{AFTERBURN}$

AE_{TRIM}: Aircraft Emissions (TONs)
$AEPS_{IDLE}$: Aircraft Emissions for Idle Power Setting (TONs)
$AEPS_{APPROACH}$: Aircraft Emissions for Approach Power Setting (TONs)
$AEPS_{INTERMEDIATE}$: Aircraft Emissions for Intermediate Power Setting (TONs)
$AEPS_{MILITARY}$: Aircraft Emissions for Military Power Setting (TONs)
$AEPS_{AFTERBURN}$: Aircraft Emissions for After Burner Power Setting (TONs)

3.4 Auxiliary Power Unit (APU)

3.4.1 Auxiliary Power Unit (APU) Assumptions

- Default Settings Used: Yes

- Auxiliary Power Unit (APU) (default)

Number of APU per Aircraft	Operation Hours for Each LTO	Exempt Source?	Designation	Manufacturer

3.4.2 Auxiliary Power Unit (APU) Emission Factor(s)

- Auxiliary Power Unit (APU) Emission Factor (lb/hr)

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

Designation	Fuel Flow	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	CO_2e

3.4.3 Auxiliary Power Unit (APU) Formula(s)

- Auxiliary Power Unit (APU) Emissions per Year
$APU_{POL} = APU * OH * LTO * EF_{POL} / 2000$

APU_{POL}: Auxiliary Power Unit (APU) Emissions per Pollutant (TONs)
APU: Number of Auxiliary Power Units
OH: Operation Hours for Each LTO (hour)
LTO: Number of LTOs
EF_{POL}: Emission Factor for Pollutant (lb/hr)
2000: Conversion Factor pounds to tons

4. Personnel

4.1 General Information & Timeline Assumptions

- Add or Remove Activity from Baseline? Add

- Activity Location
County: Kern
Regulatory Area(s): East Kern Co, CA, Kern Co (Eastern Kern), CA

- Activity Title: 200 Personnel

- Activity Description:
200 Personnel

- Activity Start Date
Start Month: 7
Start Year: 2022

- Activity End Date
Indefinite: Yes
End Month: N/A
End Year: N/A

- Activity Emissions:

Pollutant	Emissions Per Year (TONs)
VOC	0.345485
SO_x	0.004110
NO_x	0.187817
CO	2.240897
PM 10	0.054125

Pollutant	Emissions Per Year (TONs)
PM 2.5	0.023530
Pb	0.000000
NH_3	0.027699
CO_2e	395.8

4.2 Personnel Assumptions

- Number of Personnel
Active Duty Personnel: 0
Civilian Personnel: 0
Support Contractor Personnel: 200
Air National Guard (ANG) Personnel: 0

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

Reserve Personnel: 0

- Default Settings Used: Yes

- Average Personnel Round Trip Commute (mile): 20 (default)

- Personnel Work Schedule

Active Duty Personnel:	5 Days Per Week (default)
Civilian Personnel:	5 Days Per Week (default)
Support Contractor Personnel:	5 Days Per Week (default)
Air National Guard (ANG) Personnel:	4 Days Per Week (default)
Reserve Personnel:	4 Days Per Month (default)

4.3 Personnel On Road Vehicle Mixture

- On Road Vehicle Mixture (%)

	LDGV	LDGT	HDGV	LDDV	LDDT	HDDV	MC
POVs	37.55	60.32	0	0.03	0.2	0	1.9
GOVs	54.49	37.73	4.67	0	0	3.11	0

4.4 Personnel Emission Factor(s)

- On Road Vehicle Emission Factors (grams/mile)

	VOC	SO_x	NO_x	CO	PM 10	PM 2.5	Pb	NH_3	CO_2e
LDGV	000.114	000.003	000.084	000.992	000.047	000.020		000.023	00298.845
LDGT	000.288	000.004	000.178	001.871	000.048	000.021		000.024	00379.038
HDGV	000.600	000.011	001.339	008.875	000.183	000.078		000.045	01128.468
LDDV	000.026	000.003	000.125	000.281	000.060	000.032		000.008	00271.718
LDDT	000.094	000.003	000.533	000.594	000.112	000.082		000.008	00364.857
HDDV	000.194	000.014	004.796	001.133	000.211	000.117		000.028	01514.699
MC	004.452	000.002	001.252	023.791	000.019	000.009		000.054	00187.891

4.5 Personnel Formula(s)

- Personnel Vehicle Miles Travel for Work Days per Year

$VMT_P = NP * WD * AC$

VMT_P: Personnel Vehicle Miles Travel (miles/year)
NP: Number of Personnel
WD: Work Days per Year
AC: Average Commute (miles)

- Total Vehicle Miles Travel per Year

$VMT_{Total} = VMT_{AD} + VMT_C + VMT_{SC} + VMT_{ANG} + VMT_{AFRC}$

VMT_{Total}: Total Vehicle Miles Travel (miles)
VMT_{AD}: Active Duty Personnel Vehicle Miles Travel (miles)
VMT_C: Civilian Personnel Vehicle Miles Travel (miles)
VMT_{SC}: Support Contractor Personnel Vehicle Miles Travel (miles)
VMT_{ANG}: Air National Guard Personnel Vehicle Miles Travel (miles)
VMT_{AFRC}: Reserve Personnel Vehicle Miles Travel (miles)

- Vehicle Emissions per Year

$V_{POL} = (VMT_{Total} * 0.002205 * EF_{POL} * VM) / 2000$

DETAIL AIR CONFORMITY APPLICABILITY MODEL REPORT

V_{POL}: Vehicle Emissions (TONs)
VMT_{Total}: Total Vehicle Miles Travel (miles)
0.002205: Conversion Factor grams to pounds
EF_{POL}: Emission Factor for Pollutant (grams/mile)
VM: Personnel On Road Vehicle Mixture (%)
2000: Conversion Factor pounds to tons

Stratolaunch **Harbor Craft Air and Greenhouse Emissions Calculations**

Marine Vessel

					Emission Factors(g/kWh)*						
Vehicle/Source Type		Annual Operating Hours	KW	Load Factor (%)	VOC	CO	NOx	PM10	PM2.5	SO2	GHG
Marine Vessel		104	447.4	0.45	0.1093	1.1	4.69	0.07	0.0669	0.006246	679.47

		Annual Emissions from Marine Vessel operations						
Vehicle/Source Type		VOC (tpy)	CO (tpy)	NOx (tpy)	PM10 (tpy)	PM2.5 (tpy)	SO2 (tpy)	CO2eq (MTPY)
Marine Vessel		0.01	0.08	0.32	0.00	0.00	0.00	42.68
Total		**0.01**	**0.08**	**0.32**	**0.00**	**0.00**	**0.00**	**42.68**

Notes:

a Emission factor source: EPA, 2020 Ports Emissions Inventory Guidance: Methodologies for Estimating Port-Related and Goods Movement Mobile Source Emissions

CO2 carbon dioxide

g grams

h hour

HP Horse power

KW kilowatt

mm milimeter

MTPY Metric tons per year

tpy tons per year

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Stratolaunch **Talon-A Land Transport Air and Greenhouse Emissions Calculations**

Talon A Land Transport from VSFB to MHV

			Emission Factors(g/mile)[a]						
Vehicle/Source Type	Trips	Trip Length (miles)	VOC	CO	NOx	PM10	PM2.5	SO2	GHG
HDDV	52	400	0.098	0.808	3.156	0.135	0.07	0.012	1,289.26

	Annual Emissions from ATV operations						
Vehicle/Source Type	VOC (tpy)	CO (tpy)	NOx (tpy)	PM10 (tpy)	PM2.5 (tpy)	SO2 (tpy)	CO2eq (MTPY)
HDDV	0.00	0.02	0.07	0.00	0.00	0.00	26.82
Total	**0.00**	**0.02**	**0.07**	**0.00**	**0.00**	**0.00**	**26.82**

Notes:

a Emission factor source: Air Force Civil Engineer Center 2020 Air Emissions Guide for Air Force Mobile Sources

g grams

MTPY Metric tons per year

tpy tons per year

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