

A.2.2.1.2 NHPA Section 106 Consultation with Tribal Governments



U.S. Department
of Transportation
**Federal Aviation
Administration**

Office of Commercial Space Transportation

800 Independence Ave., SW.
Washington, DC 20591

JAN 06 2016

Eric Wilkerson
Tribal Representative
Cherokee of Georgia Tribal Council
Saint George, Georgia 31646

RE: Section 106 Consultation Initiation for the Spaceport Camden Environmental Impact Statement, Camden County, Georgia

Dear Mr. Wilkerson:

The purpose of this letter is to initiate consultation with you under Section 106 of the National Historic Preservation Act (NHPA) for the above-referenced project and to learn whether your organization is interested in participating as a Consulting Party.

The Camden County Board of Commissioners is seeking a Launch Site Operator License from the FAA Office of Commercial Space Transportation to develop and operate a commercial space launch site (known as Spaceport Camden) in an unincorporated area of Woodbine, in Camden County, Georgia. The project has been determined an “undertaking” subject to the NHPA and its implementing regulations under Section 106 (36 CFR Part 800, as amended). The proposed project and its associated activities are also subject to the National Environmental Policy Act (NEPA) and the FAA has initiated preparation of an Environmental Impact Statement to meet its regulatory obligations. The agency intends to complete Section 106 in conjunction with the NEPA process.

For your reference, Attachment A to this letter includes a map of the project area and brief project description. Additional information on this project is available on the FAA’s website at https://www.faa.gov/about/office_org/headquarters_offices/ast/environmental/nepa_docs/review/documents_progress/camden_spaceport/.

If you have any questions or would like to discuss the project in more detail, please contact Stacey Zee of my staff at 202-267-9305 (Stacey.Zee@faa.gov). I respectfully request that you respond at your earliest convenience if you are interested in participating as a Consulting Party. Thank you for your consideration.

Sincerely,



Daniel Murray
Manager, Space Transportation Development Division

Attachment A.
Spaceport Camden Project Description
Location of Proposed Spaceport Camden Project Map



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Washington, DC 20591

JAN 06 2016

Virginia Nail
Tribal Historic Preservation Officer
Chickasaw Nation
PO Box 1548
Ada, Oklahoma 74821

RE: Section 106 Consultation Initiation for the Spaceport Camden Environmental Impact Statement, Camden County, Georgia

Dear Ms. Nail:

The purpose of this letter is to initiate consultation with you under Section 106 of the National Historic Preservation Act (NHPA) for the above-referenced project and to learn whether your organization is interested in participating as a Consulting Party.

The Camden County Board of Commissioners is seeking a Launch Site Operator License from the FAA Office of Commercial Space Transportation to develop and operate a commercial space launch site (known as Spaceport Camden) in an unincorporated area of Woodbine, in Camden County, Georgia. The project has been determined an "undertaking" subject to the NHPA and its implementing regulations under Section 106 (36 CFR Part 800, as amended). The proposed project and its associated activities are also subject to the National Environmental Policy Act (NEPA) and the FAA has initiated preparation of an Environmental Impact Statement to meet its regulatory obligations. The agency intends to complete Section 106 in conjunction with the NEPA process.

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Daniel Murray
Manager, Space Transportation Development Division

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Washington, DC 20591

JAN 06 2016

Dr. Ian Thompson
Tribal Historic Preservation Officer
Choctaw Nation of Oklahoma
PO Box 1210
Durant, Oklahoma 74702-1210

RE: Section 106 Consultation Initiation for the Spaceport Camden Environmental Impact Statement, Camden County, Georgia

Dear Dr. Thompson:

The purpose of this letter is to initiate consultation with you under Section 106 of the National Historic Preservation Act (NHPA) for the above-referenced project and to learn whether your organization is interested in participating as a Consulting Party.

The Camden County Board of Commissioners is seeking a Launch Site Operator License from the FAA Office of Commercial Space Transportation to develop and operate a commercial space launch site (known as Spaceport Camden) in an unincorporated area of Woodbine, in Camden County, Georgia. The project has been determined an “undertaking” subject to the NHPA and its implementing regulations under Section 106 (36 CFR Part 800, as amended). The proposed project and its associated activities are also subject to the National Environmental Policy Act (NEPA) and the FAA has initiated preparation of an Environmental Impact Statement to meet its regulatory obligations. The agency intends to complete Section 106 in conjunction with the NEPA process.

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Sincerely,



Daniel Murray
Manager, Space Transportation Development Division

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Washington, DC 20591

JAN 06 2016

Georgia Tribe of Eastern Cherokee
PO Box 1915
Cumming, Georgia 30028

RE: Section 106 Consultation Initiation for the Spaceport Camden Environmental Impact Statement, Camden County, Georgia

To Whom It May Concern:

The purpose of this letter is to initiate consultation with you under Section 106 of the National Historic Preservation Act (NHPA) for the above-referenced project and to learn whether your organization is interested in participating as a Consulting Party.

The Camden County Board of Commissioners is seeking a Launch Site Operator License from the FAA Office of Commercial Space Transportation to develop and operate a commercial space launch site (known as Spaceport Camden) in an unincorporated area of Woodbine, in Camden County, Georgia. The project has been determined an "undertaking" subject to the NHPA and its implementing regulations under Section 106 (36 CFR Part 800, as amended). The proposed project and its associated activities are also subject to the National Environmental Policy Act (NEPA) and the FAA has initiated preparation of an Environmental Impact Statement to meet its regulatory obligations. The agency intends to complete Section 106 in conjunction with the NEPA process.

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Sincerely,



Daniel Murray
Manager, Space Transportation Development Division

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Washington, DC 20591

JAN 06 2016

Marian S. McCormick
Principal Chief
Lower Muskogee Creek Tribe
106 Tall Pine Drive
Whigham, Georgia 39897

RE: Section 106 Consultation Initiation for the Spaceport Camden Environmental Impact Statement, Camden County, Georgia

Dear Ms. McCormick:

The purpose of this letter is to initiate consultation with you under Section 106 of the National Historic Preservation Act (NHPA) for the above-referenced project and to learn whether your organization is interested in participating as a Consulting Party.

The Camden County Board of Commissioners is seeking a Launch Site Operator License from the FAA Office of Commercial Space Transportation to develop and operate a commercial space launch site (known as Spaceport Camden) in an unincorporated area of Woodbine, in Camden County, Georgia. The project has been determined an "undertaking" subject to the NHPA and its implementing regulations under Section 106 (36 CFR Part 800, as amended). The proposed project and its associated activities are also subject to the National Environmental Policy Act (NEPA) and the FAA has initiated preparation of an Environmental Impact Statement to meet its regulatory obligations. The agency intends to complete Section 106 in conjunction with the NEPA process.

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If you have any questions or would like to discuss the project in more detail, please contact Stacey Zee of my staff at 202-267-9305 (Stacey.Zee@faa.gov). I respectfully request that you respond at your earliest convenience if you are interested in participating as a Consulting Party. Thank you for your consideration.

Sincerely,



Daniel Murray
Manager, Space Transportation Development Division

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JAN 06 2016

Johnnie Jacobs and Emman Spain
Tribal Historic Preservation Officers
Muscogee (Creek) Nation
PO Box 580
Okmulgee, Oklahoma 74447

RE: Section 106 Consultation Initiation for the Spaceport Camden Environmental Impact Statement, Camden County, Georgia

Dear Mr. Jacobs and Mr. Spain:

The purpose of this letter is to initiate consultation with you under Section 106 of the National Historic Preservation Act (NHPA) for the above-referenced project and to learn whether your organization is interested in participating as a Consulting Party.

The Camden County Board of Commissioners is seeking a Launch Site Operator License from the FAA Office of Commercial Space Transportation to develop and operate a commercial space launch site (known as Spaceport Camden) in an unincorporated area of Woodbine, in Camden County, Georgia. The project has been determined an "undertaking" subject to the NHPA and its implementing regulations under Section 106 (36 CFR Part 800, as amended). The proposed project and its associated activities are also subject to the National Environmental Policy Act (NEPA) and the FAA has initiated preparation of an Environmental Impact Statement to meet its regulatory obligations. The agency intends to complete Section 106 in conjunction with the NEPA process.

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If you have any questions or would like to discuss the project in more detail, please contact Stacey Zee of my staff at 202-267-9305 (Stacey.Zee@faa.gov). I respectfully request that you respond at your earliest convenience if you are interested in participating as a Consulting Party. Thank you for your consideration.

Sincerely,



Daniel Murray
Manager, Space Transportation Development Division

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Washington, DC 20591

JAN 06 2019

Robert Thrower
Tribal Historic Preservation Officer
Poarch Band of Creek Indians
5811 Jack Springs Road
Atmore, Alabama 36502

RE: Section 106 Consultation Initiation for the Spaceport Camden Environmental Impact Statement, Camden County, Georgia

Dear Mr. Thrower:

The purpose of this letter is to initiate consultation with you under Section 106 of the National Historic Preservation Act (NHPA) for the above-referenced project and to learn whether your organization is interested in participating as a Consulting Party.

The Camden County Board of Commissioners is seeking a Launch Site Operator License from the FAA Office of Commercial Space Transportation to develop and operate a commercial space launch site (known as Spaceport Camden) in an unincorporated area of Woodbine, in Camden County, Georgia. The project has been determined an “undertaking” subject to the NHPA and its implementing regulations under Section 106 (36 CFR Part 800, as amended). The proposed project and its associated activities are also subject to the National Environmental Policy Act (NEPA) and the FAA has initiated preparation of an Environmental Impact Statement to meet its regulatory obligations. The agency intends to complete Section 106 in conjunction with the NEPA process.

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If you have any questions or would like to discuss the project in more detail, please contact Stacey Zee of my staff at 202-267-9305 (Stacey.Zee@faa.gov). I respectfully request that you respond at your earliest convenience if you are interested in participating as a Consulting Party. Thank you for your consideration.

Sincerely,



Daniel Murray
Manager, Space Transportation Development Division

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Washington, DC 20591

JAN 06 2016

Natalie (Deere) Harjo
Tribal Historic Preservation Officer
Seminole Nation of Oklahoma
PO Box 1498
Wewoka, Oklahoma 74884

RE: Section 106 Consultation Initiation for the Spaceport Camden Environmental Impact Statement, Camden County, Georgia

Dear Ms. Harjo:

The purpose of this letter is to initiate consultation with you under Section 106 of the National Historic Preservation Act (NHPA) for the above-referenced project and to learn whether your organization is interested in participating as a Consulting Party.

The Camden County Board of Commissioners is seeking a Launch Site Operator License from the FAA Office of Commercial Space Transportation to develop and operate a commercial space launch site (known as Spaceport Camden) in an unincorporated area of Woodbine, in Camden County, Georgia. The project has been determined an “undertaking” subject to the NHPA and its implementing regulations under Section 106 (36 CFR Part 800, as amended). The proposed project and its associated activities are also subject to the National Environmental Policy Act (NEPA) and the FAA has initiated preparation of an Environmental Impact Statement to meet its regulatory obligations. The agency intends to complete Section 106 in conjunction with the NEPA process.

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If you have any questions or would like to discuss the project in more detail, please contact Stacey Zee of my staff at 202-267-9305 (Stacey.Zee@faa.gov). I respectfully request that you respond at your earliest convenience if you are interested in participating as a Consulting Party. Thank you for your consideration.

Sincerely,



Daniel Murray
Manager, Space Transportation Development Division

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Washington, DC 20591

JAN 0 5 2016

Alan D. Emarthle
Tribal Historic Preservation Officer
Seminole Nation of Oklahoma
PO Box 1768
Seminole, Oklahoma 74868

RE: Section 106 Consultation Initiation for the Spaceport Camden Environmental Impact Statement, Camden County, Georgia

Dear Mr. Emarthle:

The purpose of this letter is to initiate consultation with you under Section 106 of the National Historic Preservation Act (NHPA) for the above-referenced project and to learn whether your organization is interested in participating as a Consulting Party.

The Camden County Board of Commissioners is seeking a Launch Site Operator License from the FAA Office of Commercial Space Transportation to develop and operate a commercial space launch site (known as Spaceport Camden) in an unincorporated area of Woodbine, in Camden County, Georgia. The project has been determined an "undertaking" subject to the NHPA and its implementing regulations under Section 106 (36 CFR Part 800, as amended). The proposed project and its associated activities are also subject to the National Environmental Policy Act (NEPA) and the FAA has initiated preparation of an Environmental Impact Statement to meet its regulatory obligations. The agency intends to complete Section 106 in conjunction with the NEPA process.

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If you have any questions or would like to discuss the project in more detail, please contact Stacey Zee of my staff at 202-267-9305 (Stacey.Zee@faa.gov). I respectfully request that you respond at your earliest convenience if you are interested in participating as a Consulting Party. Thank you for your consideration.

Sincerely,



Daniel Murray
Manager, Space Transportation Development Division

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JAN 06 2016

Dr. Paul N. Backhouse
Tribal Historic Preservation Officer
Seminole Tribe of Florida
30290 Josie Billie Highway
Clewiston, Florida 33440

RE: Section 106 Consultation Initiation for the Spaceport Camden Environmental Impact Statement, Camden County, Georgia

Dear Dr. Backhouse:

The purpose of this letter is to initiate consultation with you under Section 106 of the National Historic Preservation Act (NHPA) for the above-referenced project and to learn whether your organization is interested in participating as a Consulting Party.

The Camden County Board of Commissioners is seeking a Launch Site Operator License from the FAA Office of Commercial Space Transportation to develop and operate a commercial space launch site (known as Spaceport Camden) in an unincorporated area of Woodbine, in Camden County, Georgia. The project has been determined an "undertaking" subject to the NHPA and its implementing regulations under Section 106 (36 CFR Part 800, as amended). The proposed project and its associated activities are also subject to the National Environmental Policy Act (NEPA) and the FAA has initiated preparation of an Environmental Impact Statement to meet its regulatory obligations. The agency intends to complete Section 106 in conjunction with the NEPA process.

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If you have any questions or would like to discuss the project in more detail, please contact Stacey Zee of my staff at 202-267-9305 (Stacey.Zee@faa.gov). I respectfully request that you respond at your earliest convenience if you are interested in participating as a Consulting Party. Thank you for your consideration.

Sincerely,



Daniel Murray
Manager, Space Transportation Development Division

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800 Independence Ave., SW.
Washington, DC 20591

JAN 06 2016

Charles Coleman
Tribal Historic Preservation Officer
Thlopthlocco Tribal Town
PO Box 188
Okemah, Oklahoma 74859

RE: Section 106 Consultation Initiation for the Spaceport Camden Environmental Impact Statement, Camden County, Georgia

Dear Mr. Coleman:

The purpose of this letter is to initiate consultation with you under Section 106 of the National Historic Preservation Act (NHPA) for the above-referenced project and to learn whether your organization is interested in participating as a Consulting Party.

The Camden County Board of Commissioners is seeking a Launch Site Operator License from the FAA Office of Commercial Space Transportation to develop and operate a commercial space launch site (known as Spaceport Camden) in an unincorporated area of Woodbine, in Camden County, Georgia. The project has been determined an "undertaking" subject to the NHPA and its implementing regulations under Section 106 (36 CFR Part 800, as amended). The proposed project and its associated activities are also subject to the National Environmental Policy Act (NEPA) and the FAA has initiated preparation of an Environmental Impact Statement to meet its regulatory obligations. The agency intends to complete Section 106 in conjunction with the NEPA process.

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Daniel Murray
Manager, Space Transportation Development Division

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800 Independence Ave., SW.
Washington, DC 20591

FEB 25 2016

Dr. Althea Natalga Sumpter
Gullah Geechee Commission Chair
Gullah Geechee Cultural Heritage Corridor
PO Box 1007
Johns Island, SC 29457-1007

Dear Dr. Sumpter:

The purpose of this letter is to initiate consultation with you under Section 106 of the National Historic Preservation Act (NHPA) for the Spaceport Camden Environmental Impact Statement (EIS) and to learn whether your organization is interested in participating as a Consulting Party.

The Camden County Board of Commissioners is seeking a Launch Site Operator License from the Federal Aviation Administration (FAA) Office of Commercial Space Transportation to develop and operate a commercial space launch site (known as Spaceport Camden) in an unincorporated area of Woodbine, in Camden County, Georgia. The project has been determined an "undertaking" subject to the NHPA and its implementing regulations under Section 106 (36 CFR Part 800, as amended). The proposed project and its associated activities also are subject to the National Environmental Policy Act (NEPA) and the FAA has initiated preparation of an EIS to meet its regulatory obligations.

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Sincerely,



Daniel Murray
Manager, Space Transportation Development Division

Attachment
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Location of Proposed Spaceport Camden Project Map

TRIBAL
HISTORIC
PRESERVATION
OFFICE



P.O. BOX 167
CONCHO, OKLAHOMA 73022
1-800-247-4612 Toll Free
405-422-7416 Telephone

January 13, 2016

Office of Commercial Space Transportation
U.S. Department of Transportation
800 Independence Ave., SW
Washington, DC 20591

RE: Environmental Assessment and Cultural Resources Survey for the Proposed
Colorado Spaceport at Front Range Airport in Adams County, Colorado.

Dear Daniel Murray,

On behalf of the Cheyenne and Arapaho Tribes, thank you for the notice of the
referenced project. I have reviewed your Consultation request under Section 106 of the
National Historic Preservation Act regarding the project proposal and commented as
follows:

At this time it is determined to be **No Properties**; however, if at any time during the
project implementation inadvertent discoveries are made that reflect evidence of human
remains, ceremonial or cultural objects, historical sites such as stone rings, burial mounds,
village or battlefield artifacts, please discontinue work and notify the THPO Office
immediately. If needed, we will contact the Tribes NAGPRA representatives.

Best Regards,


Margaret Sutton, THPO Officer
Tribal Historical Preservation Office
msutton@c-a-tribes.org

From: Stacey.Zee@faa.gov
Sent: Wednesday, February 3, 2016 3:07 PM
To: Groome, Chadi D.
Cc: Pam.Schanel@icfi.com; Elyse.Mize@icfi.com
Subject: FW: Spaceport Camden Environmental Impact

For files

From: Daniel R. Ragle [mailto:dragle@choctawnation.com]
Sent: Wednesday, February 03, 2016 12:47 PM
To: Zee, Stacey (FAA)
Subject: RE: Spaceport Camden Environmental Impact

Ms. Zee,

The Choctaw Nation of Oklahoma thanks you for the correspondence regarding the above referenced project. This project lies outside of the Choctaw Nation of Oklahoma's area of historic interest. The Choctaw Nation of Oklahoma respectfully defers to the other Tribes that have been contacted. If you have any questions, please contact me by email.

Daniel Ragle

Compliance Review Officer
Historic Preservation Dept.
Choctaw Nation of Oklahoma
(800) 522-6170 Ext. 2727
dragle@choctawnation.com
www.choctawnation.com
www.choctawnationculture.com



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A.2.2.2 Endangered Species Act Section 7 Consultation



U.S. Department
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800 Independence Ave., SW.
Washington, DC 20591

Roy E. Crabtree, Ph.D., Regional Administrator
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505

September 5, 2017

Dear Dr. Crabtree,

The Federal Aviation Administration (FAA) is proposing to issue a Launch Site Operator License to the Camden County Board of Commissioners (the County). This letter is to request Endangered Species Act concurrence from your office for the proposed project: Spaceport Camden. FAA is conducting separate formal consultation with the U.S. Fish and Wildlife Service. FAA has made the following determinations regarding the proposed activity for species listed as threatened or endangered by the National Marine Fisheries Service (NMFS) under the Endangered Species Act (ESA) of 1973, as amended:

- May affect, but is not likely to adversely affect, Atlantic sturgeon (*Acipenser oxyrinchus oxyrinchus*), shortnose sturgeon (*Acipenser brevirostrum*), green sea turtle (*Chelonia mydas*), hawksbill sea turtle (*Eretmochelys imbricata*), Kemp's ridley sea turtle (*Lepidochelys kempii*), loggerhead sea turtle (*Caretta caretta*), leatherback sea turtle (*Dermochelys coriacea*), and North Atlantic right whale (*Eubalaena glacialis*)
- No effect on critical habitat for Atlantic sturgeon, loggerhead sea turtle, and North Atlantic right whale

Our supporting analysis is provided below. Potential operational-related effects would be similar, in part, to those included in FAA's and the National Aeronautics and Space Administration's consultation for waterborne landings associated with launches occurring from Kennedy Space Center, Cape Canaveral Air Force Station, and SpaceX Texas Launch Complex (Consultation Number SER-2016-17894). In that consultation, which included spacecraft and launch vehicles landing in the ocean or on a drone ship in the ocean, NMFS determined the action would not adversely affect any ESA-listed marine species.

PROPOSED PROJECT

FAA proposes to issue a Launch Site Operator License to the Camden County, Georgia Board of Commissioners. The license would allow the County to offer the commercial space launch site, referred to as Spaceport Camden, to commercial launch operators to conduct launches of liquid-fueled, small to medium-large lift-class, orbital and suborbital vertical launch vehicles. The Proposed Action analyzed in this Biological Assessment includes both proposed construction and operation of Spaceport Camden on the Atlantic seaboard in Camden County, Georgia (Exhibit 1).

Purpose of the Proposed Project

Camden County's purpose for constructing and operating Spaceport Camden is to allow the County to offer a commercial space launch site to a growing number of small to medium-large lift-class, orbital and

suborbital vertical launch vehicle operators to conduct commercial launches from the east coast of the United States. A commercial space launch site may be able to more effectively respond to the scheduling needs of commercial launch providers than Federal facilities with national security priorities and logistical complexities.

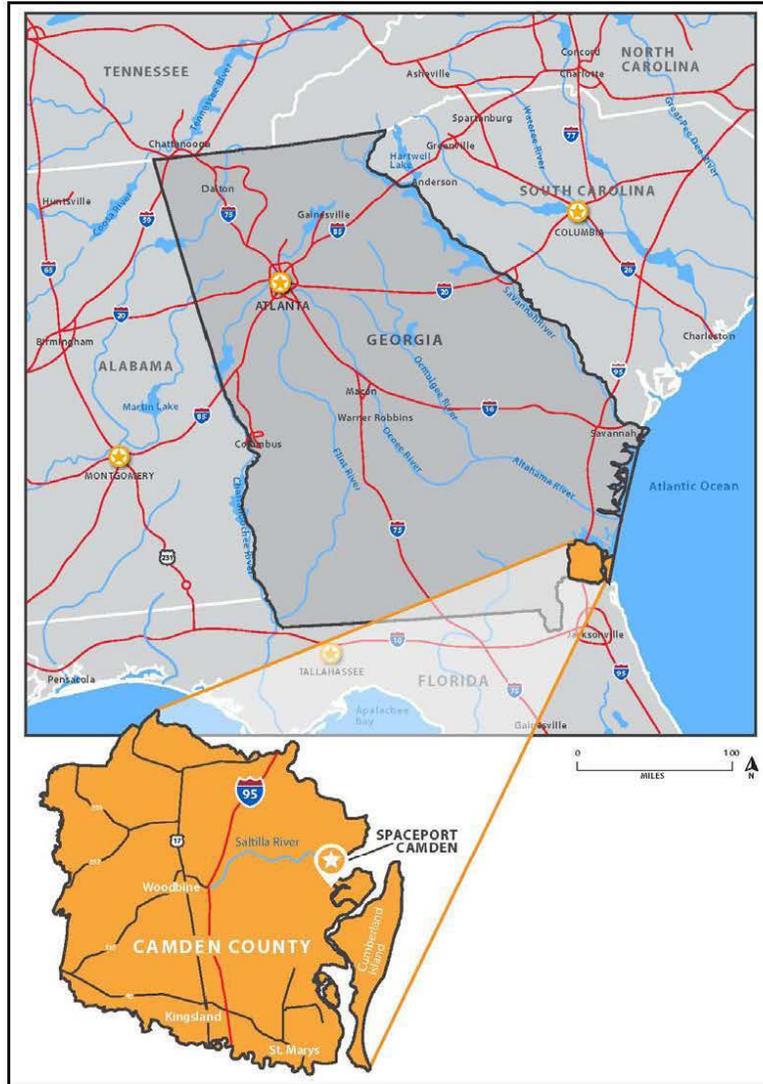


Exhibit 1. Proposed Spaceport Camden Location

The purpose of FAA's action in connection with the County's proposal is to fulfill FAA's responsibilities as authorized by Executive Order 12465, *Commercial Expendable Launch Vehicle Activities* (49 *Federal Register* [FR] 7099, 3 Code of Federal Regulations [CFR], 1984 Comp., p. 163), and the U.S. Commercial Space Launch Competitiveness Act of 2015 (Public Law 114-90) for oversight of commercial space launch activities, including licensing launch activities. The Proposed Action would be consistent with the objectives of the U.S. Commercial Space Launch Competitiveness Act of 2015.

Description of the Proposed Project

Spaceport Camden would be constructed in the extreme southeastern part of Georgia, approximately 11.5 miles due east of the town of Woodbine (Exhibit 1). The proposed launch site would be constructed within an existing 11,800-acre industrial site consisting of property currently owned by the Union Carbide Corporation and Bayer CropScience.¹ Construction of the launch site would occur on approximately 4,000 acres of this industrial site. The total 11,800 acres of this site would provide an appropriate buffer to ensure the safety of the uninvolved public. FAA would not issue a license to the County until after FAA completes its National Environmental Policy Act process (including preparation of an Environmental Impact Statement [EIS] and Record of Decision [estimated in early 2018]) and any required permits or approvals have been granted.

Construction

Proposed construction activities include the construction of four facilities and associated infrastructure: a Vertical Launch Facility, a Launch Control Center Complex, an Alternate Control Center and Visitor Center, and a Landing Zone. Construction activities are expected to last approximately 15 months. The Vertical Launch Facility would include a launch pad and its associated structures, storage tanks, and handling areas; vehicle and payload integration facilities; a lightning protection system; deluge water systems and associated water capture tank; water tower; and other launch-related facilities and systems including shops, office facilities, and stormwater retention ponds. The Launch Control Center Complex would include a Launch Control Center Building housing a control room and related equipment and a Payload Processing Building. The Alternate Control Center would mirror the Launch Control Center in facility construction, providing a backup launch control capability, and would also include a Visitor (Welcome) Center containing informational displays and accommodations for visitors to view launches. The Landing Zone would occupy approximately 11 acres located in the center of the uplands portion of the spaceport property and would consist of a 400-foot by 400-foot concrete pad located roughly in the center of the area. Construction activities would occur during daylight hours, six days a week.

The facilities of the proposed Spaceport Camden (see Exhibit 2) would encompass less than 100 noncontiguous acres. No in-water construction activities (including dredging or pile driving) would occur. The following mitigation measures would be implemented as part of the proposed project to avoid or minimize the potential for water quality impacts from construction (e.g., soil erosion, runoff, sedimentation):

- As part of National Pollutant Discharge Elimination System permit program, a Stormwater Pollution Prevention Plan (SWPPP) would be developed and implemented to include techniques that diffuse and slow the velocity of stormwater.
- No excavated or fill material would be placed in delineated Clean Water Act (CWA) Section 404 waters of the U.S. except as authorized by a permit from U.S. Army Corps of Engineers.
- Concrete mixing and placement activities would be conducted to ensure discharge water associated with these activities would not reach surrounding water bodies or pools unless specifically authorized in a CWA discharge permit.

¹ The County has entered into an option agreement to purchase most of the Union Carbide Corporation property (about 4,000 acres) and is considering an option to purchase the Bayer CropScience property (an additional 7,800 acres).

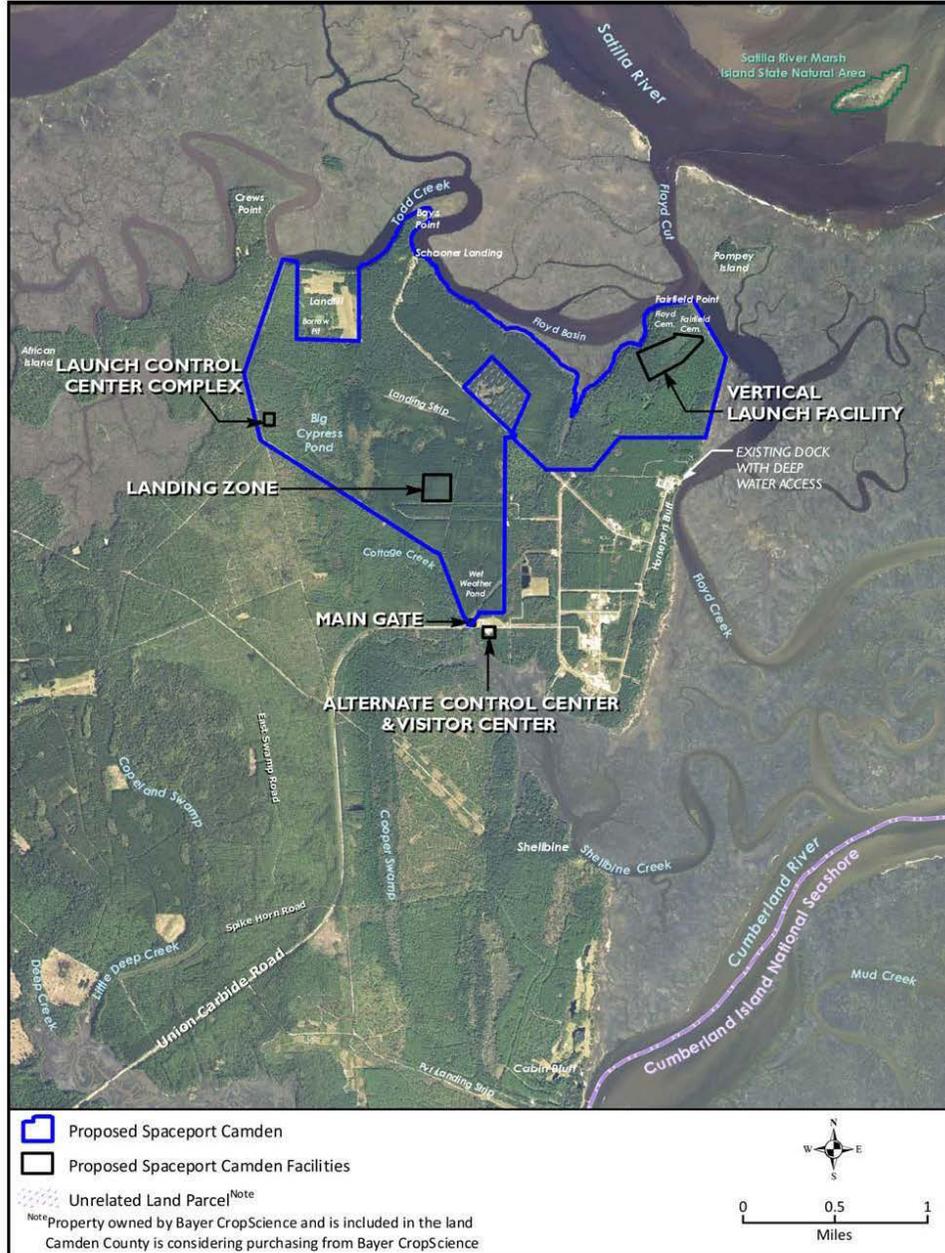


Exhibit 2. Proposed Spaceport Camden Site Plan

Operation

FAA's license would allow Camden County to offer Spaceport Camden to commercial launch operators to conduct launches of liquid-fueled, small to medium-large lift-class, orbital and suborbital vertical launch vehicles. Spaceport Camden would accommodate up to 12 vertical launches and up to 12 associated launch vehicle first stage landings per year. All vehicles would launch generally to the east over the Intracoastal Waterway, Cumberland Island National Seashore, and the Atlantic Ocean. Any first stage landings would return to the launch site from the east or land on a barge 200 to 300 miles offshore. In addition, in support of the launches, there would be up to 12 wet dress rehearsals (a launch rehearsal performed with vehicle propellant loading²) and up to 12 static fire engine tests (a wet dress rehearsal combined with the ignition of first stage engines for a few seconds and then shutting them down) per year. Since a launch operator has not been identified to date, the precise trajectory used during launch operations is unknown. The launch trajectories used for any launch would be specific to each particular launch operator's mission. As part of the launch license evaluation process, FAA conducts a policy review, payload review, financial determination, and safety review. For FAA to complete a safety review, an individual launch operator is required to submit a flight safety analysis to FAA that details the specific vehicle trajectory and hazard areas and demonstrates compliance with the 14 CFR Part 400 expected casualty requirements. For purposes of the effects analysis, FAA is considering a range of launch and landing trajectories, ranging from 83 to 115 degrees from true north. This range is depicted in Exhibit 3. It is assumed all launches and landings would occur within this range. If a trajectory outside of this area is required by the launch operator, they would need to conduct additional analyses, including reinitiating ESA Section 7 consultations, prior to conducting operations.

Launch Vehicle Description

Spaceport Camden would be available to a range of launch operators, each of which offers various launch vehicles. While these vehicles would include small and medium-large lift class and use liquid propellants, they would have different design and operating specifications. Since a specific launch vehicle cannot be identified until a launch operator applies to FAA to launch from Spaceport Camden, a representative launch vehicle was used for purposes of the EIS (and thus this consultation) to evaluate the potential environmental impacts. The design features identified for the launch vehicle described in the following paragraphs were selected as representative for a medium-large lift-class launch vehicle. A medium-large lift-class launch vehicle may have a gross liftoff weight of approximately 750,000 to 1,500,000 pounds with an approximate length of 200 to 250 feet. The representative launch vehicle uses liquid oxygen and a special grade of kerosene, known as Rocket Propellant 1 (RP-1), as propellants.

First stage: The first stage would be approximately 10 to 14 feet in diameter and between 125 to 175 feet long and may include one or two large engines or as many as nine smaller engines. For purposes of this analysis, it is assumed the representative launch vehicle would use multiple engines producing approximately 1,800,000 pounds of thrust. It is further assumed the representative launch vehicle would use liquid oxygen and RP-1 as its main propellants, and those propellants would be stored onboard in two internal aluminum tanks: one of approximately 60,000 to 65,000 gallons for liquid oxygen and one of 35,000 to 40,000 gallons for RP-1. The first stage of the launch vehicle could land at the launch site (recovered), in the Atlantic Ocean on a barge (recovered), or in the open ocean (unrecovered).

² Propellants loaded onto the launch vehicle include the main engine fuel (RP-1), liquid oxygen, and any other fuels (such as hydrazine).

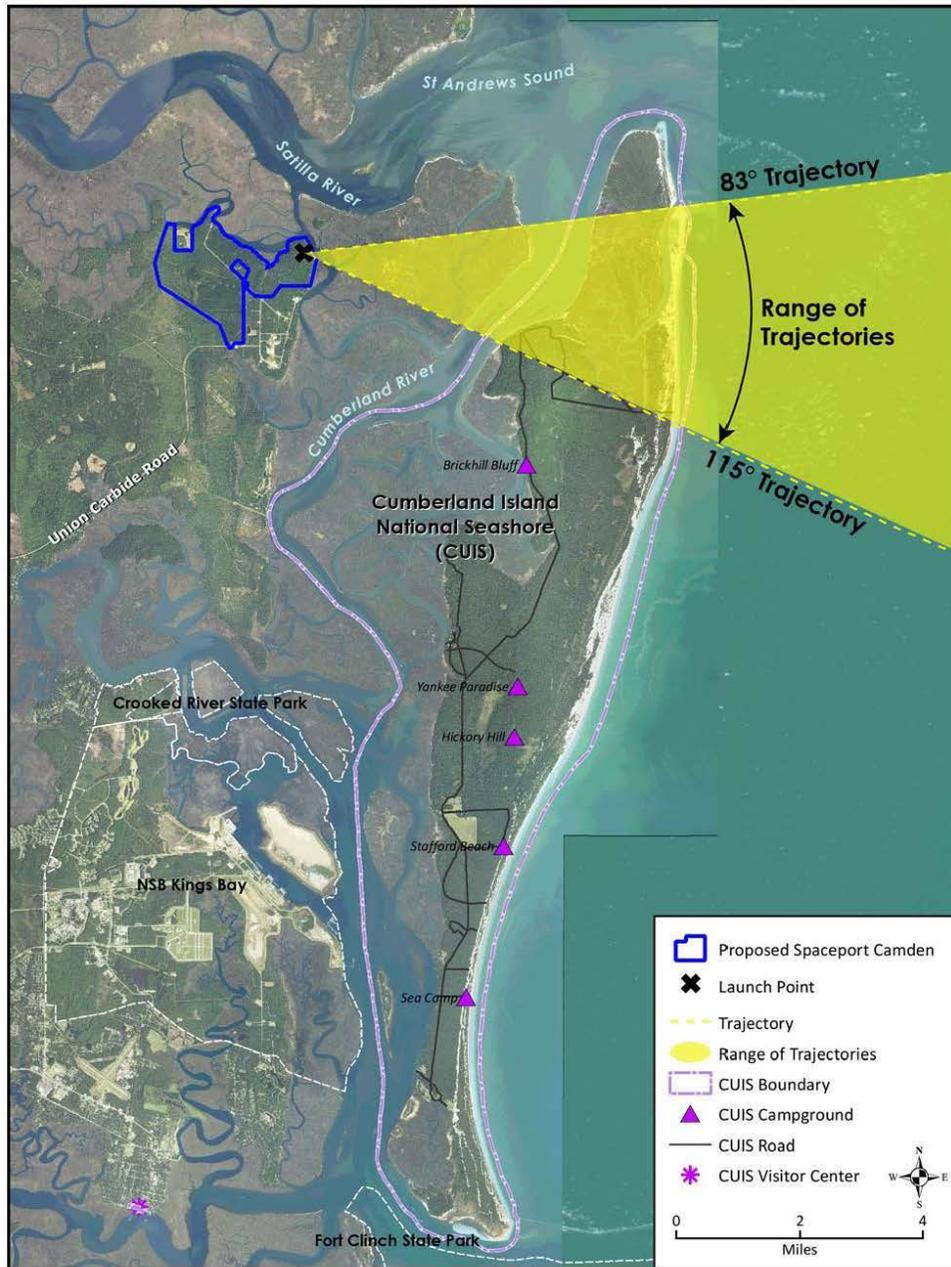


Exhibit 3. Spaceport Camden Range of Launch Trajectories

Second stage: The second stage would be similar in diameter to the first stage and between 35 and 50 feet long, not including the fairing (the top portion of the vehicle where the payload³ is enclosed) and payload. The typical second stage would use one or two engines, one engine being more typical. It is assumed that a single second stage engine would be used to provide approximately 150,000 pounds of thrust. The fairing⁴ would be between 12 and 18 feet in diameter by 30 to 40 feet long, although smaller versions may also be used. The second stage is assumed to use approximately 15,000 gallons of liquid oxygen and 9,000 gallons of RP-1 stored onboard in one aluminum tank each. Typically, the second stage achieves an orbit that decays relatively quickly, in about two to six months. The second stage typically burns up upon reentry, but there have been instances where parts have impacted Earth. If possible, if enough fuel remains in the second stage, the operator could perform a controlled reentry that would ensure that any parts surviving reentry would land in the ocean. However, the potential location of where the second stage would land would not be known until near the time of reentry.

Common subsystems in Stages 1 and 2: Most medium-large lift-class launch vehicles use high-pressure helium as purge gas (to clear components of residual fluids, such as propellants) or pressurants for propellant tanks (pressurants maintain pressure in the tanks as the propellant is used). Therefore, it is assumed that both stages of the representative vehicle would use helium gas stored in high-pressure cylinders to pressurize the propellant tanks for both stages. It is further assumed that both stages would include radio frequency transmitters to receive control signals and send monitoring and status data. Electronic control systems would be used to control valves and monitor equipment on the vehicles.

Flight termination system: Launch vehicles are equipped with safety systems, called flight termination systems, intended to cause the destruction of the launch vehicle in the event that the vehicle does not perform as intended and subsequently strays from the intended trajectory. Activation of the system would be intended to limit the location of a vehicle (or vehicle debris) impact to the identified hazard area (the hazard area would be established during FAA's review of a license application).

Launch Vehicle Assembly

The first and second stages would typically arrive at Spaceport Camden separately by oversized truck (similar in size to a mobile home) with two security escorts and would be placed in the Vehicle Integration Building at the Vertical Launch Facility. Once there, the stages and engines would be checked and prepared for mating. During vehicle operations, vehicle integration, and checkouts, information on vehicle status (transmitted on radio frequency channels) would typically occur.

Launch Operations

Launch operations consists of pre-launch, launch, and first stage landing activities. Most launches and landings would be conducted during the day. However, up to one launch and one landing per year could be conducted during the late-night time period between 10:00 p.m. and 7:00 a.m. All wet dress rehearsals and static fire engine tests (see below) would take place during daylight hours.

Pre-Launch Activities

Proposed pre-launch activities include mission rehearsals, static fire engine tests, and coordination with governmental agencies and media outlets to provide notification of these launch operation activities and establish secure areas in the vicinity of the launch site. A Security Plan, developed by Camden County in cooperation with the launch operator, would outline a process (e.g., the establishment of closure areas)

³ Payload includes everything that the launch vehicle is launching, including the cargo (such as a satellite or experimental equipment) and other material such as propellants and payload engines.

⁴ Typically a nose cone casing used to protect a launch vehicle payload against the pressure and heating impacts during a launch through the atmosphere.

to prevent the public and other nonauthorized personnel from accessing the area during hazardous operations, in accordance with 14 CFR Parts 417 and 420.

Mission Dress Rehearsals

Mission rehearsals are performed to verify that all vehicle and ground systems are functioning properly and that all procedures are properly written. After final systems checkout, there would typically be two mission rehearsals. One dry dress rehearsal (a launch rehearsal performed without loading propellants onboard the launch vehicle) and one wet dress rehearsal (a launch rehearsal performed with vehicle propellant loading⁵) would be performed to verify full launch readiness. During a wet dress rehearsal, the launch procedures would be followed up to a pre-programmed abort just prior to first stage engine ignition. Following each rehearsal, the integrated launch vehicle would be returned from the launch pad to the Vehicle Integration Building. All propellants loaded during the wet dress rehearsal would be removed from the launch vehicle and returned to their storage tanks at the Vertical Launch Facility at the conclusion of the rehearsal.

Static Fire Engine Tests

Static fire engine tests are performed to verify engine control and performance as well as launch pad systems performance. Static fire engine tests include all of the activities associated with a wet dress rehearsal, with the additional action of igniting the first stage engines. During a static fire engine test, the launch vehicle engines would typically be ignited for approximately two seconds but could be ignited for up to seven seconds, then shut down. The launch vehicle would be held in place during the test to prevent launch. The launch vehicle would be defueled of propellants not consumed during the static fire test, and those propellants would be returned to their storage tanks at the Vertical Launch Facility at the conclusion of the test.

Nominal Launch

After a final check, the integrated launch vehicle would be launched. For launches where the first stage would be recovered, the return of the first stage (either landing at the Landing Zone or returned by vessel after landing on a barge in the Atlantic Ocean), and first stage refurbishment would complete the launch operations.

First Stage Landing

The incorporation of a Landing Zone at Spaceport Camden would allow for the landing of the launch vehicle first stage after it has successfully separated from the upper stages of the vehicle. Up to 12 launch vehicle first stage landings per year could be conducted. Security and safety zones from the vehicle launch would be maintained for the return of this portion of the launch vehicle. First stage landings would occur approximately 10 minutes after launch and, therefore, would not appreciably extend the length of time security and safety zones would need to be maintained.

Not all launches would involve landing the first stage at the launch site. First stages may drop in the Atlantic Ocean or land on a barge 200 to 300 miles off the coast of Georgia in the Atlantic Ocean.⁶ During a landing (either at the launch site or on a barge at sea), the first stage engines would be used to control the descent of the vehicle. In the event of a landing on a barge, the first stage would be returned to the launch site using the existing dock on Floyd Creek, the most likely route to the dock being through St. Andrews Sound via Floyd Cut at the mouth of the Satilla River (see Exhibit 2).

⁵ Propellants loaded onto the launch vehicle include the main engine fuel (RP-1), liquid oxygen, and any other fuels (such as hydrazine).

⁶ In the event that the first stage is dropped into the Atlantic Ocean, the first stage would not be recovered and would sink in the Atlantic Ocean hundreds of miles offshore.

Public Notification of Launch Operations

Public access in the vicinity of the launch site would be restricted during launches, wet dress rehearsals, and static fire engine tests. Closures would involve securing both land and water areas (referred to as closure areas, the sizes of which would vary for each operation). Public notification would be required prior to establishing the closure areas.

Approximately two weeks in advance of a launch operation requiring public notification (i.e., actual launch, wet dress rehearsal, or static fire engine test), the appropriate county officials (including police, fire, and rescue personnel) would be notified of the proposed date, the expected closure area dimensions, times, and backup closure dates and times. Camden County and/or the launch operator would post written notices of the date, time, and the proposed closure area at several locations in the area as well as an advertisement in local newspapers. Camden County and/or the launch operator would also coordinate with local government agencies with regard to launch operations requiring public notification.

Camden County and/or the launch operator would notify the public approximately three to six days prior to a launch operation that would require a closure. Notices would be issued through local media and through the use of Notices to Mariners (NOTMARs) and Notices to Airmen. Camden County and/or the launch operator would also notify other appropriate agencies of the launch operation and associated closures.

Security and Safety Zones

As part of the licensing process, Camden County and the launch operator would jointly develop a Security Plan that defines the process for ensuring that any unauthorized persons, vessels, trains, aircraft, cars, trucks, all-terrain vehicles, or other vehicles are not within FAA-approved hazard area or, if they are, that they conform to criteria in 14 CFR Parts 417 and 420. (The hazard area encompasses all areas that could potentially be affected by debris from a launch failure. In the event of a launch failure, only some portions of the hazard area would be impacted.) The Security Plan would include safety and security personnel for each launch operation activity and roadblocks and other security checkpoints. Camden County and/or the launch operator also would develop and implement agreements and plans with local authorities whose support is needed to ensure public safety during all launch processing and flight, in accordance with 14 CFR Parts 417 and 420.

The Security Plan would describe the procedures for securing a closure area, thus limiting public access in the area on the day of a launch, wet dress rehearsal, or static fire engine test. The closure area would be expected to include areas around the access points to the launch site and the waterways surrounding the launch site, in addition to parts of Cumberland Island extending along the trajectory and out to sea. Each launch would have an individually defined closure area and hazard area, which is dependent upon the specific type of vehicle, the trajectory, and the mission.

Area closures would occur approximately 36 times annually (12 wet dress rehearsals, 12 static fire tests, and 12 launches) and could last up to 12 hours on a launch day, with 4 to 6 hours being the typical closure time for a nominal launch. The 12-hour closure period allows for potential aborts and contingencies. A closure for a wet dress rehearsal or static fire engine test would be shorter than for a launch, typically three hours or less, and the closure area would include only those areas within a 2-mile radius of the launch pad, which would not reach water areas in the Atlantic Ocean. Camden County Sheriff Department boats would be used to secure the river, streams, and ocean checkpoints.

Exhibits 4 and 5 show possible hazard and closure areas for a launch based on two representative trajectories.⁷ Additional trajectories, all in a generally easterly direction, could be used for launches from

⁷Three trajectories are being used in the analyses for the FAA's EIS: a northern (83°), a middle (100°), and a southern (115°). Exhibits 4 and 5 show hazard and closure areas for the northernmost and southernmost of these three trajectories. Other

this launch site. As can be seen from Exhibits 4 and 5, differences in the locations of the hazard areas could result in changes to the defined closure areas. In addition to land checkpoints, waterborne checkpoints could be located along the Satilla River/St. Andrews Sound area (O₁, O₂, and O₃ on Exhibits 4 and 5), the Atlantic Ocean (O₄ and O₅), and the Cumberland River (O₆ and O₇).

During a closure, monitoring would be done by vehicles (car/truck) along existing roads and by U.S. Coast Guard (USCG) and Camden County Sheriff Department boats for water areas, as well as by video surveillance (e.g., high-definition video cameras with zoom lenses placed well above ground level on the water tower and/or lightning towers). Camden County, the launch operator, and/or law enforcement would monitor the area to the east of the checkpoints to ensure the area would remain clear.

Table 1 lists actions that would be conducted to ensure the closure and security of the area prior to an actual launch. The same actions and activities would occur for other launch operations requiring a closure (i.e., wet dress rehearsal and static fire engine test), but the start time, area size, and durations would be different since these other launch operations are not expected to last as long or impact as large an area as an actual launch.

Table 1. Representative Security Activities On Day of Launch

Action	Purpose	Start Time	End Time
Establish checkpoints and take down checkpoints	Set up for launch and remove after launch. Commence monitoring of traffic flow.	T ¹ -6 to 12 hours	T +5 to 30 minutes
Establish hard checkpoints	Restrict access to owners and authorized persons only in closure areas.	T -3 hours	T +5 to 30 minutes
USCG/other waterborne law enforcement on station	The USCG and/or other local waterborne law enforcement sweep areas and restrict boating access.	T -3 hours	T +5 to 30 minutes
Security sweeps	Security sweeps responsible areas (e.g., beach, island Main Road, logging roads near launch site, rivers and creeks). Verify by video, UAV, or ATV as needed.	T -2 hours	T -1 hour 40 minutes
Trajectory sweep	Verify with visual and/or airborne sweep.	T -1 hour	T -40 minutes
Final sweep	Check land and water checkpoints for activity, review video one last time.	T -1 hour	T -40 minutes
Close airspace	In accordance with agreed-upon procedure, Jacksonville FL ARTCC closes appropriate airspace.	T -15 minutes	T +5 to 30 minutes

Notes: ATV = all-terrain vehicle; UAV = unmanned aerial vehicle; USCG = U.S. Coast Guard; FL ARTCC = Florida Air Route Traffic Control Center.

¹ "T" implies the anticipated time of engine firing, with start and end times measured before (minus x hours or minutes) or after (plus x hours or minutes). End times dependent on whether a first stage landing is planned.

The Security Plan would include a process for clearing offshore areas, such as coordinating with the USCG, issuing a NOTMAR, and clearing the offshore area in order to ensure public safety. The USCG could conduct a boat patrol to sweep the offshore area to make sure the area is clear; sweeps would continue until the launch operator is ready to load propellant to the vehicle (approximately three hours prior to launch). If necessary, a final sweep of the closure areas by manned fixed-wing aircraft or unmanned aerial vehicle could be implemented at this time to ensure the areas are clear.

trajectories proposed by launch operators would be assessed to determine the need for additional environmental impact analysis and documentation. Closure and hazard areas would be determined as part of the FAA launch approval process for each launch.

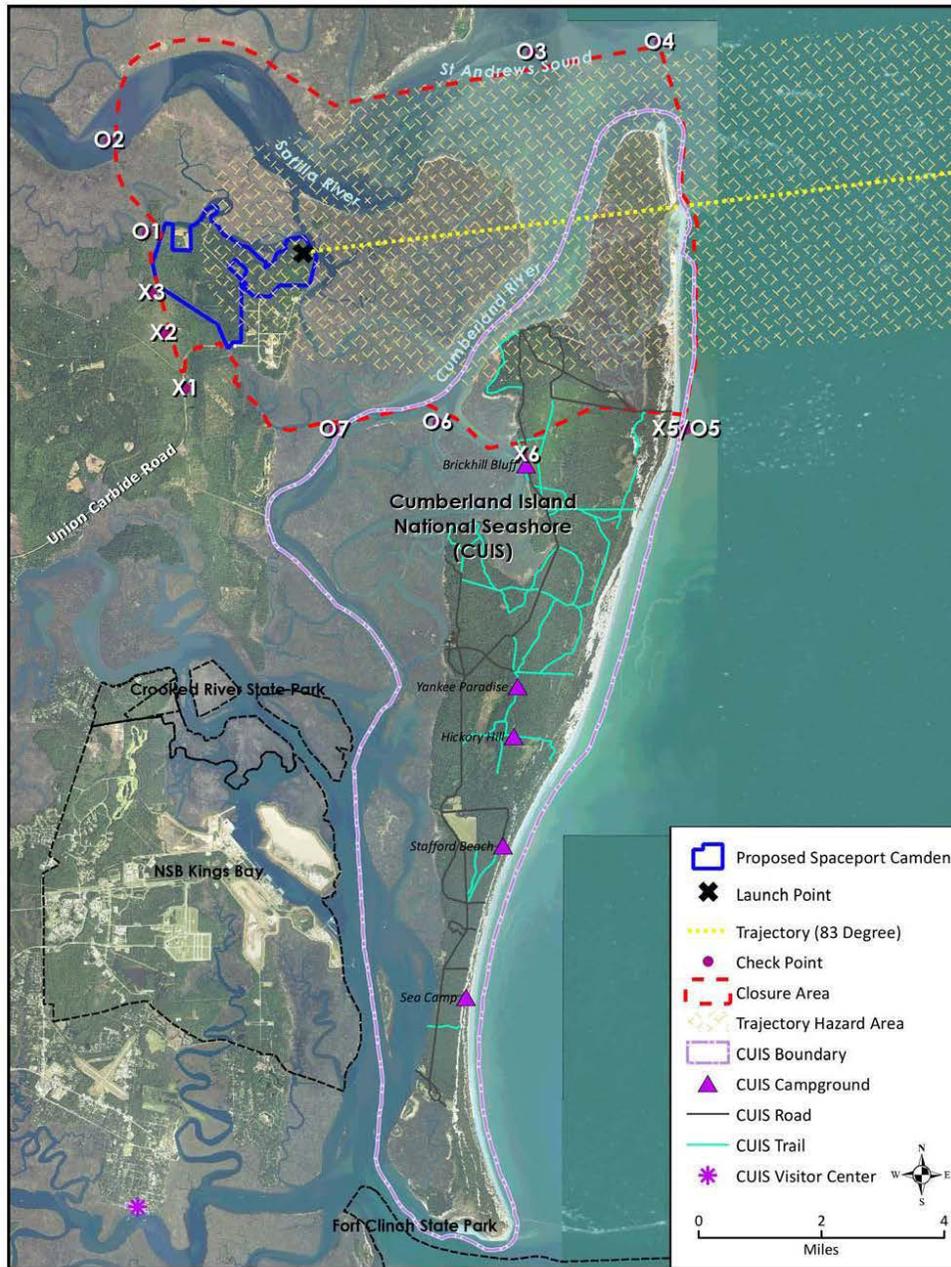


Exhibit 4. Representative Trajectory (83 Degree) with Hazard and Closure Areas

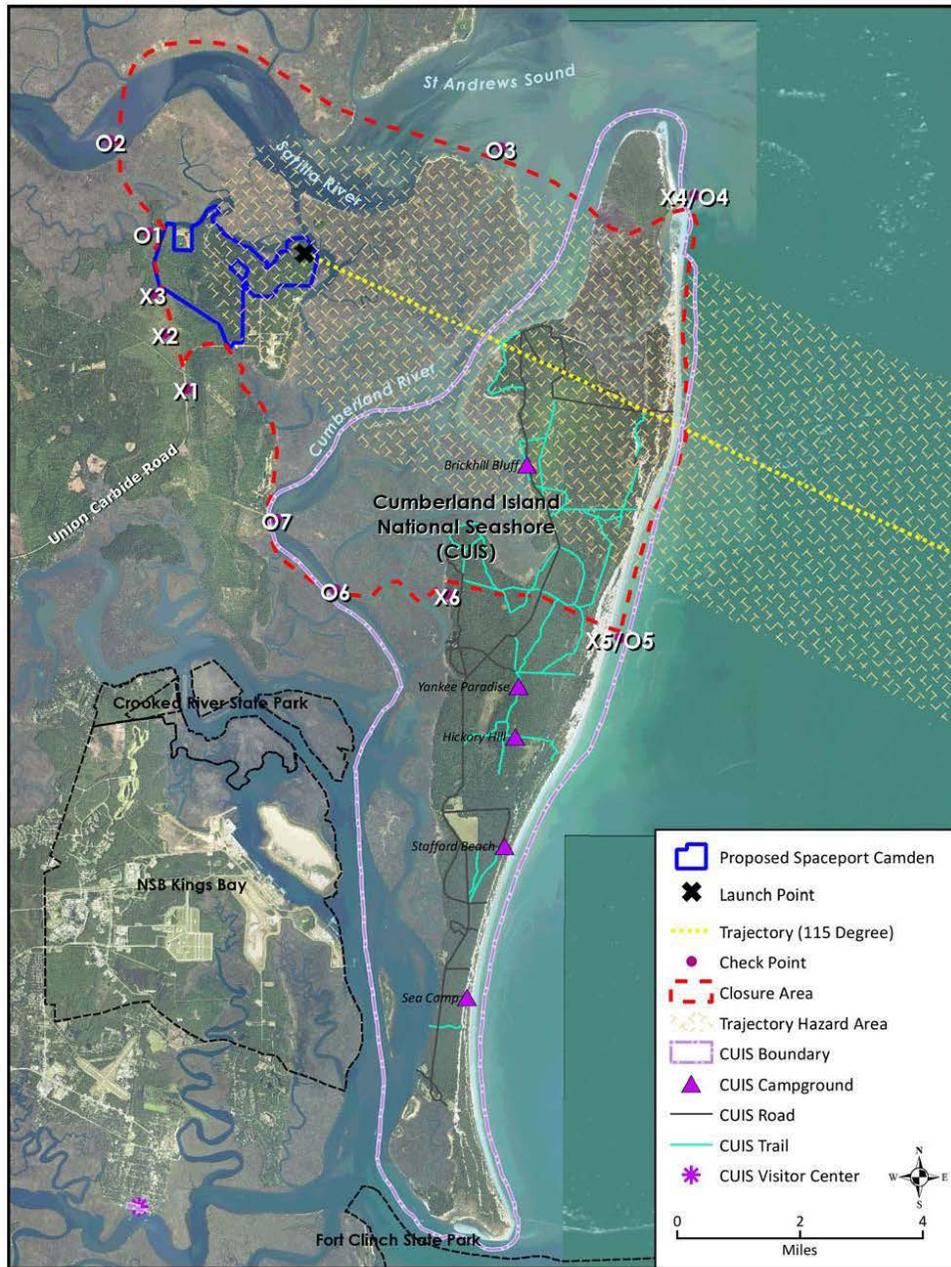


Exhibit 5. Representative Trajectory (115 Degree) with Hazard and Closure Areas

After launch and landing (if planned) operations are completed or postponed, Camden County and/or the launch operator and FAA would notify law enforcement the area has been deemed safe, allowing them to reopen the closure areas. In the event the launch is postponed, closure and hazard areas would be reestablished for the rescheduled launch.

Launch Failures

Failures, while unlikely, are possible. Launch failures would occur either on the launch pad or during flight. Failures on the launch pad would be expected to result in the complete destruction of the launch vehicle and payload. The ensuing explosion would consume most, if not all, of the propellants carried on the vehicle. Failures in flight could result in the destruction of the vehicle either due to the failure itself or as the result of a destruct signal generated by a flight termination system. The flight termination system is designed to destroy the vehicle in the event that the vehicle veers from the planned flight trajectory. This system is employed to ensure any debris from the destruction of the vehicle lands within the FAA-approved hazard zone. Most propellants are expected to be consumed during the destruction of the vehicle, but some may escape and be released into the atmosphere. Although this process is intended for the vehicle to be totally destroyed, some of the vehicle components could survive relatively intact. Any debris or surviving components would be expected to impact within the launch site boundary or on land or in water within the hazard zone. Components and debris impacting water could sink intact or break up into smaller pieces before sinking. Should any propellant tanks survive a water impact relatively intact, the propellant would, if not recovered, eventually leak out of the tanks and into the water.

Mitigation Measures

The following mitigation measures for operations over water would be implemented to avoid or minimize potential effects to protected species.

1. Closure areas are trajectory dependent, and would be based on the proposed trajectory for each launch within the range of trajectories shown in Exhibit 3. Each proposed closure area would be developed in coordination with NMFS and other federal agencies to ensure appropriate water and land areas are properly secured, with minimal impact to federal and state activities and operations related to habitat and wildlife management, such as NMFS North Atlantic right whale monitoring activities (including routine population surveys, biopsy sampling efforts, and rescues of distressed right whales). The operator would coordinate with NMFS prior to each launch event to ensure all conflicts associated with access restrictions are resolved prior to launch day. Any proposed trajectories that fall outside the range shown in Exhibit 3 would require additional NMFS consultation under the ESA and/or MMPA as applicable.
2. All launch site security employees would be briefed on special status species (including ESA-listed species) prior to conducting patrols via unmanned aerial systems, boats, all-terrain vehicle, or on foot.
3. All boat and barge operators would watch for ESA-listed aquatic species listed in this consultation and attempt to avoid collisions with these species.
4. Boats would maintain a safe distance from protected species by following these protective measures:
 - a. Sea turtles – maintain a minimum distance of 150 feet from observed sea turtles.
 - b. North Atlantic right whale – maintain a minimum distance of 1,500 feet from observed right whales.
 - c. Boats/vessels 65 feet in length or longer conducting clearance within the Southeast Seasonal Management Area of the Atlantic Ocean would restrict speed to 10 knots or less to avoid potential strikes to North Atlantic right whales and manatees, especially during right whale calving season (November 15 to April 15) (NOAA, 2017a).

- d. Mariners will check various communication media for general information regarding avoiding ship strikes and specific information regarding right whale sightings in the area. These include NOAA weather radio, USCG broadcast, and NOTMARs.
- e. Marine mammals (i.e., dolphins, whales, porpoises) – maintain a minimum distance of 300 feet of observed marine mammals
- f. When protected species are sighted while the vessel is underway (e.g., bow-riding), attempt to remain parallel to the animal’s course. Avoid excessive speed or abrupt changes in direction until they have left the area.
- g. Reduce speed to 10 knots or less when mother/calf pairs or groups of marine mammals are observed, when safety permits.

DESCRIPTION OF THE ACTION AREA

The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR §402.02). The action area for the project includes the construction footprint and surrounding water bodies as shown in Exhibit 2, the portion of the Atlantic Ocean underlying the range of trajectories shown in Exhibit 3, the hazard and closure areas associated with the boundaries of the trajectory range shown in Exhibits 4 and 5, and the offshore portion (200 to 300 miles) of the Atlantic Ocean where ocean landings may occur. The areas depicted in Exhibits 2 through 5 are expected to encompass all of the effects of the proposed project.

NMFS LISTED SPECIES AND CRITICAL HABITAT IN THE ACTION AREA

Table 2 lists ESA-listed species and critical habitat under NMFS jurisdiction occurring in the action area.

Table 2. ESA-Listed Species and Critical Habitat in the Action Area

Species	ESA Listing Status	Listing Rule (Date of most recent)	Most Recent Recovery Plan Date	Critical Habitat in Area	Listing Rule (Date of most recent)
Atlantic sturgeon (DPS: South Atlantic/New York Bight/Chesapeake Bay/Carolina/Gulf of Maine)	E	77 FR 5914 February 6, 2012	N/A	Yes	82 FR 39160 (August 17, 2017)
Shortnose sturgeon	E	32 FR 4001 March 11, 1967	December 1998	No	N/A
Green sea turtle	T	81 FR 20057 April 6, 2016	October 1991	No	63 FR 46693 (September 2, 1998)
Hawksbill sea turtle	E	35 FR 8491 June 2, 1970	December 1993	No	63 FR 45353 (September 2, 1998)
Kemp’s ridley sea turtle	E	35 FR 18319 December 2, 1970	September 2011	No	N/A
Leatherback sea turtle	E	35 FR 8491 June 2, 1970	April 1992	No	44 FR 17710 (March 23, 1979)
Loggerhead sea turtle (Northwest Atlantic DPS)	T	43 FR 32800 July 28, 1978	December 2008	Yes	79 FR 39856 (July 10, 2014)
North Atlantic right whale	E	35 FR 18319 December 2, 1970	May 2005	Yes	81 FR 4838 (January 27, 2016)

Notes: DPS = distinct population segment; E = endangered; FR = *Federal Register*; T = threatened; N/A = not applicable.

Table 3 describes the relevant biological information for the species listed in Table 2, including the potential for occurrence, whether occurrence is year-round or seasonal, and how occurrence relates to important biological behaviors and life stages. Critical habitat information is also included, along with a summary of physical and biological features that occur in the action area and have the potential to be affected.

Table 3. Species and Critical Habitat in the Action Area

Species/Critical Habitat	Description of Occurrence
<p>Atlantic sturgeon (DPS: South Atlantic/New York Bight/Chesapeake Bay/Carolina/Gulf of Maine) and shortnose sturgeon</p>	<p>Atlantic and shortnose sturgeon may potentially occur within the inland estuarine and riverine waters and coastal Atlantic Ocean surrounding the construction footprint for Spaceport Camden facilities. Since these fish are anadromous, they do not occupy the same areas year-round and occurrence in these areas would be seasonal, based on specific behaviors and life stages. Shortnose sturgeon are typically found in the Altamaha, Ogeechee, and Savannah Rivers in Georgia, all of which are outside the action area. Collection efforts for shortnose sturgeon in the Satilla Rivers in 1994 and 1995 were not successful (NMFS, 1998). Therefore, potential occurrence of shortnose sturgeon within the action area is considered low. Atlantic sturgeon are thought to be native to the Ogeechee, Altamaha, Satilla, and Saint Marys Rivers in Georgia. Sampling efforts between 2008 and 2010 in the Satilla River resulted in 218 Atlantic sturgeon captures, 22 of which were recaptures (Fritts, Grunwald, Wirgin, King, & Peterson, 2016). Therefore, Atlantic sturgeon are considered likely to occur within the action area. Spawning adult Atlantic sturgeon migrate up the Satilla River in the spring, typically beginning February/March. Following spawning, males may remain in the river or lower estuary until the fall; females typically exit the rivers within four to six weeks. Juveniles move downstream and inhabit brackish waters for a few months, and when they reach a size of about 30 to 36 inches (76 to 92 centimeters), they move into nearshore coastal waters of the Atlantic Ocean. Tagging data indicate that immature Atlantic sturgeon travel widely once they emigrate from their natal (birth) rivers. Subadults and adults live in coastal waters of the Atlantic Ocean and surrounding estuaries, such as St. Andrews Sound, when not spawning, generally in shallow (10- to 50-meter depth) nearshore areas dominated by gravel and sand substrates. Sturgeon eggs are highly adhesive and are deposited on bottom substrate in the Satilla River, usually on hard surfaces (e.g., cobble). It is likely that cold, clean water is important for proper larval development. Once larvae begin migrating downstream, they use benthic structure (especially gravel matrices) as refuges. Juveniles usually reside in estuarine waters for months to years. While the Satilla River, St. Andrews Sound, and Atlantic Ocean do not directly border the land areas that fall within the construction footprint, they do connect to other water bodies that directly surround the area (e.g., Floyd Basin, Floyd Creek, and Floyd Cut). In addition, portions of the closure areas and launch trajectories associated with operations overlap with portions of the Satilla River, St. Andrews Sound, and coastal waters of the Atlantic Ocean.</p>

Table 3. Species and Critical Habitat in the Action Area

Species/Critical Habitat	Description of Occurrence
Atlantic sturgeon critical habitat	<p>Critical habitat within the action area has been identified for the South Atlantic Sturgeon DPS, specifically in the Satilla River (82 FR 39160, August 17, 2017), which is north of Spaceport Camden (Exhibit 6), and the Carolina DPS. Physical and biological features essential for the conservation of the species that support adult and subadult foraging in estuarine or marine environments have not been identified. However, the physical features essential to the conservation of the South Atlantic DPS of Atlantic sturgeon are:</p> <ul style="list-style-type: none"> • Hard bottom substrate (e.g., rock, cobble, gravel, limestone, boulder, etc.) in low salinity waters (i.e., 0.0-0.5 ppt range) for settlement of fertilized eggs and refuge, growth, and development of early life stages; • Transitional salinity zones inclusive of waters with a gradual downstream gradient of 0.5- up to 30 ppt and soft substrate (e.g., sand, mud) between the river mouths and spawning sites for juvenile foraging and physiological development; • Water of appropriate depth and absent physical barriers to passage (e.g., locks, dams, thermal plumes, turbidity, sound, reservoirs, gear, etc.) between the river mouths and spawning sites necessary to support: <ul style="list-style-type: none"> (i) Unimpeded movement of adults to and from spawning sites; (ii) Seasonal and physiologically-dependent movement of juvenile Atlantic sturgeon to appropriate salinity zones within the river estuary; and (iii) Staging, resting, or holding of subadults or spawning condition adults. Water depths in main river channels must also be deep enough (at least 1.2 m) to ensure continuous flow in the main channel at all times when any sturgeon life stage would be in the river. • Water quality conditions, especially in the bottom meter of the water column, between the river mouths and spawning sites with temperature and oxygen values that support: <ul style="list-style-type: none"> (i) Spawning; (ii) Annual and inter-annual adult, subadult, larval, and juvenile survival; and (iii) Larval, juvenile, and subadult growth, development, and recruitment. • Appropriate temperature and oxygen values will vary interdependently, and depending on salinity in a particular habitat. For example, 6.0 mg/L DO or greater likely supports juvenile rearing habitat, whereas DO less than 5.0 mg/L for longer than 30 days is less likely to support rearing when water temperature is greater than 25 °C. In temperatures greater than 26 °C, DO greater than 4.3 mg/L is needed to protect survival and growth. Temperatures of 13 to 26 °C likely to support spawning habitat.

Table 3. Species and Critical Habitat in the Action Area

Species/Critical Habitat	Description of Occurrence
<p>Marine sea turtles: green, hawksbill, Kemp's ridley, leatherback, and loggerhead</p>	<p>All species of sea turtles may be present (swimming) year-round in the general vicinity of the action area within the coastal and open ocean areas of the Atlantic Ocean. The potential for occurrence within the coastal areas of the Atlantic Ocean that overlap the action area is based on historical nesting trends on beaches within and surrounding Camden County, Georgia. Small numbers of green sea turtles are known to nest in Georgia with female nesting abundance estimated to be five individuals between 2011 and 2012 (NOAA, 2015). Therefore, it is possible for green sea turtles to occur within the nearshore Atlantic Ocean off Camden County, Georgia. The likelihood that hawksbill sea turtles occur in the nearshore Atlantic Ocean off Camden County, Georgia, is low, considering that this area is located north of the typical nesting range for the hawksbill sea turtle and the region lacks suitable juvenile and adult habitat. Kemp's ridley sea turtle distribution is limited to the Gulf of Mexico and the western North Atlantic Ocean from Florida to the Grand Banks (NMFS and USFWS, 2015; NOAA Fisheries, 2016). Based on this, there is a low potential for Kemp's ridley sea turtle occurrence in the nearshore Atlantic Ocean off Camden County, Georgia, since only occasional nesting occurs in Georgia. Loggerhead sea turtles are known to nest regularly on Cumberland Island National Seashore, which is an important loggerhead sea turtle critical habitat area. Since 2014, Cumberland Island has produced over 1,800 nests (NPS, 2017). Given the presence of both terrestrial nesting and offshore foraging habitat, loggerhead sea turtles are expected to occur regularly in the action area. Leatherback sea turtle occurrence in the action area is expected to be seasonal and rare and correlates with the availability of preferred species of prey. Leatherback turtles may also occur in the action area while migrating between southern nesting habitats and more productive foraging habitat in the North Atlantic. Any foraging habitat would be opportunistic and transient (e.g., jellyfish). The species may be present but unlikely to use the area as a migratory corridor due to channelization and lack of major currents that turtles may utilize to migrate to seasonal habitats.</p>
<p>Loggerhead sea turtle critical habitat</p>	<p>Three ecosystem types were used to identify critical habitat for loggerhead sea turtles: terrestrial, neritic, and oceanic. <i>Sargassum</i> habitat occurs in both neritic and oceanic habitats. Terrestrial habitats are addressed in FAA's consultation with the USFWS. Only one nearshore reproductive habitat area occurs within the action area (Exhibit 6). Physical and biological features essential for nearshore reproductive habitat are described as the portion of nearshore waters adjacent to nesting beaches that are used by hatchlings and nesting females. Primary constituent elements that support this habitat include the following:</p> <ul style="list-style-type: none"> • Nearshore water directly off highest density nesting beaches out to 1 mile offshore

Table 3. Species and Critical Habitat in the Action Area

Species/Critical Habitat	Description of Occurrence
	<ul style="list-style-type: none"> • Water sufficiently free of obstructions or artificial lighting to allow transit through the surf zone and outward to ward open water • Waters with minimal manmade structures that could promote predators, disrupt wave patterns necessary for orientation, and/or create excessive longshore currents
North Atlantic right whale	<p>North Atlantic right whale occurrence in the action area would be seasonal, based on specific behaviors. For much of the year, distribution of this species is strongly correlated with the distribution of its prey, which primarily consists of dense patches of zooplankton (National Marine Fisheries Service, 2015). The North Atlantic right whale migrates annually between northern feeding areas (New England, Canadian Bay of Fundy, Scotian Shelf, and Gulf of St. Lawrence) and southern calving grounds in the coastal waters of the southeastern United States. Calving occurs in the coastal waters off Georgia and northern Florida from December through March after a gestation period of 12 to 13 months (Kraus, 2001). Portions of this calving area overlap with the nearshore Atlantic Ocean area off Camden County, Georgia. Based on aerial surveys conducted by New England Aquarium personnel between December and March from 1997 through 2009, right whale sightings are common in the waters offshore of Camden County (New England Aquarium, 2016). Seasonal management areas for North Atlantic right whales have been established to reduce the risk of ship strikes to this species. The Atlantic waters offshore of Spaceport Camden are included in the Southeast U.S. Seasonal Management Area, which restricts ship speed in the calving and nursery grounds from November 15 through April 15, when North Atlantic right whales are expected to occur in these areas.</p>
North Atlantic right whale critical habitat	<p>On January 27, 2016, NMFS issued a final rule (81 FR 4837) to replace the critical habitat for North Atlantic right whales with two new, expanded areas. These expanded areas contain the physical and biological features essential to the conservation of the North Atlantic right whale, providing requirements for successful foraging, calving, and calf survival. Critical habitat Unit 1 does not occur in the action area. Critical habitat Unit 2, which occurs in the action area, is for the protection of calving essential features and is located off the southeast U.S. coast between North Carolina and Florida (Exhibit 7). Unit 2 covers 8,429 square nautical miles. Physical and biological features identified for Unit 2 include the following:</p> <ul style="list-style-type: none"> • Sea surface conditions associated with Force 4 or less on the Beaufort Scale • Sea surface temperatures of 7 degrees Celsius (°C) to 17°C • Water depths of 6 to 28 meters, where these features simultaneously co-occur over contiguous areas of at least 231 square nautical miles of ocean waters during the months of November through April

Notes: DPS = distinct population segment; FR = *Federal Register*; NMFS = National Marine Fisheries Service.

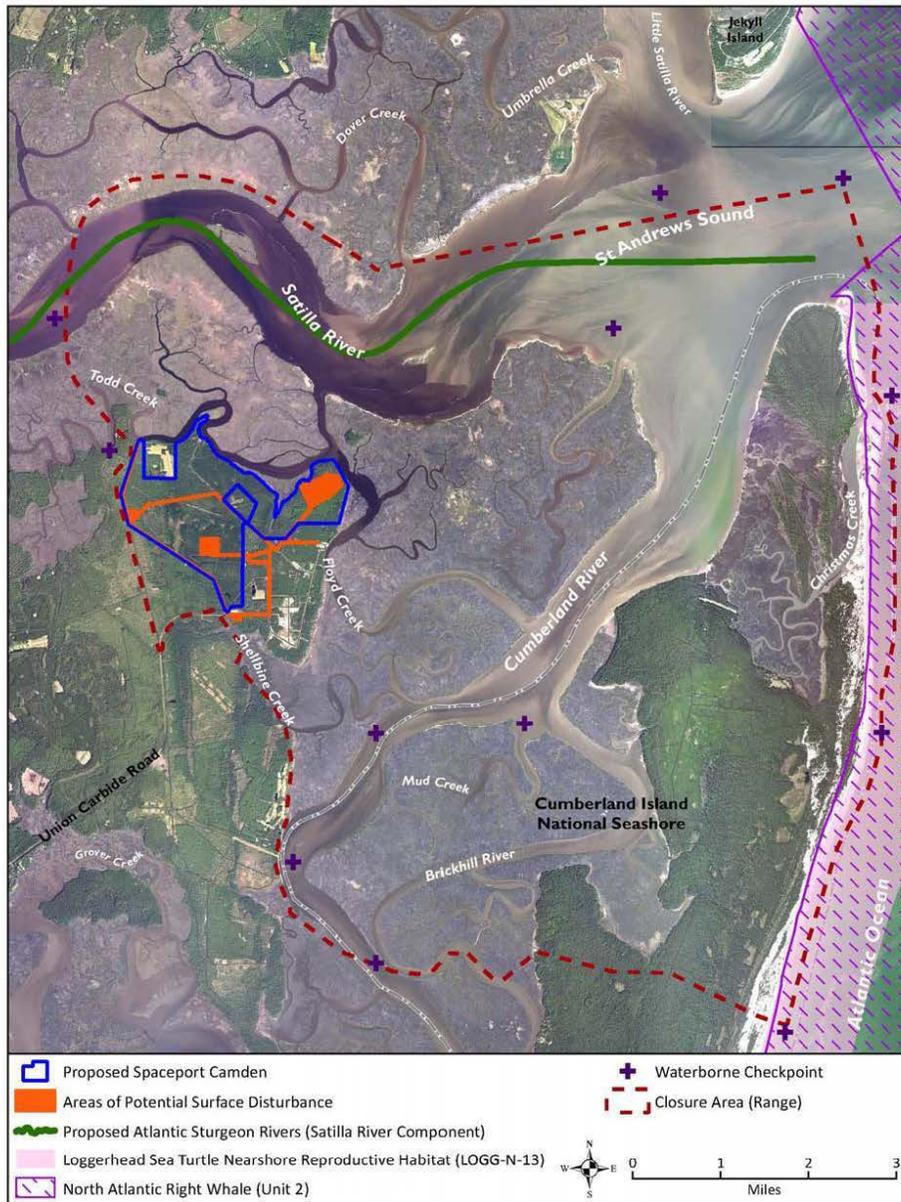


Exhibit 6. NMFS-Designated Critical Habitat in Inland and Nearshore Areas of the Action Area

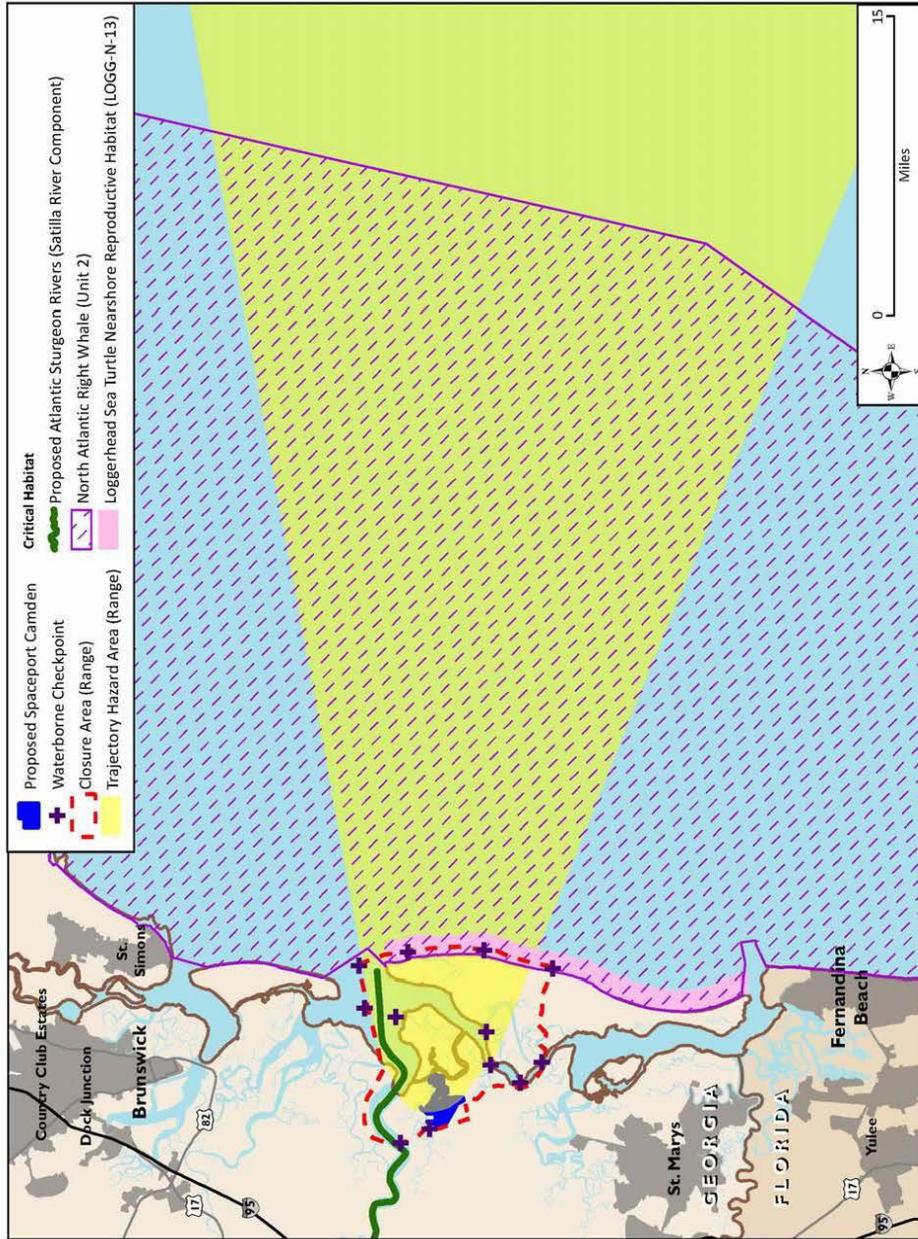


Exhibit 7. NMFS-Designated Critical Habitat in Offshore Areas of the Action Area

EFFECTS DETERMINATION

Species

Construction

Since none of the proposed construction activities would occur in water, no direct effects to ESA-listed species under NMFS jurisdiction would occur. Absent best management practices, there is the potential for indirect effects from construction to occur. Construction activities would occur approximately 840 feet to the southeast of Floyd Basin and 200 feet west of Floyd Creek, both of which branch off and are downstream from the Satilla River (see Exhibit 2 and Exhibit 6). Indirect effects to Atlantic and shortnose sturgeon could result from increased turbidity associated with stormwater runoff during construction activities. Potential effects to individuals would be temporary, localized, and not likely to spread to the Satilla River where Atlantic sturgeon are known to occur, because the location of construction activities on land is approximately 1 mile away (downstream) from Satilla River. Additionally, potential occurrence of shortnose sturgeon in the action area is considered low. However, given implementation of best management practices and permit-required plans (e.g., silt fencing, sediment and erosion control plan, SWPPP), indirect effects to Atlantic and shortnose sturgeon from erosion and stormwater runoff would not occur. Any indirect effects to Atlantic and shortnose sturgeon from construction activities would be temporary and minimal and, therefore, insignificant. Marine sea turtles and NARW are not expected to be present within the action area where indirect effects from proposed construction activities would occur. Therefore, there is no effect to these species due to indirect effects from proposed construction activities.

Operations (Excluding Noise)

Atlantic Sturgeon and Shortnose Sturgeon

Activities associated with operations that may result in effects to Atlantic and shortnose sturgeon include closing areas during a wet dress rehearsal, static fire test, and a launch. Small portions of the Satilla River (near the river's mouth), St. Andrews Sound, and coastal Atlantic Ocean are included in the proposed closure area, and there would be one checkpoint enforced by a Camden County Sheriff Department boat within the Satilla River, two checkpoints within St. Andrews Sound, and four checkpoints in the coastal Atlantic Ocean (Exhibit 6). The purpose of the checkpoints would be to restrict boats from entering these areas for safety reasons. In turn, this may temporarily reduce the potential for direct boat strikes (or contact with boat propellers) to sturgeon during the closure time (assuming boats would be using this area without the closure). However, it is possible the security boat could come into contact with an individual sturgeon. Little information exists on vessel interactions with sturgeon. This is likely due to the fact this species is primarily demersal and rarely would be at risk from moving vessels. Vessels need sufficient water to navigate without encountering the bottom, and when transiting shallow areas with marginal clearance, vessels typically transit cautiously (i.e., slowly), and consequently, interactions with sturgeon would not be anticipated. Given 1) boat traffic in the area would be temporarily reduced over existing conditions during closure activities, and 2) the chances of a security boat contacting an individual sturgeon are low, the FAA determined any effects to Atlantic and shortnose sturgeon due to activities associated with Spaceport Camden operations would be highly unlikely and, therefore, discountable.

Habitat Avoidance Effects:

Atlantic and shortnose sturgeon may be temporarily affected due to avoidance of foraging and refuge habitat during Spaceport Camden operations. Given 1) the seasonality of potential Atlantic and shortnose sturgeon occurrence within small portions of the Satilla River, St. Andrews Sound, and coastal Atlantic Ocean and 2) that each closure event would last a maximum of 12 hours per day and would occur

approximately 36 times annually (12 wet dress rehearsals, 12 static fire tests, and 12 launches), avoidance of the project area will be temporary and localized. Therefore, the effects of short-term avoidance of the project area to Atlantic and shortnose sturgeon are insignificant.

Marine Sea Turtles

Activities associated with operations that may result in effects to marine sea turtles include boat/vessel use required for closures and ocean landings. As previously indicated, launches would occur a maximum of 12 times a year (which includes up to 36 closure events), requiring a small coastal area within the Atlantic Ocean to be closed for up to 12 hours per event. Boat traffic in this coastal portion of the Atlantic Ocean may temporarily increase over baseline conditions from security boats clearing the closure area and from spectators watching launch events. Security boats would be stationed at four checkpoints with the coastal area of the Atlantic Ocean to keep the general public away from the launch site, which would decrease boat traffic in this area. However, boats would be displaced to other areas of the Atlantic Ocean and public spectators aboard their personal vessels may aggregate outside the closure area to view the launch. The number of potential boats being cleared and spectator boats is unknown and would likely vary. According to a NMFS Protected Resources Division analysis, it would take an introduction of at least 300 new vessels to an area to result in a take of 1 sea turtle in any single year.⁸ Because this project will likely result in less than 300 new vessels, we believe it is extremely unlikely that sea turtles will be killed or injured by “new” vessel traffic. It is expected that once the launch is completed, all boats would leave the area and boat traffic would resume to baseline levels. Adverse effects to individual marine sea turtles from increased boat traffic during launch events are not likely to occur to given their offshore distribution and small amount of time spent at or near the water surface. Implementation of the mitigation measures described above for operations (i.e., maintain a minimum distance of 150 feet from observed sea turtles) would further reduce the risk. Any effects to sea turtles due to boat activities associated with operations are highly unlikely, and therefore, discountable.

Water landings in the Atlantic Ocean would occur at a location roughly 200 to 300 miles from shore. Additional security boats would clear an area around the barge. Once the landing is completed, all security boats would leave the area and the first stage would be returned to the existing dock on Floyd Creek by vessel. During transport to the dock, boats/vessels would maintain a minimum distance of 150 feet from observed sea turtles. Sea turtle distribution in the Atlantic Ocean is not uniform, and a sea turtle would only be struck by a first stage during a water landing if it is present in the exact location at the exact time a landing occurs. The probability of this occurring is highly unlikely. Thus, any water landing effects to marine sea turtles due to Spaceport Camden operations are discountable.

Habitat Avoidance Effects:

Marine sea turtles may be temporarily affected due to avoidance of foraging, refuge, and/or nursery habitat during Spaceport Camden operations. Avoidance of the project area will be temporary and localized, occurring a maximum of 12 times a year (which includes up to 36 closure events) and requiring a small coastal area within the Atlantic Ocean to be closed for up to 12 hours per event. Therefore, the effects of short-term avoidance of the project area to sea turtles are insignificant.

North Atlantic Right Whale

Boat clearance activities associated with wet dress rehearsals, static fire engine tests, and launches would occur within the designated North Atlantic right whale calving area. Boat traffic in the Atlantic Ocean may temporarily increase over baseline conditions during clearance of ocean areas and from spectators

⁸ Barnette, M. Threats and Effects Analysis for Protected Resources on Vessel Traffic Associated with Dock and Marina Construction. NMFS SERO PRD Memorandum. April 18, 2013.

watching launch events. This may result in an increased risk of boat strikes to North Atlantic right whales. Closure activities would occur a maximum of 36 times a year. Closure areas in the Atlantic Ocean would encompass the very nearshore area within the North Atlantic right whale calving area. Boats would be stationed at four checkpoints within coastal areas of the Atlantic Ocean to keep the general public away from the launch site. Closure and access restrictions to the water areas conducted by the USCG or other local waterborne law enforcement would begin approximately three hours prior to launch. In addition, public spectators aboard their personal vessels may aggregate to view the launch from outside the closed areas. The number of potential spectator boats is unknown and would likely vary. Boat clearance activities would cause a small, localized, and temporary increase in boat traffic. This level of increase above baseline conditions in this portion of the Atlantic Ocean would not result in a measurable or detectable increase in the risk of vessel strike to individual North Atlantic right whales. It is expected that once the launch is completed, all boats would leave the area. Furthermore, implementation of the mitigation measures described above is expected to reduce the risk. Effects to NARW due to boat clearance activities during Spaceport Camden operations are highly unlikely, and therefore, discountable.

Ocean landings would occur on a barge anchored approximately 200 to 300 miles from shore. Additional security boats would clear an area around the barge. Security personnel would restrict boat speed to 10 knots or less if mother/calf pairs or groups of marine mammals are observed during travel to and from the landing location. Security personnel would also visually scan for right whales during their clearance activities and safely maneuver to attempt to avoid collisions with any right whales that may be present. Because the North Atlantic right whale's calving area is within 50 miles from shore (NOAA, 2017b), as shown in Exhibit 7, and barge landing operations would occur approximately 200 to 300 miles offshore, the probability of direct strikes and disturbance from first stage water landings to right whales is highly improbable. Once an ocean landing is completed, all security boats would leave the area and the first stage would be transported to the existing dock on Floyd Creek by vessel. During transport to the dock, all boats/vessels would comply with the mitigation measures identified above for North Atlantic right whales. (e.g., maintain a minimum 1,500-foot distance from observed North Atlantic right whales; compliance with the Right Whale Ship Strike Reduction Rule [50 CFR §224.105]). Ocean landings would cause a small, localized, and temporary increase in boat traffic. This level of increase above baseline conditions in this portion of the Atlantic Ocean would not result in a measurable or detectable increase in the risk of vessel strike to individual North Atlantic right whales. Furthermore, implementation of the mitigation measures described above is expected to reduce the risk. Effects to NARW due to ocean landings during Spaceport Camden operations are highly unlikely, and therefore, discountable.

Habitat Avoidance Effects:

NARW mother/calf pairs or groups may be temporarily affected by avoidance of foraging, refuge, and/or nursery habitat during Spaceport Camden operations. Avoidance of the project area will be temporary and localized, occurring a maximum of 12 times a year (which includes up to 36 closure events) and requiring a small coastal area within the Atlantic Ocean to be closed for up to 12 hours per event. Therefore, the effects of short-term avoidance from the project area to NARW are insignificant.

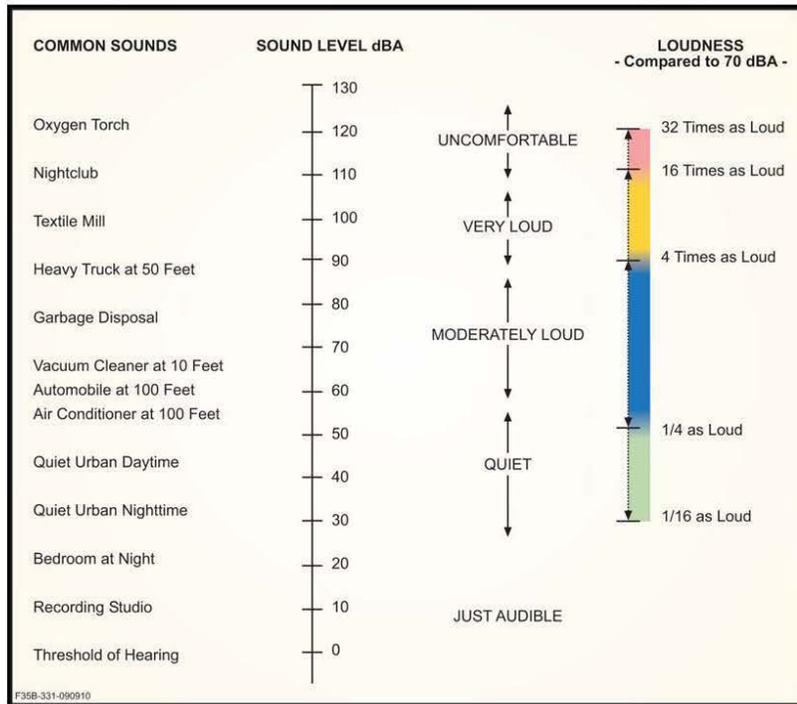
Operations – Noise

Noise would be generated from subsonic (static fire engine tests, liftoff, and landing) and supersonic (flight) rocket operations. All sounds have a spectral content, which means their magnitude or level changes with frequency, where frequency is measured in cycles per second or hertz. To mimic the human ear's nonlinear sensitivity and perception of different frequencies of sound, the spectral content is weighted. For example, environmental noise measurements are usually on an "A-weighted" scale that filters out very low and very high frequencies in order to replicate human sensitivity. It is common to add the "A" to the measurement unit (decibel [dB]) in order to identify that the measurement has been made

with this filtering process (dBA). Exhibit 8 provides a chart of A-weighted sound levels from typical noise sources. Some noise sources (e.g., air conditioner, vacuum cleaner) are continuous sounds that maintain a constant sound level for some period of time. Other sources (e.g., automobile, heavy truck) are the maximum sound produced during an event like a vehicle passing by. Other sounds (e.g., urban daytime, urban nighttime) are averages taken over extended periods of time.

A metric is a system for measuring or quantifying a particular characteristic of a subject. Since noise is a complex physical phenomenon, different noise metrics help to quantify the noise environment and describe impacts from noise. The selection of particular metrics for noise analysis is based on the nature of the noise event and who or what is affected by the sound. For example, noise metrics used to evaluate the highest sound level occurring during a single event are different than those used for evaluating long-term average sound levels. The following are example noise metrics:

- **Overall sound pressure level (OASPL).** The OASPL provides a measure of the sound level at any given time.
- **Maximum OASPL (L_{max}).** The L_{max} indicates the highest OASPL over the duration of the noise event. The L_{max} is a single-event metric that is useful for analyzing short-term responses to noise exposure. OASPL can be presented as either unweighted or A-weighted. The maximum unweighted OASPL (L_{max}) is used for the analysis of noise impacts to structures.
- **Maximum A-weighted OASPL ($L_{A,max}$).** The $L_{A,max}$ represents the maximum A-weighted OASPL during the noise event. A-weighting approximates the natural range and sensitivity of human hearing (USACHPPM, 2005). The $L_{A,max}$ is used for the analysis of noise impacts to humans and wildlife.
- **Sonic Boom Overpressure measured in pounds per square foot (psf).** A sonic boom is the sound associated with the shock waves created by a vehicle moving through the air faster than the speed of sound. When heard at ground level, a sonic boom consists of a positive pressure change associated with air particles being pushed out of the way by the front of the vehicle and then a negative pressure change of equal magnitude after the vehicle and its rocket plume have passed by. The magnitude of the changes in air pressure is typically expressed in psf.



Source: (Harris, 1979)

Exhibit 8. Typical A-Weighted Levels of Common Sounds

For purposes of the analysis in this consultation, L_{Amax} and sonic boom overpressure associated with launch, landing, and static fire events were modeled for the range of trajectories using a medium-class lift vehicle (MCLV) and are shown as composite noise profiles in Exhibits 9 through 13.

In-air noise from subsonic (static fire engine tests, launches, and landing) and supersonic (flight) rocket operations is not expected to affect marine species underwater. Acoustic energy from in-air noise does not effectively cross the air/water interface; therefore, most of the noise is reflected off the water surface (Richardson, 1995). In addition, underwater sound pressure levels from in-air noise are not expected to reach or exceed threshold levels for injury. Previous research conducted by the U.S. Air Force supports this conclusion with respect to sonic booms, indicating that there is no risk of harassment for protected marine species in water (U.S. Air Force Research Laboratory, 2000). Therefore, the effects of in-air noise associated with Spaceport Camden operations to Atlantic and shortnose sturgeon, marine sea turtles, and North Atlantic right whales is highly unlikely, and therefore, discountable.

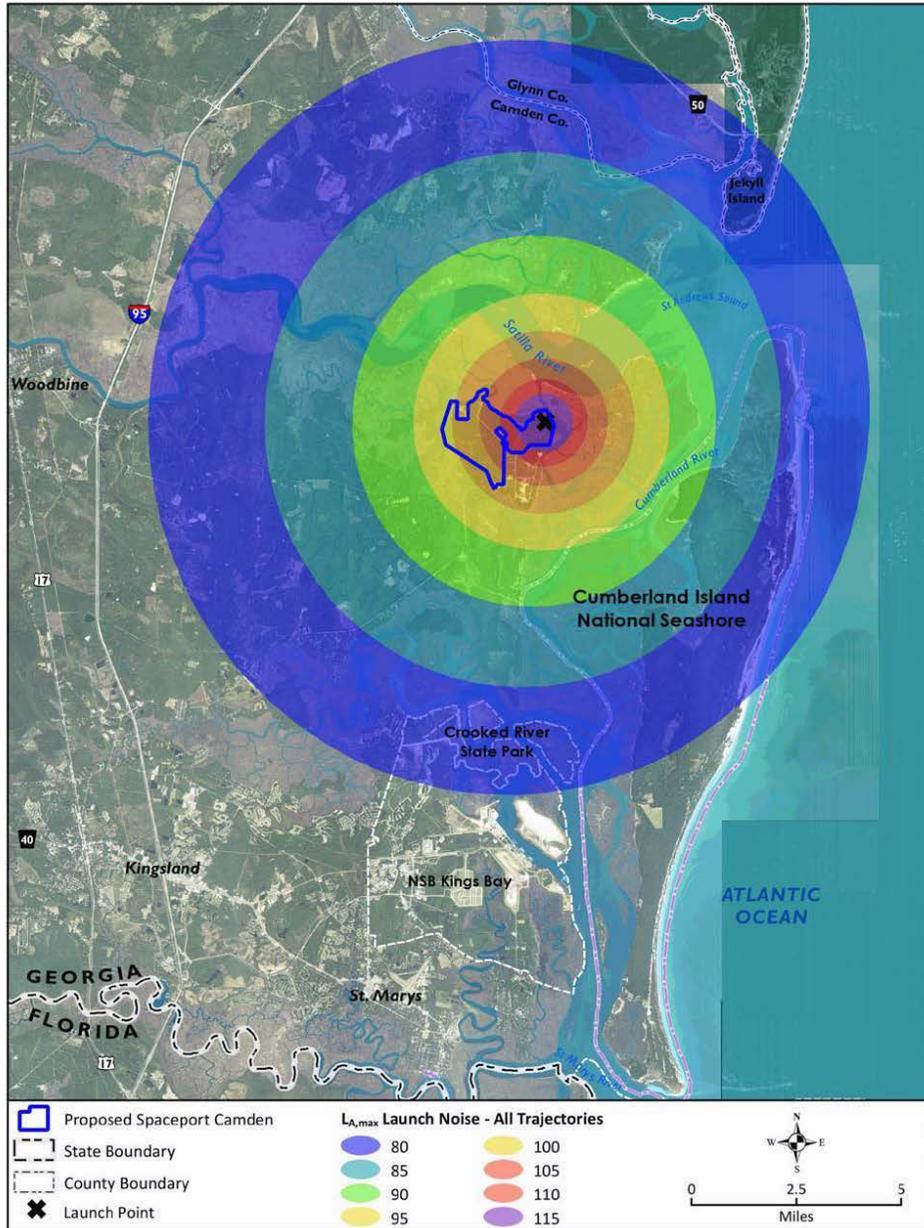


Exhibit 9. Composite of L_{A,max} Contours for a MCLV Launch at Spaceport Camden

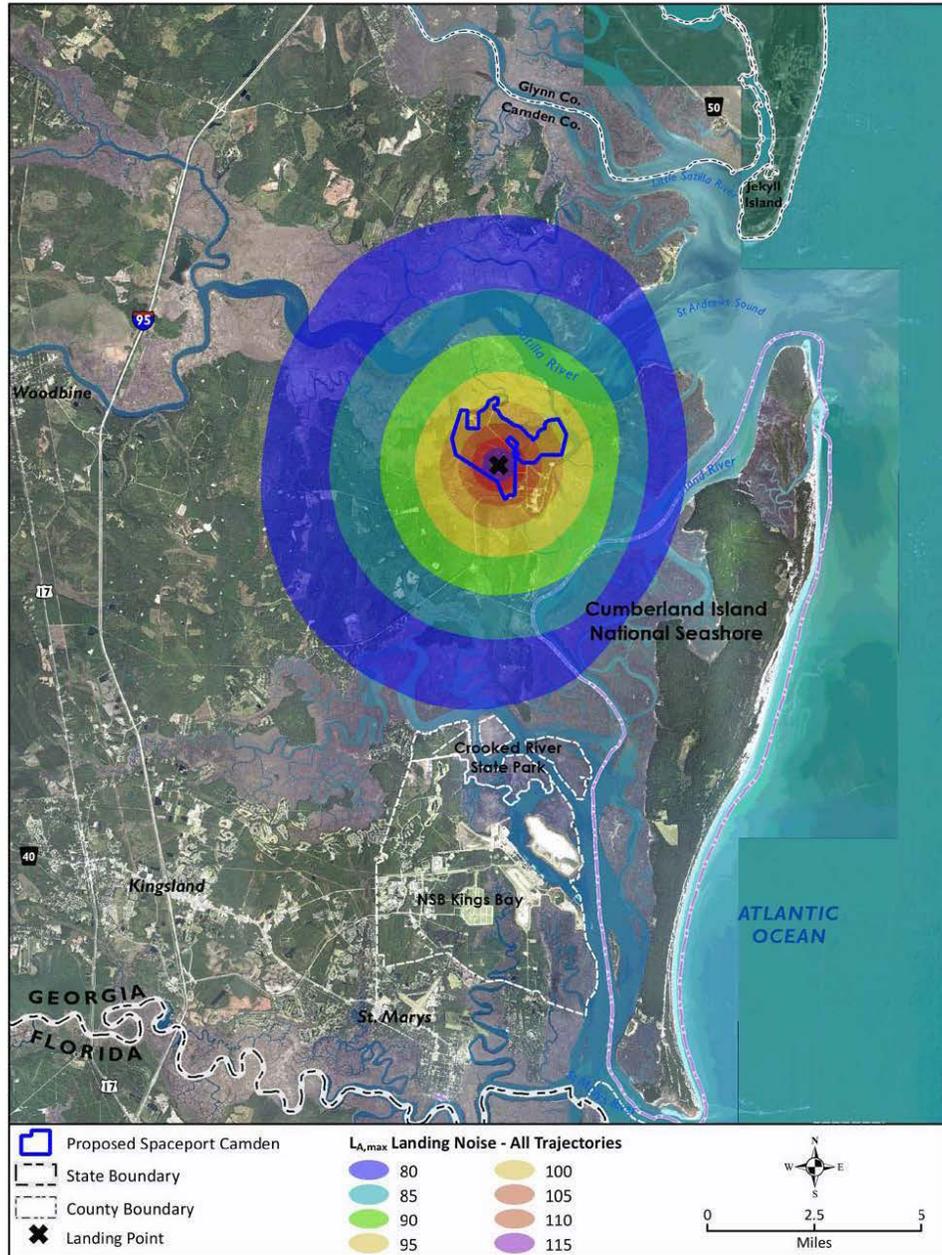


Exhibit 10. Composite of $L_{A,max}$ Contours for a MCLV Landing at Spaceport Camden

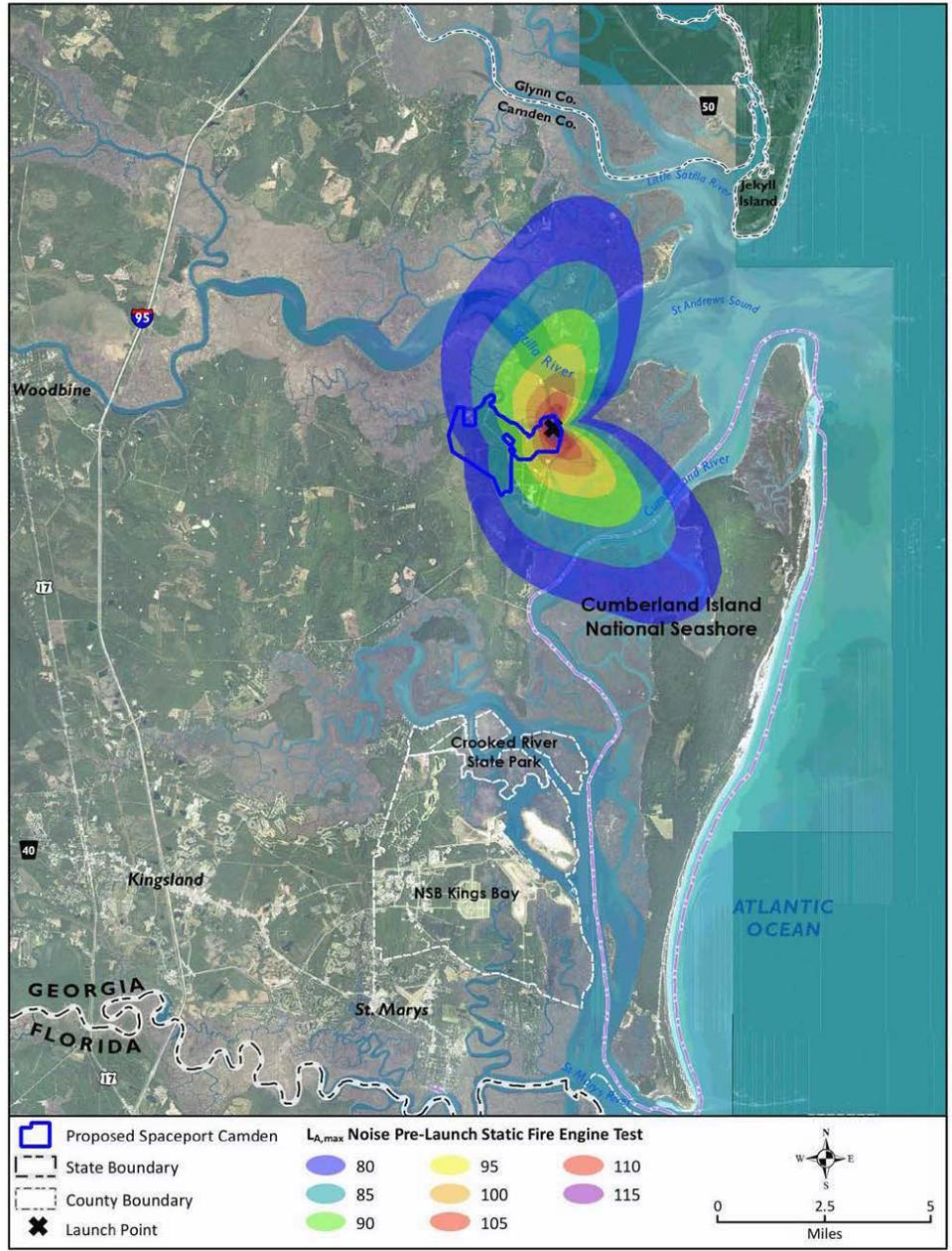


Exhibit 11. $L_{A,max}$ Contours for a MCLV Static Fire Engine Test at Spaceport Camden

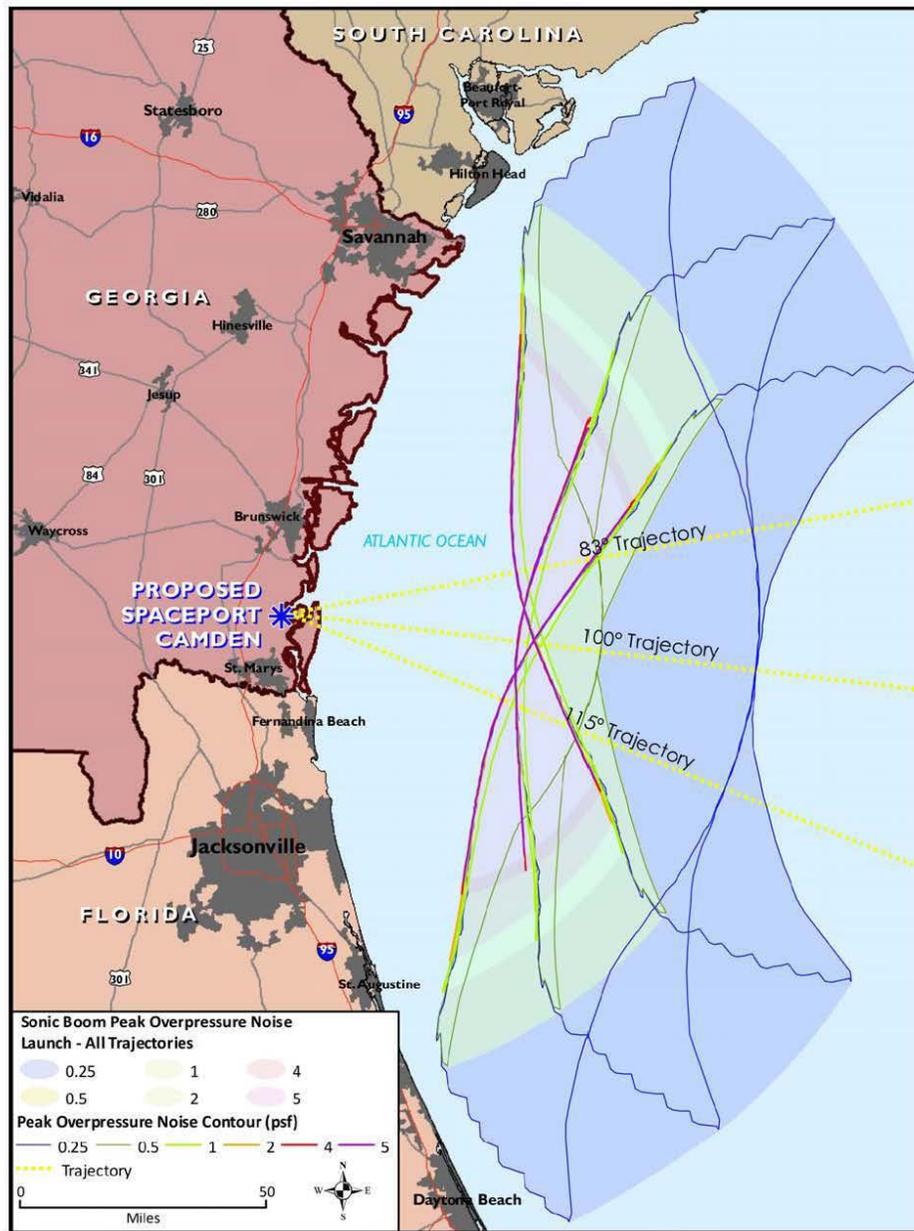


Exhibit 12. Composite of Sonic Boom Peak Overpressure Contours for a MCLV Launch from Spaceport Camden

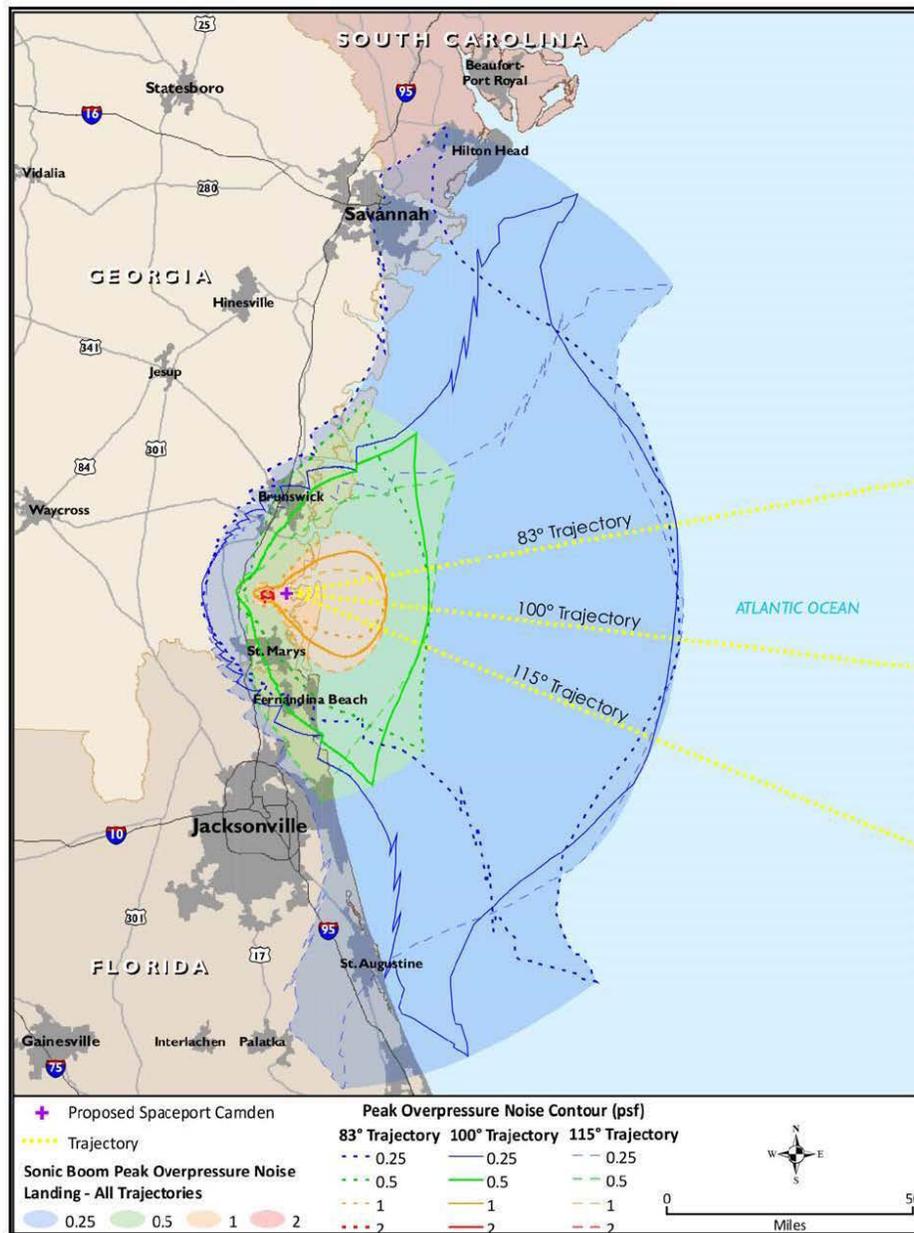


Exhibit 13. Composite of Sonic Boom Peak Overpressure Contours for a MCLV Landing at Spaceport Camden

Launch Failures

In the event of a launch failure, it is possible an explosion could injure or kill species or damage habitat within areas impacted by debris. Debris scatter could occur over the Satilla River or the Atlantic Ocean during a launch abort where Atlantic sturgeon, shortnose sturgeon, marine sea turtles, and North Atlantic right whales may be present. Also, during a launch failure, the launch vehicle propellant tanks would likely rupture, and the propellants would burn explosively. Thus, it is possible for propellants to be spilled directly or released as a burning byproduct into surface water bodies, including the Satilla River and the Atlantic Ocean. The extent of potential impacts would depend on the type of propellant, the conditions of the launch failure, and the location of the failure in relation to water areas. However, most, if not all, of the propellants would be consumed during an explosion. Marine/estuarine species could suffer injury or mortality from associated chemicals, heat, and noise. Habitats may be temporarily degraded or permanently destroyed, causing animals to move to other areas to forage and nest. In the event of a launch failure, emergency response and cleanup procedures would reduce the magnitude and duration of any impacts. Given the limited number of annual launches and the unlikely scenario of a launch failure and patchy distribution of species occurrence, the likelihood of effects to Atlantic and shortnose sturgeon, marine sea turtles, and North Atlantic right whales is highly unlikely, and therefore, discountable.

Critical Habitat

Atlantic Sturgeon Critical Habitat (South Atlantic DPS Unit 6 Satilla River)

On August 17, 2017, the Final Rule for critical habitat designation for Atlantic sturgeon was published for the Gulf of Maine, New York Bight, Chesapeake Bay, Carolina, and South Atlantic DPSs (82 FR 39160). The effective date for the Final Rule is September 18, 2017. Components of the proposed action are located within the boundary of critical habitat for the South Atlantic DPS (the Satilla River).

The physical features essential for the conservation of Atlantic sturgeon belonging to the South Atlantic Distinct Population Segments are those habitat components that support successful reproduction and recruitment. These are:

1. Hard bottom substrate (e.g., rock, cobble, gravel, limestone, boulder, etc.) in low salinity waters (i.e., 0.0-0.5 ppt range) for settlement of fertilized eggs and refuge, growth, and development of early life stages;
2. Transitional salinity zones inclusive of waters with a gradual downstream gradient of 0.5- up to 30 ppt and soft substrate (e.g., sand, mud) between the river mouths and spawning sites for juvenile foraging and physiological development;
3. Water of appropriate depth and absent physical barriers to passage (e.g., locks, dams, thermal plumes, turbidity, sound, reservoirs, gear, etc.) between the river mouths and spawning sites necessary to support:
 - (i) Unimpeded movement of adults to and from spawning sites;
 - (ii) Seasonal and physiologically-dependent movement of juvenile Atlantic sturgeon to appropriate salinity zones within the river estuary; and
 - (iii) Staging, resting, or holding of subadults or spawning condition adults. Water depths in main river channels must also be deep enough (at least 1.2 m) to ensure continuous flow in the main channel at all times when any sturgeon life stage would be in the river.
4. Water quality conditions, especially in the bottom meter of the water column, between the river mouths and spawning sites with temperature and oxygen values that support:

- (i) Spawning;
- (ii) Annual and inter-annual adult, subadult, larval, and juvenile survival; and
- (iii) Larval, juvenile, and subadult growth, development, and recruitment.

5. Appropriate temperature and oxygen values will vary interdependently, and depending on salinity in a particular habitat. For example, 6.0 mg/L DO or greater likely supports juvenile rearing habitat, whereas DO less than 5.0 mg/L for longer than 30 days is less likely to support rearing when water temperature is greater than 25 °C. In temperatures greater than 26 °C, DO greater than 4.3 mg/L is needed to protect survival and growth. Temperatures of 13 to 26 °C likely to support spawning habitat.

Components of the proposed action are located within the boundary of Atlantic sturgeon designated critical habitat (South Atlantic DPS Unit 6 Satilla River). Given best management practices, the FAA does not believe any of the EFs of Atlantic sturgeon designated critical habitat in the Satilla River (Listed in Table 3) may be affected by any component of Spaceport Camden operations.

Loggerhead Sea Turtle Critical Habitat (Nearshore Reproductive Habitat, Unit N-13)

Components of the proposed action are located within the boundary of loggerhead sea turtle designated critical habitat (Nearshore Reproductive Habitat, Unit N-13). Nearshore Reproductive Habitat is the portion of the nearshore waters adjacent to nesting beaches used by hatchlings to egress to the open-water environment as well as by nesting females to transit between beach and open water during the nesting season. The following primary constituent elements (PCEs) support this habitat:

- (i) Nearshore waters directly off the highest density nesting beaches and their adjacent beaches, as identified in 50 CFR 17.95(c), to 1.6 km offshore;
- (ii) Waters sufficiently free of obstructions or artificial lighting to allow transit through the surf zone and outward toward open water; and
- (iii) Waters with minimal manmade structures that could promote predators (i.e., nearshore predator concentration caused by submerged and emergent offshore structures), disrupt wave patterns necessary for orientation, and/or create excessive longshore currents.

Given best management practices, the FAA does not believe any of the essential features of loggerhead sea turtle designated critical habitat (Nearshore Reproductive Habitat, Unit N-13) may be affected by any component of Spaceport Camden operations.

North Atlantic Right Whale Critical Habitat (Unit 2)

Components of the proposed action are located within the boundary of North Atlantic right whale designated critical habitat (Unit 2). The physical features essential to the conservation of the North Atlantic right whale (i.e., essential features [EFs]), which provide calving area functions in Unit 2, are:

- (i) Sea surface conditions associated with Force 4 or less on the Beaufort Scale;
- (ii) Sea surface temperatures of 7°C to 17°C; and
- (iii) Water depths of 6 to 28 meters, where these features simultaneously co-occur over contiguous areas of at least 231 square nautical miles (nmi²) of ocean waters during the months of November through April.

When these features are available, they are selected by North Atlantic right whale cows and calves in dynamic combinations that are suitable for calving, nursing, and rearing, and that vary, within the ranges specified, depending on factors such as weather and age of the calves. Given best management practices,

the FAA does not believe any of the EFs of North Atlantic right whale designated critical habitat in Unit 2 may be affected by any component of Spaceport Camden operations.

CONCLUSION

Because all potential project effects to listed species and critical habitat were found to be discountable, insignificant, or beneficial, we conclude that the proposed action is not likely to adversely affect listed species and critical habitat under NMFS's purview.

This information was prepared based on the best available scientific and commercial data available. FAA is requesting NMFS's written concurrence with these determinations. Please contact Stacey Zee, FAA Environmental Specialist, at Stacey.Zee@faa.gov or (202) 267-9305 to discuss any questions or concerns on the Proposed Action.

Sincerely,



Daniel Murray
Manager, Space Transportation Development Division

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FEB 17 2017

Donald W. Imm, PhD.
Field Supervisor
U.S. Fish and Wildlife Service
Georgia Ecological Services Field Office
105 Westpark Drive, Suite D
Athens, GA 30606

Re: USFWS File Number 2016-0135

Dear Mr. Imm,

Thank you for your scoping comments provided on December 22, 2015 in response to the Federal Aviation Administration's (FAA's) Notice of Intent to prepare an Environmental Impact Statement for Camden County's proposal to construct and operate Spaceport Camden in Camden County, GA. A complete description of the FAA's proposed action and alternatives is provided as an attachment to this letter for your reference. I am writing to you regarding FAA's compliance with the federal Endangered Species Act (ESA).

In accordance with Section 7 of the ESA, the FAA is developing a Biological Assessment (BA) to analyze the project's potential effects on federally listed species. The FAA used the U.S. Fish and Wildlife Service's (Service's) *Information for Planning and Consultation* system to generate a list of species to consider in the BA (see attached list). Accordingly, the BA will assess potential effects of the project on the following species under the Service's jurisdiction: piping plover (*Charadrius melodus*), red knot (*Calidris canutus rufa*), red-cockaded woodpecker (*Picoides borealis*), wood stork (*Mycteria americana*), West Indian manatee (*Trichechus manatus*), eastern indigo snake (*Drymarchon corais couperi*), leatherback sea turtle (*Dermochelys coriacea*), and loggerhead sea turtle (*Caretta caretta*). Additionally, the BA will include two candidate species: striped newt (*Notophthalmus perstriatus*) and gopher tortoise (*Gopherus polyphemus*). The BA will also include species under National Marine Fisheries Service (NMFS) jurisdiction, and the FAA will conduct consultation with NMFS.

Because construction activities may not occur for a year or more after completion of the Section 7 consultation and National Environmental Policy Act process, species surveys in the

action area are not planned prior to completing the BA. The FAA proposes to assume species presence if suitable habitat is located within the action area rather than conducting species-specific surveys. We plan to use the best available data when assessing species presence, including information provided by the Service and the Georgia Department of Natural Resources (GADNR), as well as a site characterization study of the Union Carbide Corporation Woodbine Site.

To avoid and/or minimize adverse impacts to listed species, the FAA proposes to include a conservation measure in the BA that would require Camden County to conduct species surveys at least 30 days prior to beginning construction for the following species: striped newt, red-cockaded woodpecker, wood stork, eastern indigo snake, and gopher tortoise. If these species are found within the action area (particularly the construction footprint), the FAA would coordinate with the Service and/or the GADNR to determine the best method to avoid or minimize effects to the species or to relocate the species following approved protocol.

To ensure the BA will satisfy Service requirements, the FAA requests a preliminary planning discussion at your earliest convenience. The FAA's environmental project lead, Stacey Zee, will contact staff biologist Bill Wikoff to schedule a meeting.

Sincerely,



Daniel Murray
Manager, Space Transportation Development Division

Attachments: Description of Proposed Action and Alternatives
USFWS Species List

cc: Bill Wikoff, USFWS Coastal Georgia Sub Office



U.S. Department
of Transportation
**Federal Aviation
Administration**

Office of Commercial Space Transportation

800 Independence Ave., SW.
Washington, DC 20591

October 31, 2017

Donald W. Imm, Ph.D.
U.S. Fish and Wildlife Service
Georgia Ecological Services
105 West Park Drive, Suite D
Athens, GA 30606

RE: Endangered Species Act Section 7 Consultation

Dear Dr. Imm:

The Federal Aviation Administration (FAA) is evaluating the Camden County Board of Commissioners' (County's) proposal to construct and operate a commercial space launch site—referred to as Spaceport Camden—in Camden County, Georgia. The County is proposing to construct the launch site over approximately 100 acres within an existing 11,800-acre site, consisting of property currently owned by the Union Carbide Corporation and Bayer CropScience. In order to operate a commercial space launch site, the County must obtain a Launch Site Operator License from the FAA. The FAA is currently assessing the potential environmental impacts of issuing a Launch Site Operator License to the County, including potential effects to species listed and critical habitat designated under the federal Endangered Species Act (ESA).

The FAA is submitting the attached Biological Assessment (BA) to fulfill requirements under section 7 of the ESA. The BA addresses potential effects from construction and operation of Spaceport Camden on eastern indigo snake (*Drymarchon corais couperi*), wood stork (*Mycteria americana*), red-cockaded woodpecker (*Picoides borealis*), piping plover (*Charadrius melodus*), red knot (*Calidris rufa*), West Indian manatee (*Trichechus manatus latirostris*), loggerhead sea turtle (*Caretta caretta*), green sea turtle (*Chelonia mydas*), leatherback sea turtle (*Dermochelys coriacea*), striped newt (*Notophthalmus perstriatus*), and gopher tortoise (*Gopherus polyphemus*). The FAA is conducting a separate informal consultation with the National Marine Fisheries Service for ESA-listed marine species.

The BA analyzes the potential direct and indirect effects to the listed species from construction; daily operations; and pre-launch, launch, and landing activities. In order to avoid or minimize potential effects to protected species, conservation measures outlined in the BA would be implemented through coordinated efforts by the FAA, County, and the future launch site operator. Based on the analysis in the BA, the FAA has determined that issuing a Launch Site Operator License to the County would not

adversely affect any ESA-listed or candidate species or critical habitat. The individual determinations of effect are summarized in the following table.

Species	ESA Status	Effects Determinations
Striped newt	C	Construction and operational activities may affect, but are not likely to adversely affect, the striped newt.
Eastern indigo snake	T	Construction and operational activities may affect, but are not likely to adversely affect, the eastern indigo snake.
Gopher tortoise	C	Construction and operational activities may affect, but are not likely to adversely affect, the gopher tortoise.
Wood stork	T	Construction and operational activities may affect, but are not likely to adversely affect, the wood stork.
Red-cockaded woodpecker	E	Construction and operational activities may affect, but are not likely to adversely affect, the red-cockaded woodpecker.
Red knot	T	Construction activities would have no effect on the red knot. Operational activities may affect, but are not likely to adversely affect, the red knot.
Piping plover	T, CH	Construction activities would have no effect on the piping plover and piping plover critical habitat. Operational activities may affect, but are not likely to adversely affect, the piping plover and would not affect piping plover critical habitat.
West Indian manatee	T	Construction activities would have no effect on the manatee. Operational activities may affect, but are not likely to adversely affect, the manatee.
Loggerhead sea turtle	T, CH	Construction activities would have no effect on the loggerhead sea turtle and would not affect loggerhead sea turtle critical habitat. Operational activities may affect, but are not likely to adversely affect, the loggerhead sea turtle and would not affect loggerhead sea turtle critical habitat.
Green sea turtle	T	Construction activities would have no effect on the green sea turtle. Operational activities may affect, but are not likely to adversely affect, the green sea turtle.
Leatherback sea turtle	E	Construction activities would have no effect on the leatherback sea turtle. Operational activities may affect, but are not likely to adversely affect, the leatherback sea turtle.

Notes: C = candidate; CH = critical habitat; E = endangered; ESA = Endangered Species Act; T = threatened.

We seek your written concurrence on our “may affect, not likely to adversely affect” determinations as summarized in the table above and detailed in the BA. Thank you for your assistance in this matter. Please contact Stacey Zee, FAA Environmental Specialist, at Stacey.Zee@faa.gov or (202) 267-9305 to discuss any questions or concerns.

Sincerely,



Daniel Murray
 Manager, Space Transportation Development Division

Attachment: Biological Assessment – Spaceport Camden

Biological Assessment

Spaceport Camden **Camden County, Georgia**

October 2017

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ACRONYMS AND ABBREVIATIONS

AC	Advisory Circular
APLIC	Avian Power Line Interaction Committee
BA	Biological Assessment
CFR	Code of Federal Regulations
CSS	Coastal Stormwater Supplement
CWA	Clean Water Act
dB	decibels
dba	A-weighted decibels
EIS	Environmental Impact Statement
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FL ARTCC	Florida Air Route Traffic Control Center
FR	<i>Federal Register</i>
FWC	Florida Fish and Wildlife Conservation Commission
GDNR	Georgia Department of Natural Resources
GSMM	Georgia Stormwater Management Manual
kVA	kilovolt-ampere
mph	miles per hour
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NOTMAR	Notice to Mariners
NPS	National Park Service
OASPL	overall sound pressure level
PSHMP	Protected Species and Habitat Management Plan
psf	pounds per square foot
RCW	red-cockaded woodpecker
RP	rocket propellant
SWPPP	Stormwater Pollution Prevention Plan
T&E	threatened and endangered
UAS	unmanned aerial system
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USCG	U.S. Coast Guard

1.0 Introduction

The Federal Aviation Administration (FAA) is evaluating the Camden County Board of Commissioners' (County's) proposal to construct and operate a commercial space launch site—referred to as Spaceport Camden—in Camden County, Georgia. In order to operate a commercial space launch site, the County must obtain a Launch Site Operator License from the FAA. This Biological Assessment (BA) has been prepared to fulfill requirements under Section 7 of the Endangered Species Act (ESA). This report addresses potential impacts to all federally listed threatened and endangered (T&E) species and candidate¹ species, as well as critical habitat, resulting from the FAA's issuance of a launch site operator license to the County, which involves the County constructing and operating Spaceport Camden. This BA is meant to initiate the ESA consultation process for species under the jurisdiction of the U.S. Fish and Wildlife Service (USFWS). The objectives of this BA are to:

- document all federally listed T&E species and associated habitat that occur, or may potentially occur, on or near the action area.
- identify the activities that have the potential to impact, either beneficially or adversely, those documented species.
- determine and quantify to the extent possible the effects these activities may have on federally listed species and critical habitat.
- identify methods to reduce the potential for negative impacts to protected species from these activities.

2.0 Description of the Proposed Action

The FAA proposes to issue a Launch Site Operator License to the County. The license would allow the County to offer Spaceport Camden to commercial launch operators to conduct launches of liquid-fueled, small to medium-large lift-class, orbital and suborbital vertical launch vehicles. The Proposed Action, therefore, includes both proposed construction and operation of a commercial space launch site on the Atlantic seaboard in Camden County, Georgia (Exhibit 2-1).

2.1 Purpose of the Proposed Project

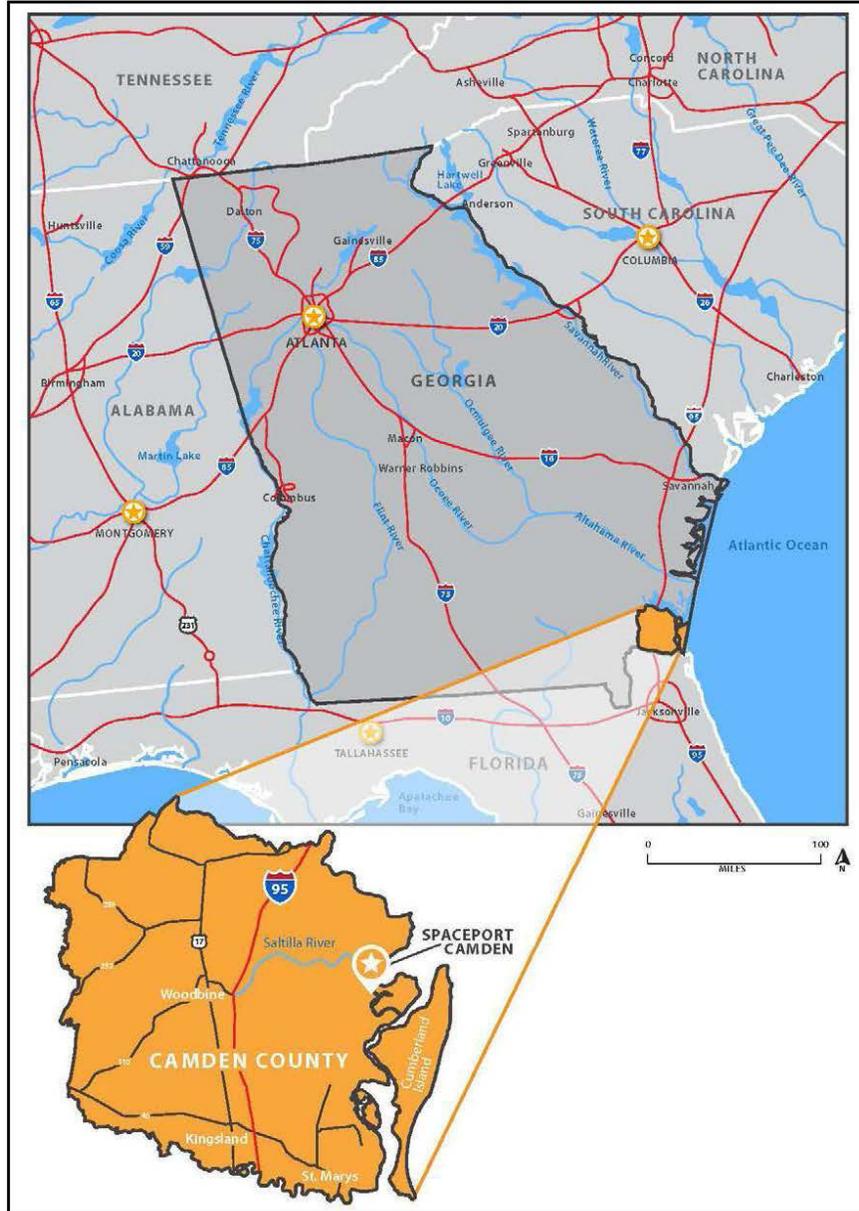
The County's purpose to construct and operate Spaceport Camden is to allow the County to offer a commercial space launch site to a growing number of small to medium-large lift-class, orbital and suborbital, vertical launch vehicle operators to conduct commercial launches from the east coast of the United States. A commercial space launch site may be able to more effectively respond to the scheduling needs of commercial launch providers than Federal facilities with national security priorities and logistical complexities.

The purpose of the FAA's action in connection with the County's proposal is to fulfill the FAA's responsibilities as authorized by Executive Order (EO) 12465, *Commercial Expendable Launch Vehicle Activities* (49 Federal Register [FR] 7099, 3 Code of Federal Regulations [CFR], 1984 Comp., p. 163), and

¹ Although candidate species receive no statutory protection under the ESA, they are being included in case they are listed in the future and to promote cooperative conservation efforts for these species because they are, by definition, species that may warrant future protection under the ESA.

Biological Assessment, Spaceport Camden

the U.S. Commercial Space Launch Competitiveness Act of 2015 (Public Law 114-90) for oversight of commercial space launch activities, including licensing launch activities. The Proposed Action would be consistent with the objectives of the U.S. Commercial Space Launch Competitiveness Act of 2015.



Final – October 2017

Exhibit 2-1. Proposed Spaceport Camden Regional Area

2.2 Description of the Proposed Project

The proposed launch site would be constructed in Camden County, Georgia, in the extreme southeastern part of the state, approximately 11.5 miles due east of the town of Woodbine (Exhibit 2-1). The proposed launch site would be constructed within an existing 11,800-acre industrial site, consisting of property currently owned by the Union Carbide Corporation and Bayer CropScience, shown in Exhibit 2-2. The County has signed an option agreement² with the Union Carbide Corporation to purchase their portion of this industrial site (approximately 4,000 acres) on which to construct the spaceport. The Union Carbide site consists of 1,200 acres of upland and 2,800 acres of marshland. The spaceport (the boundary of which is outlined in blue in Exhibit 2-2) would be constructed on the uplands portion of this site. The County is also considering purchasing approximately another 7,800 acres of adjoining property, currently owned by Bayer CropScience, in the same industrial complex; this area would only be purchased if the spaceport is approved. The 11,800 acres of these two properties would provide an appropriate buffer³ to ensure the safety of the uninvolved public.

Two aspects of the Proposed Action are considered in this analysis: construction activities and operations. The facilities of the proposed Spaceport Camden would encompass less than 100 noncontiguous acres as shown in Exhibit 2-3. Related infrastructure (e.g., roads and utilities) would also be improved within the existing industrial site. The facilities and infrastructure improvements are further described in Section 2.2.1, *Construction*.

Each of the launch site facilities and the western boundary of the site would be fenced to provide security and control access. The proposed Spaceport Camden boundary, which is fully within the uplands portion of the property, is shown in dark blue on Exhibit 2-3. (Note that the location of one of the facilities, the Alternate Control Center and Visitor Center, is located outside the proposed Spaceport Camden site boundary on what is currently Bayer CropScience property⁴.) The remainder of the property, much of which is marshland, would be used as buffer.

The FAA would not issue a license to the County until after the FAA completes its National Environmental Policy Act (NEPA) process (including preparation of an Environmental Impact Statement [EIS] and Record of Decision [estimated in mid- to late 2018]) and any required permits or approvals have been granted.

² An option to purchase is a formal agreement that provides one of the parties, for a specified time, the right but not the obligation to buy, sell, or obtain an asset at an agreed-upon price at some time in the future, usually with certain conditions.

³ Camden County has defined the buffer as the area that exists between the launch point and the launch site boundary, as defined in 14 CFR §420.21, Table 2, and any other additional lands, water, and/or marsh around the launch point determined to be needed to ensure the safety of the uninvolved public. This buffer area would not be constructed upon and would be left in its current condition.

⁴ Bayer CropScience has indicated a willingness to sell the property to Camden County, should the County pursue the purchase. However, should the County not purchase the property nor reach an agreement to build on Bayer CropScience property, this facility would have to be relocated. Alternative locations for the facility would be assessed to determine the need for additional environmental impact analysis, consultation, and documentation.

Biological Assessment, Spaceport Camden



Exhibit 2-2. Proposed Spaceport Camden Location

2.2.1 Construction

Construction activities would include the construction of four facilities, including a Vertical Launch Facility, a Launch Control Center Complex, an Alternate Control Center and Visitor Center, a Landing Zone, and associated infrastructure. These activities are expected to last approximately 15 months, the length of time needed for construction of the Vertical Launch Facility. Construction activities would occur during daylight hours, six days per week.

2.2.1.1 Launch Site Construction Activities

There are no structures that could be converted to support launch site operations and very little infrastructure (i.e., there are some roadways but no water, electricity, or communications systems) available on the Union Carbide Corporation property. Therefore, all of the facilities and most of the onsite infrastructure proposed for Spaceport Camden would be new. Onsite infrastructure improvements would include improvements to existing internal roads, construction of new roadways, and new electrical distribution, water distribution, and septic systems on the launch site.

However, electricity and water are available on the adjoining Bayer CropScience property, and there is an acceptable access road to the launch site. No improvements to the offsite infrastructure would be needed to support Spaceport Camden.

During construction, temporary laydown areas for each facility would be included within the facility fenced perimeter (Exhibit 2-4). Typically these laydown areas would be located in areas that would ultimately be used as parking lots (or in the case of the Vertical Launch Facility, the launcher track) and other areas within the fenced perimeter that would be open space after construction is completed. If needed, existing unused roadways may also be used as laydown areas.

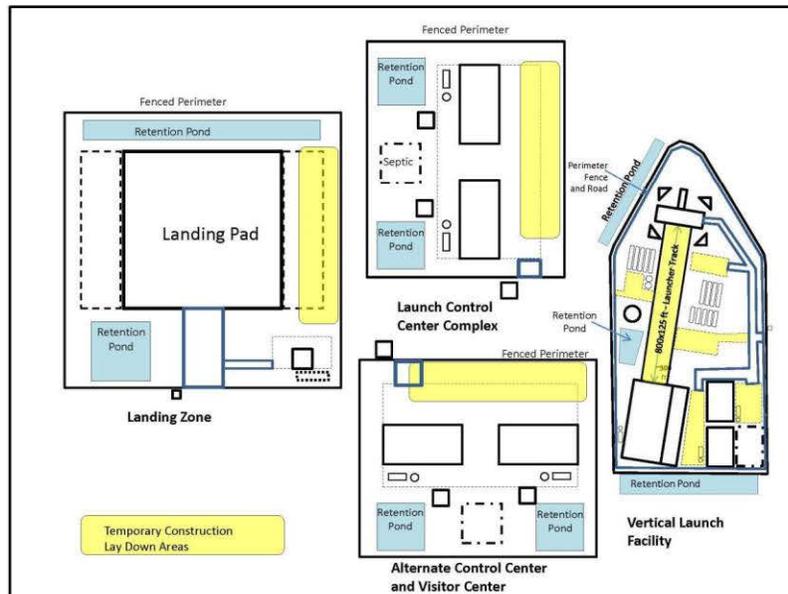


Exhibit 2-4. Facility Construction Laydown Areas

Table 2-1 shows the estimated construction timeframe for Spaceport Camden facilities. Construction of the facilities and infrastructure would occur concurrently and last approximately 15 months, the length of time needed for construction of the Vertical Launch Facility. Construction activities would occur during daylight hours, six days per week. It is anticipated that about 40 to 50 construction workers would be required for the construction of the facilities and about 20 additional construction workers would be required for the construction of new infrastructure (water, sewer, drainage, and roads). Launch site construction activities would not commence until after the NEPA process has been completed, including issuance of a Record of Decision, and any required permits or approvals have been granted (estimated in mid- to late 2018).

Table 2-1. Estimated Construction Duration

Facility	Construction Duration
Vertical Launch Facility	15 months
Launch Control Center Complex	12 months
Alternate Control Center and Visitor Center	12 months
Landing Zone	9-10 months
Infrastructure ¹	6-7 months

¹ Includes water, sewer, drainage, electricity, and roads.

Vertical Launch Facility

Exhibit 2-5 is an artist’s rendering of the Vertical Launch Facility and Exhibit 2-6 is a schematic of the facility. The Vertical Launch Facility would be approximately 29 acres⁵ in size and, as indicated in Exhibit 2-3, would be located in the northeastern portion of the spaceport.



Exhibit 2-5. Artist Concept for Vertical Launch Facility

⁵ Facility areas include the area within the fenced perimeter (which encloses all of the facility structure) and the 25-foot grassy (cleared) area outside the fenced perimeter and, for this facility, the two retention ponds located outside of the fenced perimeter.

Biological Assessment, Spaceport Camden

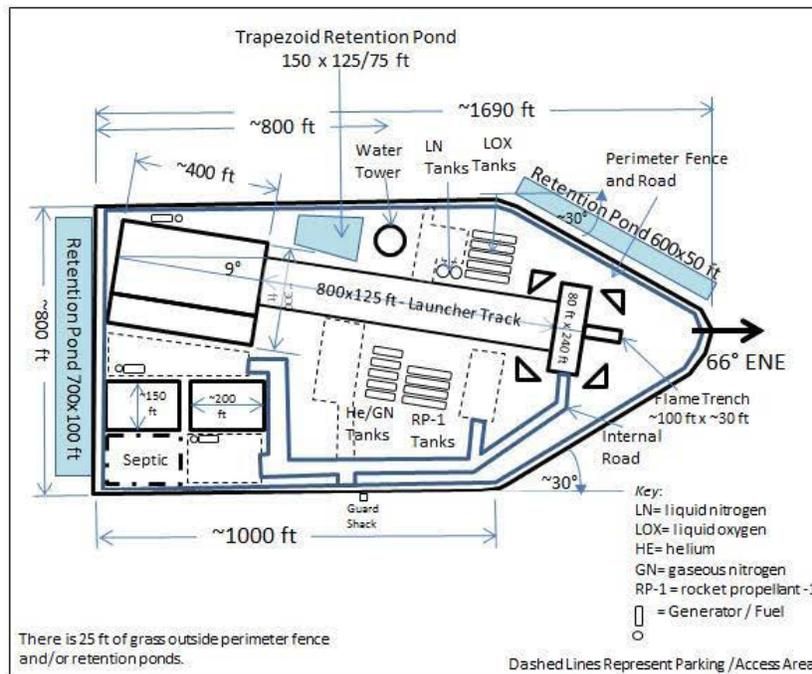


Exhibit 2-6. Vertical Launch Facility

The Vertical Launch Facility would include a launch pad and its associated structures, storage tanks, and handling areas; vehicle and payload integration facilities; a lightning protection system; deluge water systems and associated water capture tank; water tower; and other launch-related facilities and systems including shops, office facilities, and stormwater retention ponds (also referred to as retention ponds).

The launch pad would be a pile-supported concrete platform with a steel gantry framing. A concrete launcher track (supported by 3-foot-diameter piers), a flame trench, and a water retention tank would be the principal supporting features for launch activities. Four lightning towers about 250 feet tall each would be the major components of the lightning protection system.

Liquid oxygen and rocket propellant-1 (RP-1) would be stored in dedicated propellant storage areas at the Vertical Launch Facility. Liquid oxygen tanks would store 50,000 to 100,000 gallons each and would be approximately 14 feet in diameter and 50 to 100 feet long. RP-1 tanks could be up to 50,000-gallon capacity each, approximately 12 feet in diameter and 60 feet long. Depending on the size of the tanks, up to six tanks for liquid oxygen and up to four tanks for RP-1 would be installed at the Vertical Launch Facility. Additional storage tanks would be provided for helium and nitrogen (both gaseous and liquified), which are used as purge gases and tank pressurants. A total of approximately 10,000 to 15,000 gallons of helium would be stored in high-pressure tube banks, and a total of 25,000 to 50,000 gallons of nitrogen would be stored in up to two liquified nitrogen storage tanks and four gaseous nitrogen storage tanks, each up to approximately 10 feet in diameter and 44 feet long. In addition to these materials, ordnance may be stored at this facility for a short time before being inserted into the launch vehicle. Launch vehicles use

ordnance as part of the flight termination system and often use explosive bolts to ensure that components would separate when needed. The ordnance supplies the explosive force for these bolts.

The Vehicle Integration Building (the largest building within the Vertical Launch Facility) would be used for the inspection and assembly of the component parts (e.g., first stage, second stage) of the launch vehicle and payload mating (attachment of the payload to the launch vehicle) and would house a machine shop and storage facilities. If a launch operator arranged for the first stage to return to Spaceport Camden, either by landing at the spaceport or after landing on a barge in the Atlantic Ocean, some refurbishment of the first stage could occur in the Vehicle Integration Building. This building would be certified to meet National Fire Protection Association requirements for electrical systems and equipment. This structure would be a 65-foot-tall, pre-engineered metal building on a concrete foundation with a metal roof and siding. The Vehicle Integration Building would include a high bay and a multistory work area and would contain overhead bridge and jib cranes for operational support. Two support buildings housing machine shops, offices, integration facilities, and a warehouse would be either pre-engineered metal buildings or cinder block masonry buildings on concrete foundations with metal roofs and interior offices and work areas. Like the Vehicle Integration Building, the building housing machine shops and a warehouse would have a high bay. These support buildings would be approximately 45 feet tall.

The deluge and sound suppression system would provide local sound and vibration suppression during launches. This system would include a water retention tank to collect any water not vaporized during a launch and a 250-foot-tall water tower with a capacity of approximately 250,000 gallons.

Other Vertical Launch Facility features would include associated roads, a parking lot, a perimeter road and fencing, gates, a guard shack, a diesel generator system (including fuel storage tanks),⁶ a septic system, and area lighting. As shown in Exhibit 2-6, three retention ponds for stormwater runoff control would be installed at the Vertical Launch Facility. Each pond would be 8 feet deep, and the ponds would have a combined surface area of 115,000 square feet and total retention volume of 920,000 cubic feet.

Construction of the Vertical Launch Facility, including facility site preparation, is anticipated to take about 15 months.

Launch Control Center Complex

The Launch Control Center Complex would be constructed on approximately 2.4 acres (see Exhibit 2-3, Exhibit 2-7, and Exhibit 2-8). As indicated on Exhibit 2-3, the Launch Control Center would be located on an uplands area in the extreme western portion of the property approximately 2.3 miles from the launch pad at the Vertical Launch Facility and approximately 1 mile from the Landing Zone.

⁶ There may be a total of up to seven diesel fuel storage tanks on the Spaceport Camden property, located at the Launch Control Center Complex, Vertical Launch Facility, and Alternate Control Center and Visitor Center.

Biological Assessment, Spaceport Camden



Exhibit 2-7. Artist Concept for the Launch Control Center Complex

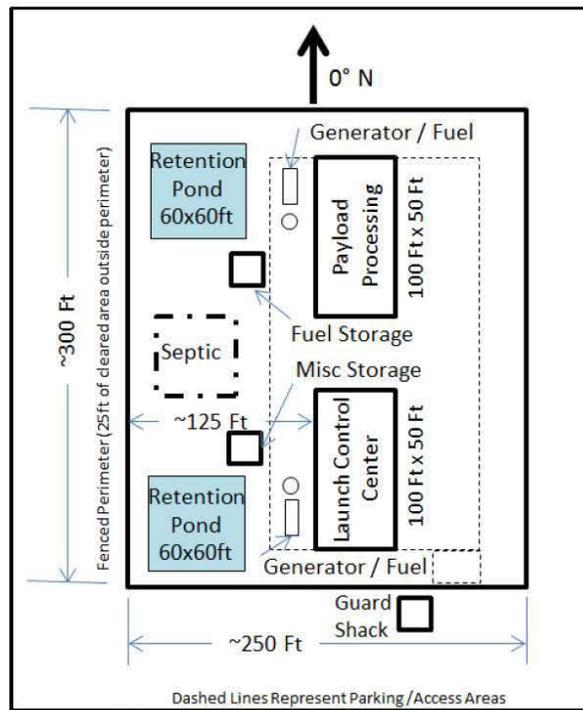


Exhibit 2-8. Launch Control Center Complex

Biological Assessment, Spaceport Camden

The Launch Control Center Complex would include a Launch Control Center Building housing a control room and related equipment and a Payload Processing Building. The Launch Control Center Building would be the control hub for launches and related operations. The Payload Processing Building would be the location for satellite⁷ and other related payload processing activities prior to integration onto launch vehicles. A first-responder facility would be located within the Launch Control Center Building or the Payload Processing Building.

In addition to these two structures, the Launch Control Center Complex would include two small storage buildings for payload propellants (satellite and special fuels⁸) and miscellaneous maintenance equipment. Additional space for approximately 1,000 cubic feet of helium storage and 3,000 cubic feet of nitrogen storage would be provided at the Launch Control Center Complex. Typically, these gases would be stored in six to eight tube banks or tanks, the tanks being approximately 2 feet in diameter and 40 feet long. In addition to these materials, ordnance may be stored at this facility for a short time before being inserted into the payload or transferred to the Vertical Launch Facility.

The Launch Control Center Building and Payload Processing Building (the main buildings in this complex) would be approximately 150 feet by 50 feet and 40 to 45 feet tall, with a high bay and/or a second floor for offices and conference spaces. The smaller storage buildings (20 feet by 20 feet and 15 feet tall), if used for storage of hazardous materials such as hydrazine (used sometimes as satellite fuel), would have appropriate environmental and safety equipment. The main buildings would be of environmentally controlled, pre-engineered metal construction on concrete foundations with footers. The smaller storage buildings would be of pre-engineered metal or cinder block construction.

Both main buildings would be served by a backup generator with a fuel source (fuel storage tanks, up to 5,000 gallons each). Other features at the Launch Control Center Complex would include a parking lot, fencing, guard shack, gates, a septic system, and area lighting. These features are described in Section 2.2.1.2, *Infrastructure*. Two retention ponds for stormwater runoff control would be installed at the Launch Control Center Complex. Each pond would be 8 feet deep, and the ponds would have a combined surface area of 7,200 square feet and total retention volume of 58,000 cubic feet.

Construction of the Launch Control Center Complex, including facility site preparation, is anticipated to take about 12 months.

Alternate Control Center and Visitor Center

Exhibit 2-9 shows an artist concept for the Alternate Control Center and Visitor Center, and Exhibit 2-10 shows the footprint for this facility. This facility would be similar in size and design to the Launch Control Center Complex and would serve as administration and conference headquarters for Spaceport Camden. It would be constructed on the south side of the spaceport site, as indicated in Exhibit 2-3, near the main entrance to the property. The Alternate Control Center would mirror the Launch Control Center in facility construction and would provide a backup launch control capability. This facility would also include a Visitor Center that would house informational displays for visitors and have accommodations for viewing launches.

⁷ A satellite is the portion of the payload consisting of an object placed in orbit around the earth.

⁸ Satellite and special fuels include hydrazine and monomethylhydrazine or unsymmetrical dimethyl hydrazine used with nitrogen tetroxide. These fuels would be stored in small quantities not exceeding 25 gallons each.

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Exhibit 2-9. Artist Concept for the Alternate Control Center and Visitor Center

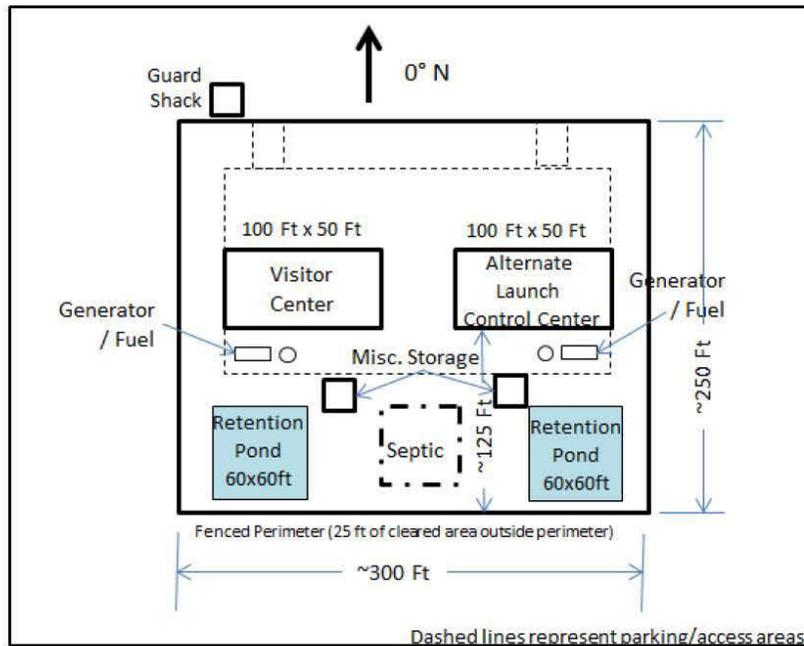


Exhibit 2-10. Alternate Control Center and Visitor Center

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The Alternate Control Center and Visitor Center buildings would be 40 to 45 feet tall. The two main buildings would be environmentally controlled, pre-engineered metal construction on concrete foundations with footers. The building would have a high-bay capability and/or second floor with offices and conference spaces. The storage buildings would be pre-engineered metal building or cinder block construction.

In addition to the buildings, the facility would include a parking lot, fencing, a septic system, area lighting and a guard shack. These features are described in Section 2.2.1.2, *Infrastructure*. The complex would have backup generators with a fuel source (fuel storage tanks, up to 5,000 gallons each) and two 20-foot by 20-foot storage buildings. Two retention ponds for stormwater runoff control would be installed at the Alternate Control Center and Visitor Center. Each would be 8 feet deep, and the ponds would have a combined surface area of 7,200 square feet and total retention volume of 58,000 cubic feet.

Construction of the Alternate Control Center, including facility site preparation, is anticipated to take about 12 months.

Landing Zone

Exhibit 2-11 is an artist's rendering of the Landing Zone, and Exhibit 2-12 is a schematic of it. The Landing Zone would be used to land the first stage of some launch vehicles. It would occupy approximately 13 acres located in the center of the uplands portion of the spaceport, as indicated in Exhibit 2-3. The Landing Zone would primarily be a concrete pad "located roughly in the center of the area. The Landing Zone would also have a building for operations and storage and fuel and oxidizer "offload" tanks.

The 400-foot by 400-foot concrete landing pad would be supported by 3-foot-diameter concrete piers driven into the ground. There would be 100-foot-wide concrete side wings (concrete pads similar to the landing pad but not designed to support the landing of a first stage) for parking and storage of mobile offload propellant tanks and other support equipment such as mobile cranes or forklifts. The Landing Zone would have a building for operations and storage (50 feet by 50 feet by 20 feet tall) housing office space and storage areas. The building for operations and storage would be constructed of either pre-engineered metal or cinder block and would be environmentally controlled. The Landing Zone would be fenced for security with a guard shack at the entrance and would also include a septic system. These features are described in Section 2.2.1.2, *Infrastructure*. Two retention ponds for stormwater runoff control would be installed at the Landing Zone. Each would be 8 feet deep with a combined surface area of 46,000 square feet and total retention volume of 370,000 cubic feet.

Construction of the Landing Zone, including facility site preparation, is anticipated to take about 9 to 10 months.

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Exhibit 2-11. Artist Concept for the Landing Zone

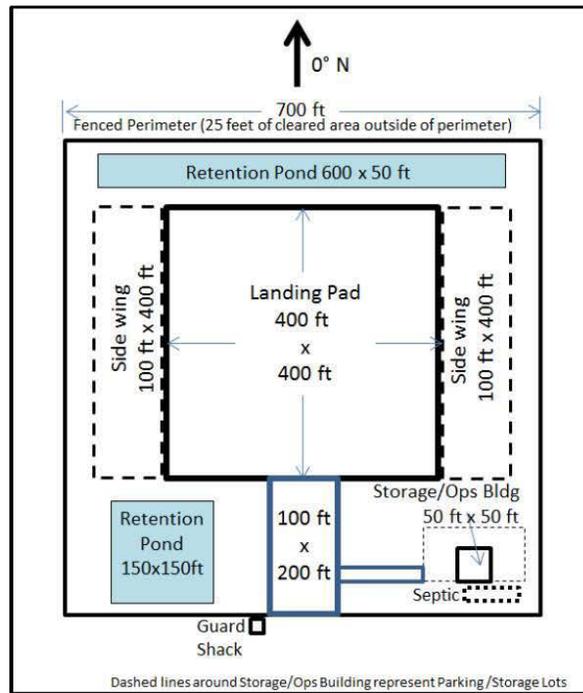


Exhibit 2-12. Landing Zone

2.2.1.2 Infrastructure

New infrastructure or improvements to existing infrastructure would be required to support Spaceport Camden operations. Spaceport Camden would need water, electricity, and sewage treatment systems. The launch site road system would need to be expanded and upgraded. New security systems that include facility and improved launch site perimeter fencing, guard facilities, and gates would be required. Each facility would also need parking areas to accommodate launch site workers and visitors. New infrastructure and improvements would be limited to onsite improvements or, in the case of improved roadways, within the industrial property. There are no anticipated improvements or expansions required for the access road to the spaceport site (Harrietts Bluff Road/Union Carbide Road) or the utilities that bring electricity and communications to the industrial property.

Expansion and improvement of the internal roadway system would be required for construction activities and to accommodate the new facilities and activities. Exhibit 2-3 shows the proposed roadway modifications, including modifications to roads on the spaceport site and on the Bayer CropScience property. Most of the launch site roadwork would be upgrading existing roadbeds. It is anticipated that two grades of roads would be required onsite: regular roads, primarily for automotive traffic, and heavy roads to accommodate construction and transport of heavier equipment, including large and oversize components. Much of the road system to be upgraded for heavier use is located on the Bayer CropScience portion of the industrial property. It is estimated that 21,300 linear feet of regular road (8,800 feet of internal roads and a 12,500-foot launch site perimeter road) and 16,500 linear feet of heavier road would be required. Within the Vertical Launch Facility and Landing Zone, parking lots, internal roads, and the perimeter road would be constructed of concrete. All other roads (facility internal and perimeter roads and the site perimeter road) and parking lots would be constructed of asphalt.

As shown in Exhibit 2-3, one of the road upgrades is an upgrade to a heavier road to the existing dock. The dock could be used during construction or for the return of a first stage after a launch should the first stage be landed on a barge in the Atlantic Ocean. Existing infrastructure exists at the docks for use during construction and operation activities. There are no plans to make any modifications to the dock, and there would be no need to dredge the channel for spaceport-related activities.

There is no electrical power or water available on the proposed Spaceport Camden site. The Bayer CropScience property includes electrical and communications lines as well as two deep water wells; however, these utilities do not extend onto the Spaceport Camden site. Electric power, communications, and water are available at the main gate building to the two properties (Union Carbide Corporation and Bayer CropScience), but this guard facility is part of the Bayer CropScience side of the property. (This main gate building is located at the main gate location identified in Exhibit 2-3.) Power, communications, and water would be provided by extending the existing services available at the main gate for the two properties to the spaceport site and from there to each of the proposed new facilities.

Electrical power would be provided on the project site by installing approximately 3 miles of above-ground lines (mounted on wooden poles) located along launch site roadways to each facility and connected to existing offsite transmission lines. At each facility, the power lines would then be run underground. Transformers would be installed on the launch site as necessary. Annual power requirements during launch site operation are estimated to be approximately 31 million kilowatt-hours per year. This is based

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on a nominal power demand of 6,400 kilovolt amperes (kVA) per day⁹ (during operation, with a maximum demand of approximately 7,500 kVA per day). Power requirements during construction would be much less, nominally a little over 500 kVA per day.

There are two existing deep wells on the Bayer CropScience property that would be used to provide water for Spaceport Camden operations. Twelve-inch water lines would be run underground alongside the launch site roadways to provide water to each facility. The site is authorized to withdraw 1.7 million gallons of water daily from the two existing deep wells. Annual water usage during launch site operation is estimated to be 16.3 million gallons of water. This is based on a nominal water usage of 11,500 gallons per day with peak usage of approximately 405,000 gallons per day. (Peak usage would be dominated by the activation of the water deluge system, which could use up to 250,000 gallons per launch.)

Septic systems would be constructed at each of the four facilities to manage sanitary sewage. Commercial grade onsite sewage disposal (septic) systems would be utilized to treat the wastewater generated at each facility. Septic systems are sized based on the anticipated daily sewage flow. The anticipated flow for the launch site would be nearly 60,000 gallons per day (12,500 at the Launch Control Center Complex, 25,000 at the Alternate Control Center and Visitor Center, 2,500 at the Landing Zone, and 19,000 at the Vertical Launch Facility). Septic systems are regulated and permitted by the Georgia Department of Public Health and Camden County Department of Health.

Security fencing would be installed around each of the four individual facilities and along the western border of the Camden launch site¹⁰. A main gate with controlled access would be installed near the Alternate Control Center and Visitor Center. Perimeter fencing would be designed in accordance with FAA guidelines for security fencing in accordance with FAA-Advisory Circular (AC) 150/5630-13 (as amended) and AC 150/5370-10 (as amended). The security fencing would consist of a chainlink fabric installed to a height of 8 feet (2.5 meters) and topped with a three-strand barbed wire overhang. Fence posts would be installed at no greater than 10-foot (3-meter) intervals. An area between 10 feet to 20 feet (3 meters to 6 meters) wide immediately outside of the perimeter fencing would be cleared.

Each of the facilities would have controlled access and guard shacks provided at the entrance to the facility. All the guard shacks for the four individual internal facilities (Vertical Launch Facility, Launch Control Center Complex, Landing Zone, and Alternate Control Center and Visitor Center) would be small one- to two-person enclosures. They would have power, an environmental control system, communications, lighting, water, and a bathroom that connects to the facility's septic system.

Area lighting would consist of perimeter/security lighting, general illumination for parking lots, and walkway lighting for staff and visitor areas. Typical (non-launch weekday) operations would dictate that external lighting be turned on until about 9:00 p.m., then go into an automatic dim mode. Security lighting would be on trip sensors after 9:00 p.m. and would only be activated when triggered by a security alert. For launch operations, external lighting may be active from dusk until dawn due to the potential for three-shift operations at all four facilities. Exterior lighting for buildings and infrastructure would comply with

⁹ kVA, kilovolt-ampere, is a measure of electrical power for an AC power system, it is the AC power equivalent to watts in a DC power system.

¹⁰ No perimeter fencing would be installed at the launch site borders abutting marshland or water. Regular security patrols would be established to maintain access control for the site perimeter without fencing.

the Lighting Management Plan (refer to Section 2.3, *Conservation Measures*). Lighting systems would be designed and operated using best practices¹¹ for wildlife, navigation, safety, and security as part of a lighting plan in coordination with USFWS and a professional organization such as International Dark-Sky Association. Area lighting would be provided for the four facilities but is not anticipated for the entire property or roads. Area lighting would consist of perimeter/security lighting, general illumination for parking lots, and walkway lighting for staff and visitor areas. All external lighting would be light-emitting diode lighting.

Typical (non-launch weekday) operations would dictate that external lighting would be turned on until about 9:00 p.m. then go into an automatic dim mode. Security lighting would be on trip sensors after 9:00 p.m. and would only be activated and on when triggered by a security alert. For launch operations, external lighting may be active from dusk until dawn due to the potential for three-shift operations at all four facilities.

2.2.1.3 Structure Summary

The previous sections provided information about the features of each of the four facilities and the infrastructure proposed for Spaceport Camden. Table 2-2 provides a summary of the permanent vertical structures that would be located at each of the Spaceport Camden facilities, their sizes, and type of construction. The facility size identified for each facility includes the area within a fenced perimeter plus a 25-foot cleared grassy area outside of the perimeter. Table 2-3 provides summary information for all facilities (total area, occupancy, and construction duration). The Vertical Launch Facility retention ponds would be located outside of the fenced perimeter; this area is included in the Vertical Launch Facility total area. Table 2-4 provides the facility final construction proposed footprint with the contribution from each of the structures at the facility (buildings, roads, parking areas, supporting foundations (pads), retention ponds). As noted in each of the previous sections, areas temporarily affected by construction (laydown areas) would all be within the fenced perimeter of the facilities. For the construction of these structures, all excavated material (an estimated 126,000 cubic yards) would be reused onsite, primarily as backfill. Note that within the Landing Zone and Vertical Launch Facility all pads, parking lots, and roads would be concrete; all others would be asphalt.

Table 2-2. Proposed Action Permanent Vertical Structures

Facility	Structure	Height (feet)	Footprint (feet) ¹	Construction
Launch Control Center Complex (facility size: 300 feet x 250 feet)	Launch Control Center	40–45	100 x 50	Pre-engineered metal on concrete foundation
	Payload Processing Building	40–45	100 x 50	Pre-engineered metal on concrete foundation
	Storage building	1 story	20 x 20	Pre-engineered metal or cinder block on concrete foundation
	Storage building	1 story	20 x 20	Pre-engineered metal or cinder block on concrete foundation
	Guard shack	1 story	10 x 10	Pre-engineered metal or cinder block on concrete foundation

¹¹ Best practices such as shielding lights, directing light sources to the ground or landward, and use of low-pressure sodium lights or light-emitting diode (LED) lights would help to reduce light pollution (urban glow).

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Table 2-2. Proposed Action Permanent Vertical Structures

Facility	Structure	Height (feet)	Footprint (feet) ¹	Construction
Alternate Control Center and Visitor Center (facility size: 300 feet x 250 feet)	Alternate Control Center	40–45	100 x 50	Pre-engineered metal on concrete foundation
	Visitor Center	40–45	100 x 50	Pre-engineered metal on concrete foundation
	Storage building	1 story	20 x 20	Pre-engineered metal or cinder block on concrete foundation
	Storage building	1 story	20 x 20	Pre-engineered metal or cinder block on concrete foundation
	Guard shack	1 story	10 x 10	Pre-engineered metal or cinder block on concrete foundation
Landing Zone (facility size: 700 feet x 700 feet)	Storage/operations building	20	50 x 50	Pre-engineered metal or cinder block on concrete foundation
	Guard shack	1 story	10 x 10	Pre-engineered metal or cinder block on concrete foundation
Vertical Launch Facility (facility size: 1,690 feet x 800 feet ²)	Vehicle Integration Building	65	300 x 400	Pre-engineered metal on concrete foundation with metal roof and siding
	Office building	45	150 x 200	Pre-engineered metal or cinder block on concrete foundation with metal roof
	Warehouse/storage/shop building	45	150 x 200	Pre-engineered metal or cinder block on concrete foundation with metal roof
	Guard shack	1 story	10 x 10	Pre-engineered metal or cinder block on concrete foundation
	Water tower	250		Metal frame
	Lightning towers ¹ (four)	250	60 x 60 x 85	Metal frame
	Chemical storage tanks ³			
	Liquid oxygen	14	150 x 135	
	Rocket Propellant-1	12	135 x 135	
Helium/nitrogen	10	80 x 160		

¹ Footprint dimensions are for the concrete pads for these structures.

² Facility is not rectangular; the fenced perimeter consists of an 800-foot x 1,000-foot rectangular area and an area that is roughly triangular with an 800 foot base and a height of 690 feet.

³ Tank diameters were used for structure height; footprint dimensions are for the concrete pads for these structures.

Table 2-3. Proposed Action Facility Summary

Facility	Total Acreage ¹ (square feet/acres)	Occupants (normal/surge)	Construction Duration (months)
Launch Control Complex	105,000 / 2.4	25 /100	12
Alternate Control Center and Visitor Center	105,000 / 2.4	10/50 15/150 (visitors)	12
Landing Zone	563,000 / 12.9	2/20 1(visitor)	9–10
Vertical Launch Facility	1,270,000 / 29.2	40/150	15
Infrastructure ¹	924,000 / 21.2	N/A	6–7

¹ Total acreage includes area for roads. (Water, drainage, and electric would be placed within the cleared areas along the roads. The sewer system is included in the acreage of its associated facility.) Construction duration is for all components of the infrastructure: water, sewer, drainage, electric, and roads.

Table 2-4. Spaceport Facilities Component Footprints

Vertical Launch Facility Components	Component Footprint (square feet)	Launch Control Center Components	Component Footprint (square feet)
Vehicle Integration Building	120,000	Launch Control Center Building	5,000
Office building	30,000	Payload Processing Building	5,000
Warehouse/storage/shop building	30,000	Guard shack	100
Water tower	0	Storage buildings (two)	800
Guard house	100	Parking area	22,500 ^b
Launch pad	19,200	Access drive	600
Launcher track	100,000	Retention ponds (two)	7,200
Flame trench	3,000	Total footprint (structures/pavement)	33,900 ^a
Lightning tower pads (four)	7,200	Alternate Control Center and Visitor Center Components	Component Footprint (square feet)
Parking lots (five)	132,000	Alternate Control Center Building	5,000
Chemical storage tank pads:		Visitor Center	5,000
Liquid oxygen	20,300	Guard shack	100
Rocket Propellant-1	18,200	Storage buildings (two)	800
Helium/nitrogen	12,800	Parking area	22,500 ^b
Interior roads	56,800	Access drive (two)	1,200
Facility perimeter road	48,900	Retention ponds (two)	7,200
Retention ponds (two)	100,000	Total footprint (structures/pavement)	34,500 ^a
Total footprint ¹ (Structures/pavement)	598,000 ^a	Landing Zone Components	Component Footprint (square feet)
Launch Site Roads²	Component Footprint (square feet)	Storage/operations building	2,500
Launch site perimeter road (west side of site)	150,000	Landing pad	160,000
Interior regular roads	312,000	Side wings (two)	80,000
Interior heavy use roads	462,000	Access road	20,000
Total road footprint	924,000	Parking lot	9,500 ^c
		Retention ponds (two)	31,500
		Total footprint (structures/pavement)	272,000 ^a

¹ Facility would not be rectangular; the fenced perimeter consists of an 800-foot x 1,000-foot rectangular area and an area that is roughly triangular with an 800-foot base and a height of 690 feet.

² The perimeter road would be one lane; all others two lanes. Lanes on regular use roads would be 12 feet wide and 14 feet wide on heavy use roads. An additional 6 feet of grassy area would be provided on each side of the roads. Construction duration is for all utilities (road, electric distribution, and water distribution).

^a Total does not include retention pond area.

^b Paved area of parking lot encompasses the two larger buildings. Paved area excludes area associated with the buildings.

^c Paved area of parking lot encompasses the storage/operations building. Paved area excludes area associated with the building.

2.2.2 Operations

To authorize the operation of the spaceport, the FAA would issue a Launch Site Operator License to the County. The license would allow the County to offer Spaceport Camden to commercial launch operators to conduct launches of liquid-fueled, small to medium-large lift-class, orbital and suborbital vertical launch vehicles. Spaceport Camden would accommodate up to 12 vertical launches and up to 12 associated launch vehicle first stage landings per year. All vehicles would launch generally to the east over the Intracoastal Waterway, Cumberland Island National Seashore, and the Atlantic Ocean. Any first stage landings would return to the launch site from the east. In addition, in support of the launches there would be up to 12 wet dress rehearsals and up to 12 static fire engine tests per year. For purposes of impact

analysis, FAA is considering a range of launch and landing trajectories ranging from 83 to 115 degrees from true north. This range is depicted in Exhibit 2-13.

2.2.2.1 Launch Vehicle Description

Spaceport Camden would be available to a range of launch operators, each of which offers various launch vehicles. While these vehicles would include small and medium-large lift class and use liquid propellants, they would have different design and operating specifications. Since a specific launch vehicle cannot be identified until a launch operator is identified and a variety of launch vehicles would be candidates to be launched from the launch site, a representative launch vehicle is used in this BA to evaluate the potential environmental impacts of launches from the launch site. The design features identified for the launch vehicle described in the following paragraphs were selected as representative for a medium-large lift-class launch vehicle. A medium-large lift-class launch vehicle may have a gross liftoff weight of approximately 750,000 to 1,500,000 pounds with an approximate length of 200 to 250 feet. The representative launch vehicle considered for purposes of this BA uses liquid oxygen and a special grade of kerosene known as RP-1 as propellants.

First stage: The first stage would be approximately 10 to 14 feet in diameter and between 125 to 175 feet long and may include one or two large engines or as many as nine smaller engines. For purposes of this analysis, it is assumed that the representative launch vehicle uses multiple engines producing approximately 1,800,000 pounds of thrust. It is further assumed the representative launch vehicle uses liquid oxygen and RP-1 as its main propellants, and those propellants are stored onboard in two internal aluminum tanks: one of approximately 60,000 to 65,000 gallons for liquid oxygen and one of 35,000 to 40,000 gallons for RP-1. The first stage of the launch vehicle could land at the launch site (recovered), in the Atlantic Ocean on a barge (recovered) approximately 200 to 300 miles off shore, or in the water (unrecovered).

Second stage: The second stage would be similar in diameter to the first stage and between 35 and 50 feet long, not including the fairing (the top portion of the vehicle where the payload is enclosed) and payload. The typical second stage would use one or two engines, one engine being more typical. It is assumed that a single second stage engine would be used to provide approximately 150,000 pounds of thrust. The fairing would be between 12 and 18 feet in diameter by 30 to 40 feet long, although smaller versions may also be used. The second stage is assumed to use approximately 15,000 gallons of liquid oxygen and 9,000 gallons of RP-1 stored onboard in one aluminum tank each.

Common subsystems in Stages 1 and 2: Most medium-large lift-class launch vehicles use high-pressure helium as purge gas (to clear components of residual fluids, such as propellants) or pressurants for propellant tanks (pressurants maintain pressure in the tanks as the propellant is used). Therefore, it is assumed that both stages of the representative vehicle use helium gas stored in high-pressure cylinders to pressurize the propellant tanks for both stages. It is further assumed that both stages include radio frequency transmitters to receive control signals and send monitoring and status data. Electronic control systems are used to control valves and monitor equipment on the vehicles.

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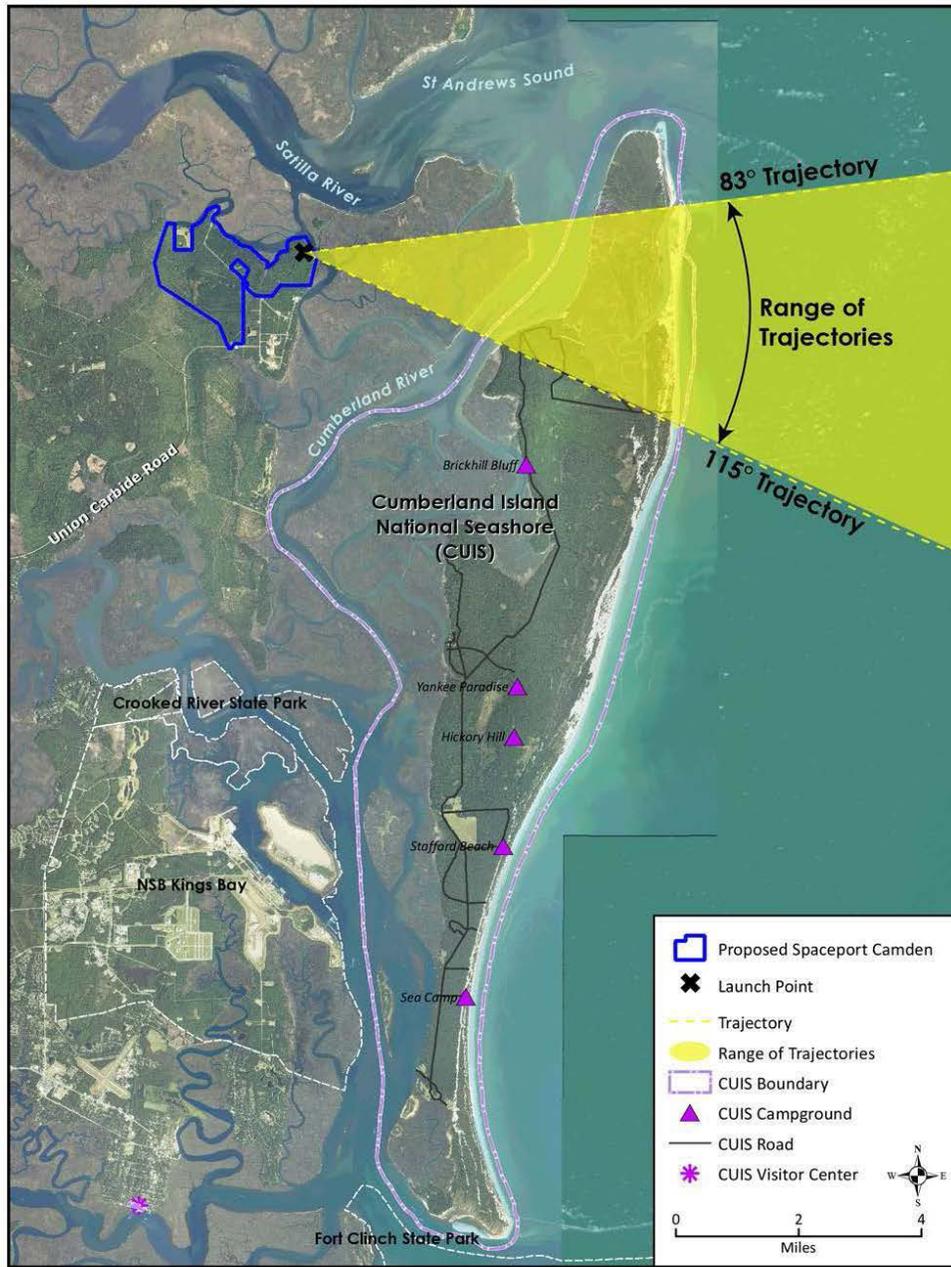


Exhibit 2-13. Spaceport Camden Range of Launch Trajectories

Flight termination system: Launch vehicles are equipped with safety systems, called flight termination systems, intended to cause the destruction of the launch vehicle in the event that the vehicle does not perform as intended and subsequently strays from the intended trajectory. Activation of the system would be intended to limit the location of a vehicle (or vehicle debris) impact to the identified hazard area.

2.2.2.2 Launch Vehicle Assembly

The first and second stages would typically arrive separately by oversized truck (similar in size to a mobile home) with two security escorts and would be placed in the Vehicle Integration Building at the Vertical Launch Facility. Once there, the stages and engines would be checked and prepared for mating. During vehicle operations, vehicle integration, and checkouts, information on vehicle status (transmitted on radio frequency channels) would typically occur.

2.2.2.3 Launch Operations

Launch operations consists of pre-launch, launch, and first-stage landing activities. Most launches and landings would be conducted during the day. However, up to one launch and one landing per year could be conducted during the nighttime period between 10:00 p.m. and 7:00 a.m. All static fire events would take place during daylight hours.

Pre-Launch Activities

Pre-launch activities would include mission rehearsals, static fire engine tests, and coordination with governmental agencies and media outlets to provide notification of these launch operation activities and establish secure areas in the vicinity of the vertical launch area. A Security Plan, developed by Camden County in cooperation with the launch operator, would outline a process (e.g., the establishment of closure areas) to prevent the public and other non-authorized personnel from accessing the area during hazardous operations in accordance with 14 CFR Parts 417 and 420.

Mission Dress Rehearsals

Mission rehearsals are performed to verify that all vehicle and ground systems are functioning properly and that all procedures are properly written. After final systems checkout, there would typically be two mission rehearsals. One dry dress rehearsal (a launch rehearsal performed without loading propellants on board the launch vehicle) and one wet dress rehearsal (a launch rehearsal performed with vehicle propellant loading¹²) would be performed to verify full launch readiness. During a wet dress rehearsal, the launch procedures would be followed up to a pre-programmed abort just prior to first stage engine ignition. Following each rehearsal, the integrated launch vehicle would be returned from the launch pad to the Vehicle Integration Building. All propellants loaded during the wet dress rehearsal would be removed from the launch vehicle and returned to their storage tanks at the Vertical Launch Facility at the conclusion of the rehearsal.

¹² Propellants loaded onto the launch vehicle include the main engine fuel (RP-1), liquid oxygen, and any other fuels (such as hydrazine).

Static Fire Engine Tests

Static fire engine tests are performed to verify engine control and performance as well as launch pad systems performance. Static fire engine tests include all of the activities associated with a wet dress rehearsal, with the additional action of igniting the first stage engines. During a static fire engine test, the launch vehicle engines would typically be ignited for approximately two seconds, but could be ignited for up to seven seconds, then shut down. The launch vehicle would be held in place during the test to prevent launch. The launch vehicle would be defueled of propellants not consumed during the static fire test, and those propellants would be returned to their storage tanks at the Vertical Launch Facility at the conclusion of the test.

Representative Launch

After a final check, the integrated launch vehicle would be launched. For launches where the first stage would be recovered, the return of the first stage (either landing at the Landing Zone or returned by vessel after landing on a barge in the Atlantic Ocean) and first stage refurbishment would complete the launch operations.

First Stage Landing

The incorporation of a Landing Zone at Spaceport Camden would allow for the landing of the launch vehicle first stage after it has successfully separated from the upper stages of the vehicle. Up to 12 launch vehicle first stage landings per year could be made. Security and safety zones from the vehicle launch would be maintained for the return of this portion of the launch vehicle. First stage landings would occur approximately 10 minutes after launch and, therefore, would not appreciably extend the length of time security, and safety zones would need to be maintained.

Not all launches would involve landing the first stage at the launch site. First stages may drop in the Atlantic Ocean or land on a barge 200 to 300 miles off the coast of Georgia in the Atlantic Ocean.¹³ During a landing (either at the launch site or on a barge at sea), the first stage engines would be used to control the descent of the vehicle. In the event of a landing on a barge, the first stage would be returned to the launch site using the existing dock on Floyd Creek, the most likely route to the dock being through St. Andrews Sound via Floyd Cut at the mouth of the Satilla River (Exhibit 2-3).

2.2.2.4 Public Notification of Launch Operations

Public access in the vicinity of the launch site would be restricted during launches, wet dress rehearsals, and static fire engine tests. Closure events (up to 36 per year) would involve securing both land and water areas (referred to as a closure areas, the sizes of which would vary for each operation). Public notification would be required prior to establishing the closure areas.

Typically, for a commercial launch of a medium-large launcher and its primary payload(s), an estimated launch window can be established as far as 6 to 12 months out from launch and is usually publicly published. A specific target date(s) for the actual launch, wet dress rehearsal, and/or static fire engine test and associated hazard area closures is typically identified at least one to three months in advance and would be made available to county officials (including police, fire, and rescue personnel) and the public

¹³ In the event that the first stage is dropped into the Atlantic Ocean, the first stage would not be recovered and would sink in the Atlantic Ocean hundreds of miles offshore.

for planning purposes. Public notification would include the proposed date, the expected closure dimensions, times, and backup closure dates and times. Camden County and/or the launch operator would post written notices of the date, time, and the proposed closure area at several locations in the area as well as an advertisement in local newspapers. Camden County and/or the launch operator would also coordinate with local government agencies with regard to launch operations requiring public notification.

Camden County would coordinate with Glenn County, State of Georgia law enforcement agencies, the U.S. Coast Guard (USCG), and the appropriate Regional Air Route Traffic Control Center. Notices would be put out through local media and through the use of Notices to Mariners (NOTMARs) and Notices to Airmen. Camden County and/or the launch operator would also notify the City of Brunswick, the National Park Service (NPS), Crooked River State Park, the USFWS, the U.S. Navy at Naval Submarine Base Kings Bay, and other appropriate agencies of the launch operation and associated closures.

The actual date for anticipated activity (to include hazard area closures) would be reconfirmed about two weeks in advance, and notification would once again be made to officials and the public. Changes in the estimated, target, and/or actual dates could occur any time prior to the planned activity due to weather, technical issues, or other mission critical parameters. In such cases, the officials and public would be notified of any cancellation or changes in target date of the activity and any associated hazard area closures. In an atypical scenario for a medium-large launcher and its primary payload (e.g., a rush launch to replace a critical asset that has failed on orbit), this timeline could potentially be condensed to under one month, but this would be very unusual.

2.2.2.5 Security and Safety Zones

As part of the licensing process, Camden County and the launch operator would jointly develop a Security Plan that defines the process for ensuring that any unauthorized persons, vessels, trains, aircraft, cars, trucks, all-terrain vehicles, or other vehicles are not within the FAA-approved hazard area or, if they are, that they conform to criteria in 14 CFR Parts 417 and 420. (The hazard area encompasses the areas that could potentially be affected by debris from a launch accident. In the event of a launch accident, only some portions of the hazard area would be impacted.) The Security Plan would include safety and security personnel for each launch operation activity and roadblocks and other security checkpoints. Camden County and/or the launch operator also would develop and implement agreements and plans with local authorities whose support is needed to ensure public safety during all launch processing and flight, in accordance with 14 CFR Parts 417 and 420.

The Spaceport Camden Security Plan would describe the procedures for securing a closure area, thus limiting unauthorized public access in the area on the day of a launch. The closure area would be expected to include areas around the access points to the launch site and the waterways surrounding the launch site, in addition to parts of Cumberland Island extending along the trajectory and out to sea. Each launch would have an individually defined closure and hazard area, which is dependent upon the specific type of vehicle, the trajectory, and the mission.

Area closures could last up to 12 hours on a launch day, with four to six hours being the typical closure time for a nominal launch. The 12-hour closure period allows for potential aborts and contingencies. A closure for a wet dress rehearsal or static fire engine test would be shorter than for a launch, typically three hours or less, and the closure area would include only those areas within a 2-mile radius of the

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launch pad, which would not reach water areas in the Atlantic Ocean. Camden County Sheriff Department boats would be used to secure the river, streams, and ocean checkpoints.

Exhibit 2-14 and Exhibit 2-15 show possible hazard and closure areas for a launch based on two representative trajectories.¹⁴ Additional trajectories, all in a generally easterly direction, could be used for launches from this launch site. As can be seen from Exhibit 2-13 and Exhibit 2-14, differences in the locations of the hazard areas could result in changes to the defined closure areas. In addition to land checkpoints, waterborne checkpoints could be located along the Satilla River/St. Andrews Sound area (O₁, O₂, and O₃ on Exhibit 2-14 and Exhibit 2-15), the Atlantic Ocean (O₄ and O₅ on Exhibit 2-14 and Exhibit 2-15), and the Cumberland River (O₆ and O₇ on Exhibit 2-14 and Exhibit 2-15).

During a closure, monitoring would be done by vehicles (car/truck) along existing roads such for land areas or by a USCG boat for water areas, as well as by video surveillance (e.g., high-definition video cameras with zoom lenses placed well above ground level on the water tower and/or lightning towers). Camden County, the launch operator, and/or law enforcement would monitor the area to the east of the checkpoints to ensure that the area would remain clear.

Table 2-5 lists actions that would be conducted to ensure the closure and security of the area prior to an actual launch. The same actions and activities would occur for other launch operations requiring a closure (i.e., wet dress rehearsal and static fire engine test), but the start time, area size, and durations would be different since these other launch operations are not expected to last as long or impact as large an area as an actual launch.

Table 2-5. Representative Security Activities on Day of Launch

Action	Purpose	Start Time	End Time
Establish checkpoints and take down checkpoints	Set up for launch and remove after launch. Commence monitoring of traffic flow.	T ¹ -6 to 12 hours	T +5 to 30 minutes
Establish hard checkpoints	Restrict access to owners and authorized persons only in closure areas.	T -3 hours	T +5 to 30 minutes
USCG/other waterborne law enforcement on station	The USCG and/or other local waterborne law enforcement sweep areas and restrict boating access.	T -3 hours	T +5 to 30 minutes
Security sweeps	Security sweeps responsible areas (e.g., beach, island Main Road, logging roads near launch site, rivers and creeks). Verify by video, UAV, or ATV as needed.	T -2 hours	T -1 hour 40 minutes
Trajectory sweep	Verify with visual and/or airborne sweep.	T -1 hour	T -40 minutes
Final sweep	Check land and water checkpoints for activity; review video one last time.	T -1 hour	T -40 minutes
Close airspace	In accordance with agreed-upon procedure, Jacksonville FL ARTCC closes appropriate airspace.	T -15 minutes	T +5 to 30 minutes

Notes: ATV = all-terrain vehicle; UAV = unmanned aerial vehicle; USCG = U.S. Coast Guard; FL ARTCC = Florida Air Route Traffic Control Center.

¹ "T" implies the anticipated time of engine firing, with start and end times measured before (minus x hours or minutes) or after (plus x hours or minutes). End times dependent on whether a first stage landing is planned.

¹⁴Three trajectories were used in the analyses for the EIS: a northern (83°), a middle (100°) and a southern (115°). Exhibit 2-14 and Exhibit 2-15 show hazard and closure areas for the northernmost and southernmost of these three trajectories. Other trajectories proposed by launch operators would be assessed to determine the need for additional environmental impact analysis and documentation. Closure and hazard areas would be determined as part of the FAA launch approval process for each launch.

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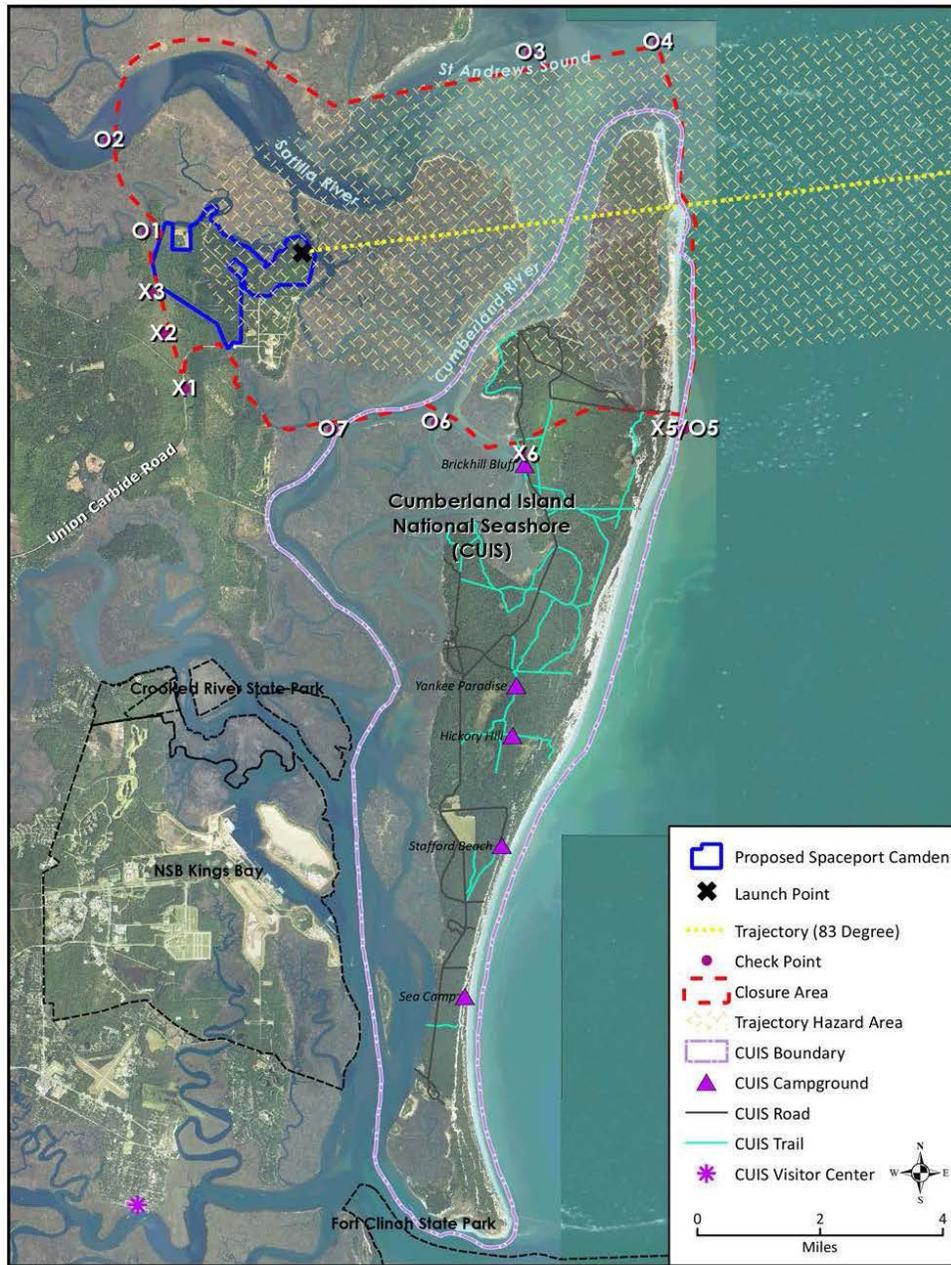


Exhibit 2-14. Representative Trajectory (83 Degree) with Hazard and Closure Areas

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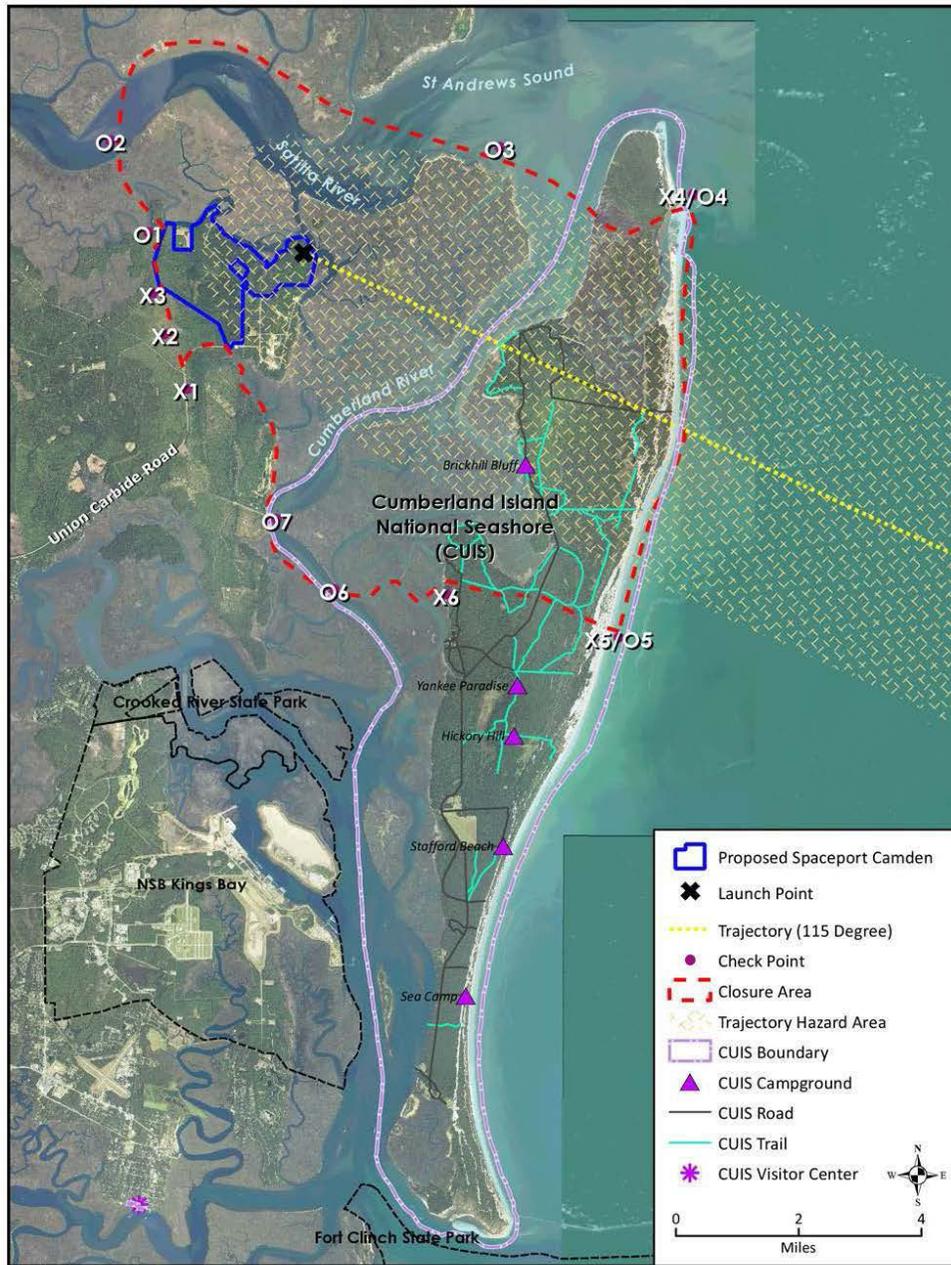


Exhibit 2-15. Representative Trajectory (115 Degree) with Hazard and Closure Area

The Security Plan would include a process for clearing offshore areas, such as coordinating with the USCG, issuing a NOTMAR, and clearing the offshore area in order to ensure public safety. The USCG could conduct a boat patrol to sweep the offshore area to make sure the area is clear; sweeps would continue until the launch operator is ready to load propellant to the vehicle (approximately three hours prior to launch). If necessary, a final sweep of the closure areas by manned fixed-wing aircraft or unmanned aerial vehicle could be implemented at this time to ensure the areas are clear.

After the launch (and landing at the launch site, if planned) operation is completed or postponed, Camden County and/or the launch operator and FAA would notify law enforcement that the area has been deemed safe, allowing them to reopen the closure areas. In the event that the launch would be postponed, closure and hazard areas would be reestablished for the rescheduled launch.

2.2.2.6 Launch Failures

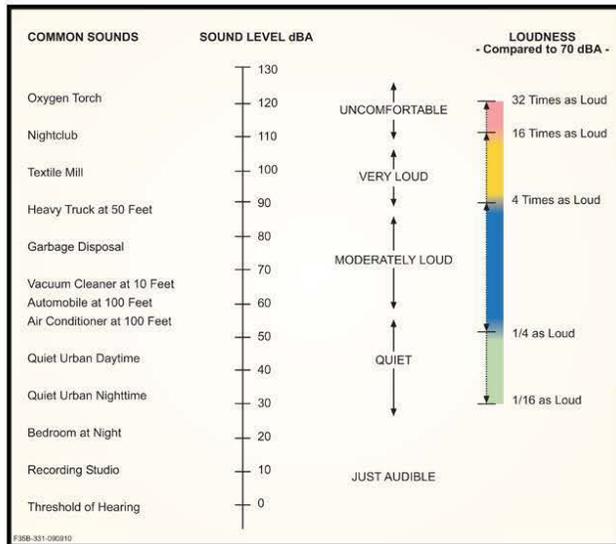
Failures, while uncommon, are possible. Launch failures would occur either on the launch pad or during flight. Failures on the launch pad would be expected to result in the complete destruction of the launch vehicle and payload. The ensuing explosion would consume most, if not all, of the propellants carried on the vehicle.

Failures in flight could result in the destruction of the vehicle either due to the failure itself or as the result of a destruct signal generated by a flight termination system. The flight termination system is designed to destroy the vehicle in the event that the vehicle veers from the planned flight trajectory. This system is employed to ensure any debris from the destruction of the vehicle lands within the FAA-approved hazard area. Most propellants are expected to be consumed during the destruction of the vehicle, but some may escape and be released into the atmosphere. Although this process is intended for the vehicle to be totally destroyed, some of the vehicle components could survive relatively intact. Any debris or surviving components would be expected to impact within the launch site boundary or on land or in water within the hazard zone. Components and debris impacting water could sink intact or break up into smaller pieces before sinking. If any propellant tanks survive a water impact relatively intact, the propellant would, if not recovered, eventually leak out of the tanks into the water.

2.2.2.7 Noise Impacts from Operations

Noise would be generated from subsonic (static fire engine tests, liftoff, and landing) and supersonic (flight) rocket operations. All sounds have a spectral content, which means their magnitude or level changes with frequency, where frequency is measured in cycles per second or hertz. To mimic the human ear's nonlinear sensitivity and perception of different frequencies of sound, the spectral content is weighted. For example, environmental noise measurements are usually on an "A-weighted" scale that filters out very low and very high frequencies in order to replicate human sensitivity. It is common to add the "A" to the measurement unit (decibels [dB]) in order to identify that the measurement has been made with this filtering process (i.e., "dBA"). Exhibit 2-16 provides a chart of A-weighted sound levels from typical noise sources. Some noise sources (e.g., air conditioner, vacuum cleaner) are continuous sounds that maintain a constant sound level for some period of time. Other sources (e.g., automobile, heavy truck) are the maximum sound produced during an event like a vehicle passing by. Other sounds (e.g., urban daytime, urban nighttime) are averages taken over extended periods of time.

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Source: (Harris, 1979)

Exhibit 2-16. Typical A-Weighted Levels of Common Sounds

A metric is a system for measuring or quantifying a particular characteristic of a subject. Since noise is a complex physical phenomenon, different noise metrics help to quantify the noise environment and describe impacts from noise. The selection of particular metrics for noise analysis is based on the nature of the noise event and who or what is affected by the sound. For example, noise metrics used to evaluate the highest sound level occurring during a single event are different than those used for evaluating long-term average sound levels. Noise metrics are listed below:

- **Overall sound pressure level (OASPL).** The OASPL provides a measure of the sound level at any given time.
- **Maximum OASPL (L_{max}).** The L_{max} indicates the highest OASPL over the duration of the noise event. The L_{max} is a single-event metric that is useful for analyzing short-term responses to noise exposure. OASPL can be presented as either unweighted or A-weighted. The maximum unweighted OASPL (L_{max}) is used for the analysis of noise impacts to structures.
- **Maximum A-weighted OASPL ($L_{A,max}$).** The $L_{A,max}$ represents the maximum A-weighted OASPL during the noise event. A-weighting approximates the natural range and sensitivity of human hearing (USACHPPM, 2005). The $L_{A,max}$ is used for the analysis of noise impacts to humans and wildlife.
- **Sonic boom overpressure measured in pounds per square foot (psf).** A sonic boom is the sound associate with the shock waves created by a vehicle moving through the air faster than the speed of sound. When heard at ground level, a sonic boom consists of a positive pressure change associated with air particles being pushed out of the way by the front of the vehicle and then a negative pressure change of equal magnitude after the vehicle and its rocket plume have passed by. The magnitude of the changes in air pressure is typically expressed in pounds per square foot.

For purposes of analysis in this consultation $L_{A,max}$ and sonic boom overpressure associated with launch, landing, and static fire events were calculated for the range of trajectories using a medium-class lift vehicle (MCLV) and are shown as composite noise profiles in Exhibit 2-17 through Exhibit 2-21.

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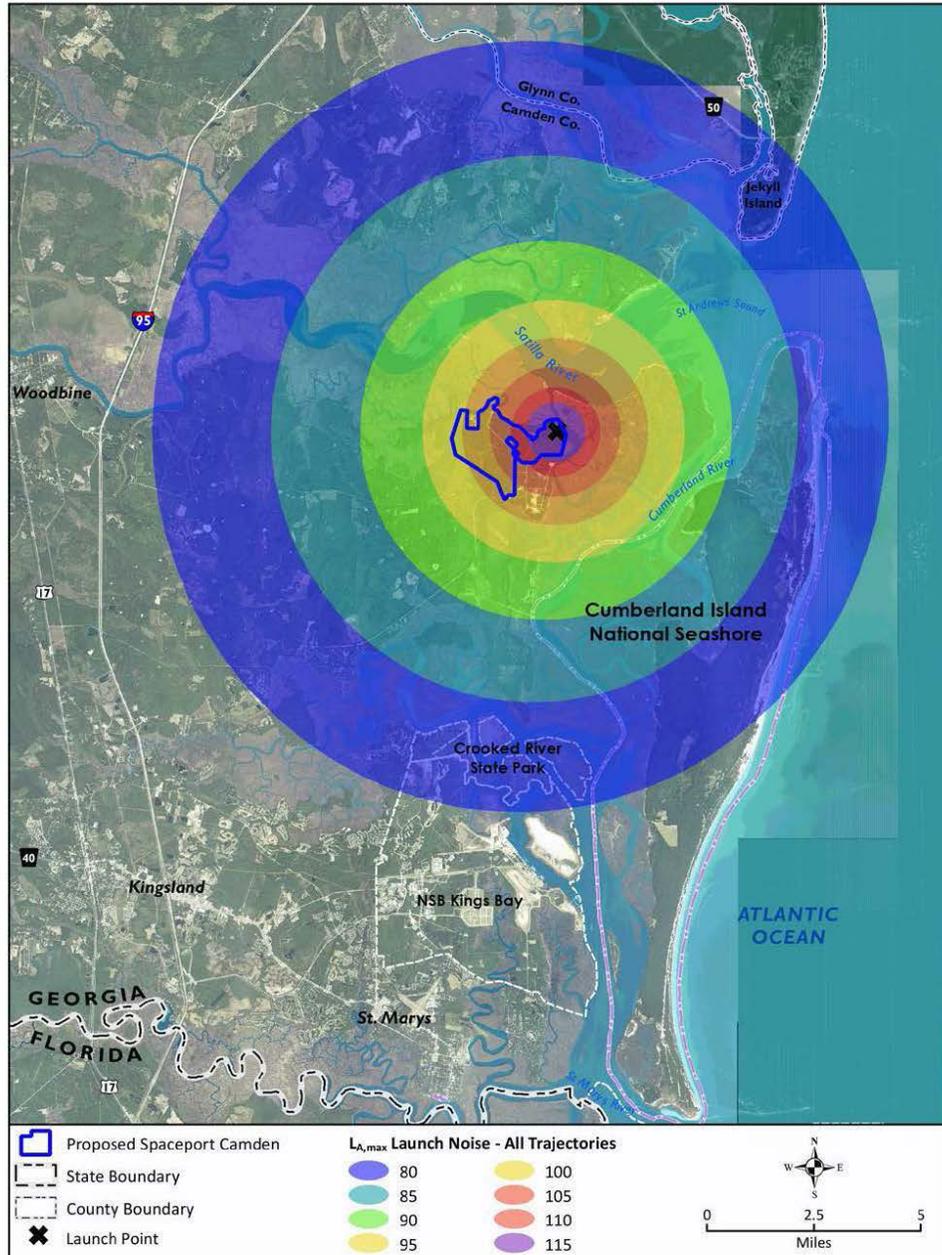


Exhibit 2-17. Composite of L_{A,max} Contours for an MCLV Launch at Spaceport Camden

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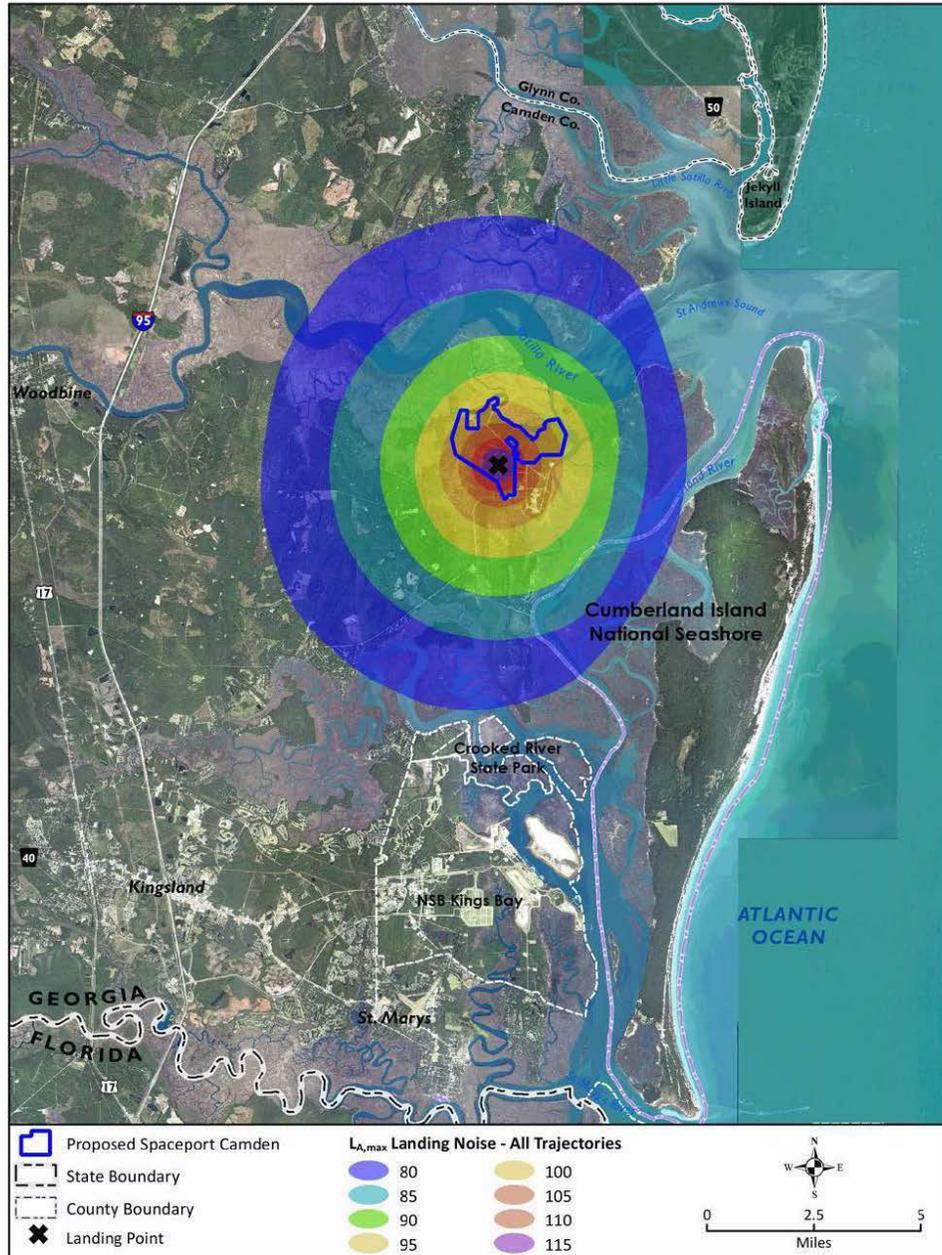


Exhibit 2-18. Composite of $L_{A,max}$ Contours for an MCLV Landing at Spaceport Camden

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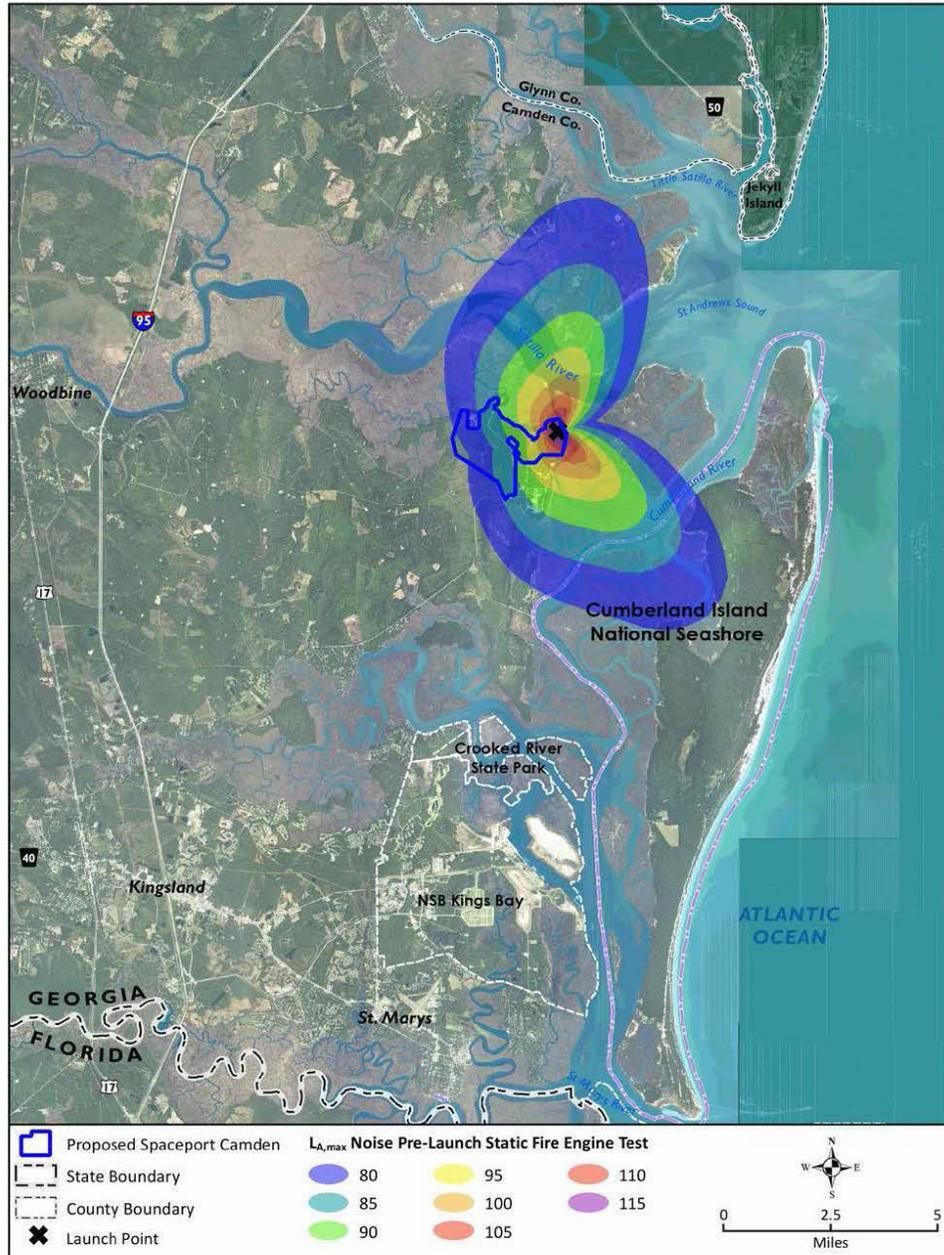


Exhibit 2-19. L_{A,max} Contours for an MCLV Static Fire Engine Test at Spaceport Camden

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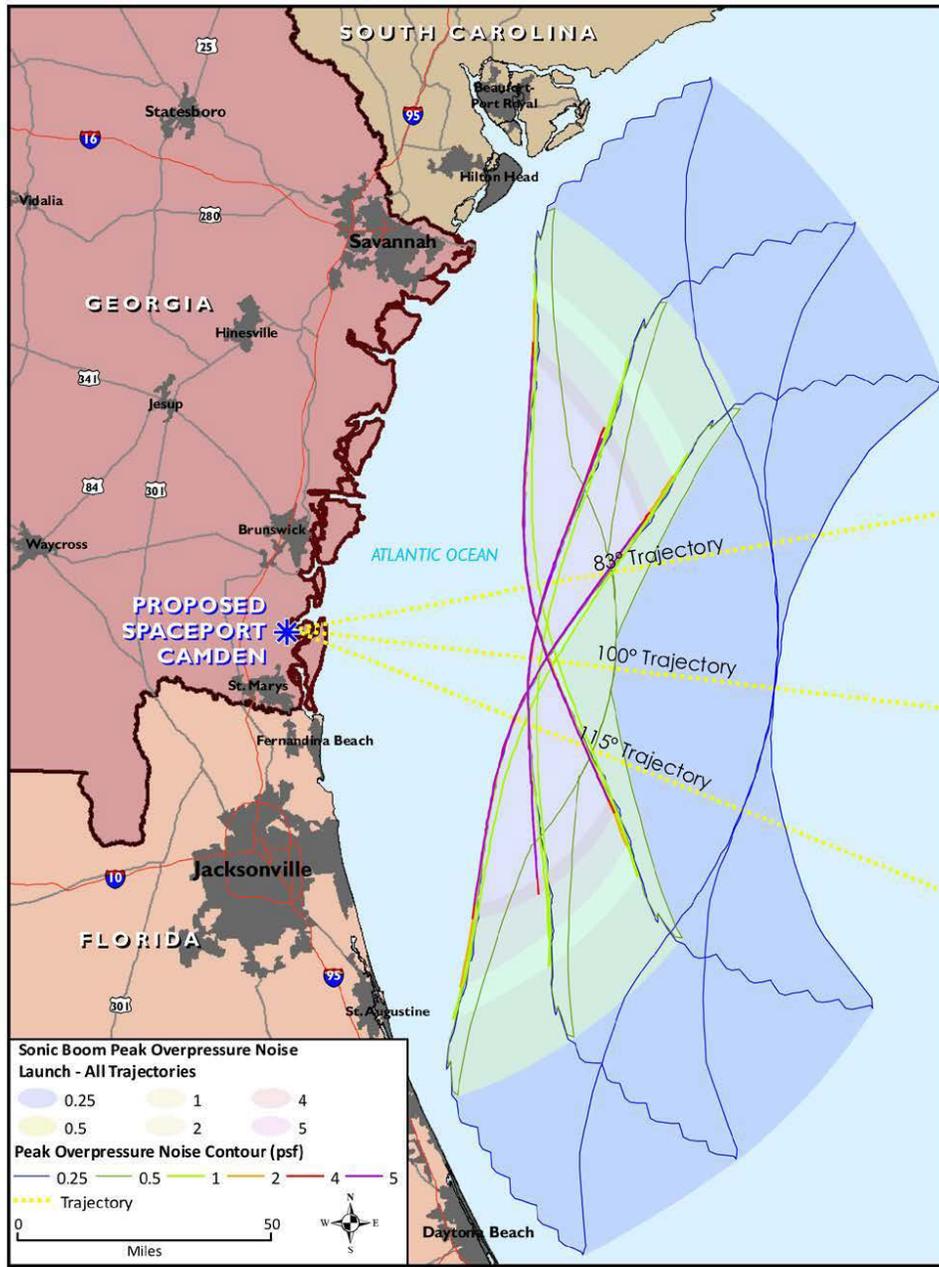


Exhibit 2-20. Composite of Sonic Boom Peak Overpressure Contours for an MCLV Launch from Spaceport Camden

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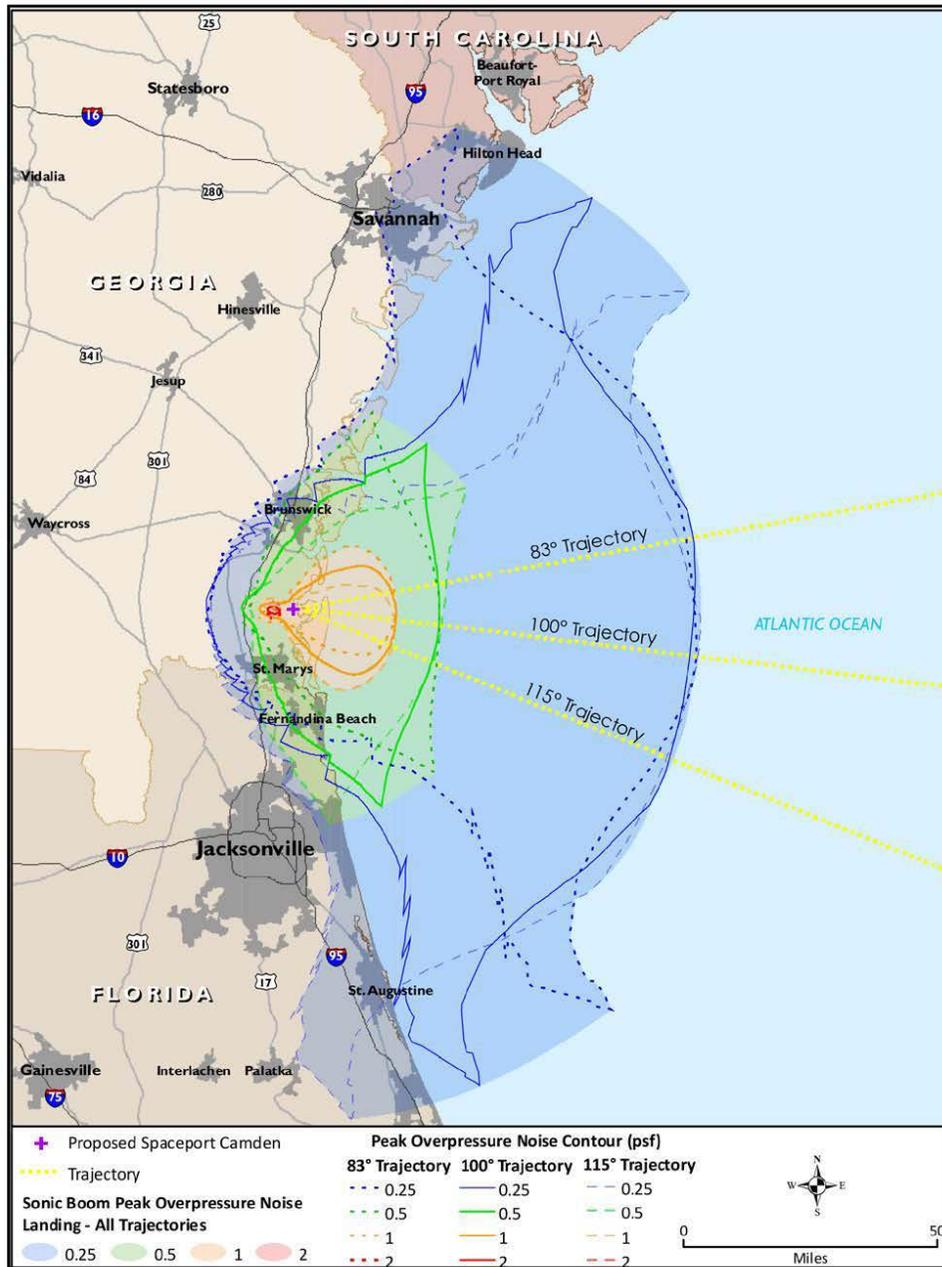


Exhibit 2-21. Composite of Sonic Boom Peak Overpressure Contours for an MCLV Landing at Spaceport Camden

2.3 Conservation Measures

This section describes the conservation measures that Spaceport Camden would implement to avoid, minimize, and compensate for potential effects on federally listed species and critical habitat from the proposed construction and operational activities described in Section 2.2, *Description of the Proposed Project*. The conservation measures would be implemented through coordinated efforts of the FAA, Camden County, and future spaceport operators. Spaceport Camden would designate an employee or contractor as the Natural Resources Specialist who would be responsible for overseeing compliance with these conservation measures. The Natural Resources Specialist would be a biologist or have similar ecology or natural resources training. The FAA would require compliance with these conservation measures as part of maintaining an active Launch Site Operator License. If Camden County purchases the remaining portion of the Bayer CropScience property in the future, that land area would be incorporated into the Protected Species and Habitat Management Plan (PSHMP) in coordination with the USFWS and Georgia Department of Natural Resources (GDNR) and all conservation measures would apply; any activities planned for the Bayer CropScience property outside the scope of that analyzed in this BA or the associated EIS would require additional NEPA and consultation efforts.

The following conservation measures are organized by those applying to (1) the overall project, (2) construction, and (3) operations.

2.3.1 Project-level Measures

1. In cooperation with the USFWS and GDNR, Camden County would develop a comprehensive PSHMP. To ensure timely implementation of the measures identified in the PSHMP, Camden County would finalize the PSHMP at least six months prior to starting construction. The PSHMP would include the following modules:

- a. **Protected Species Management, Monitoring, and Reporting**

The goal of protected species management, monitoring, and reporting is to provide for species-specific adaptive management for the preservation and/or enhancement of identified sensitive species present at the Spaceport Camden site, with the objectives being to (1) provide species-specific management procedures, (2) identify species-specific monitoring protocols, and (3) develop reporting procedures to inform the USFWS and GDNR of progress in meeting the program objectives. Camden County would commit to this goal and supporting objectives by developing a plan module for protected species management, monitoring, and reporting that outlines specific requirements and procedures as agreed upon by Camden County, USFWS, and GDNR for the species included in this consultation. This module would include the species-related conservation measures listed below for construction and operations (Sections 2.3.2 and 2.3.3 in this BA), as well as applicable requirements from the USFWS as a result of consultation. For example, this module would include details regarding pre-construction species surveys and reports, as well as surveys conducted during and after launches, species-specific monitoring protocols to measure impacts of spaceport operations and the health and abundance of sensitive species at the site.

b. Habitat Management, Monitoring, and Reporting

The goal of habitat management, monitoring, and reporting is to preserve and/or enhance the natural habitats present at Spaceport Camden, in particular those that support sensitive species, with the objectives being to provide a clear path forward regarding habitat management by (1) identifying specific habitat management protocols by habitat type, (2) monitoring protocols per habitat type, and (3) reporting requirements supporting habitat management. Camden County would commit to this goal and supporting objectives by developing a plan module for habitat management and improvement, monitoring, and reporting that outlines specific requirements and procedures as agreed upon by Camden County, USFWS, and GDNR for the sensitive habitats included in this consultation. This module would include applicable habitat measures listed below for construction and operations, as well as applicable requirements from the USFWS as a result of consultation. This habitat management program would provide for special considerations for the closed areas of the site due to the presence of unexploded ordnance or contamination from previous use. Considerations may include limitations on the types and frequency of management activities that could occur in these areas, or special management practices to account for these issues.

Timber management would also be included as part of the habitat management program. To the extent practicable, timber revenue from the Spaceport Camden project site would be used to fund habitat enhancement and improvement programs. Exhibit 2-22 shows habitat types that are suitable for timber management. A timber management module would be developed in coordination with the USFWS and GDNR that outlines guidelines for thinning, clear cutting, and a general regeneration plan (e.g., regeneration of pine sites to longleaf and regeneration of other sites, naturally or with planting, to appropriate local native species based on habitat type).

c. Wildland Fire Management

The goals of the wildland fire management program are to reduce the potential for ignition of wildfires at the spaceport and enhance habitat through controlled, prescribed burning—the objectives being to (1) identify processes and procedures for identifying, preventing, and responding to wildfires resulting from spaceport-related activities, and (2) establish a prescribed fire program that details the frequency, timing, and location of prescribed burns. To meet these goals and objectives, Camden County would develop a Wildland Fire Management and Burn Plan that specifically identifies, among other items: wildfire prevention education for spaceport personnel, identification of first responders and other emergency personnel, procedures for notification of wildfires, sensitive/restricted activity areas, burn units and associated burn rotations that allow for a frequency of at least every three years (notwithstanding other factors such as weather, etc.). Exhibit 2-23 shows the areas currently considered as suitable for prescribed fire; these may be updated regularly in coordination with the USFWS and GDNR. Specific details of the Wildland Fire Management and Burn Plan would be developed in coordination with USFWS and GDNR at least six months prior to Spaceport Camden development. Should the GDNR Non-game Conservation Section or the USFWS decide in their own opinion that prescribed burning conducted by Camden County is not adequate, they may express their concerns to Camden County and mutually agree to an appropriate course of action.

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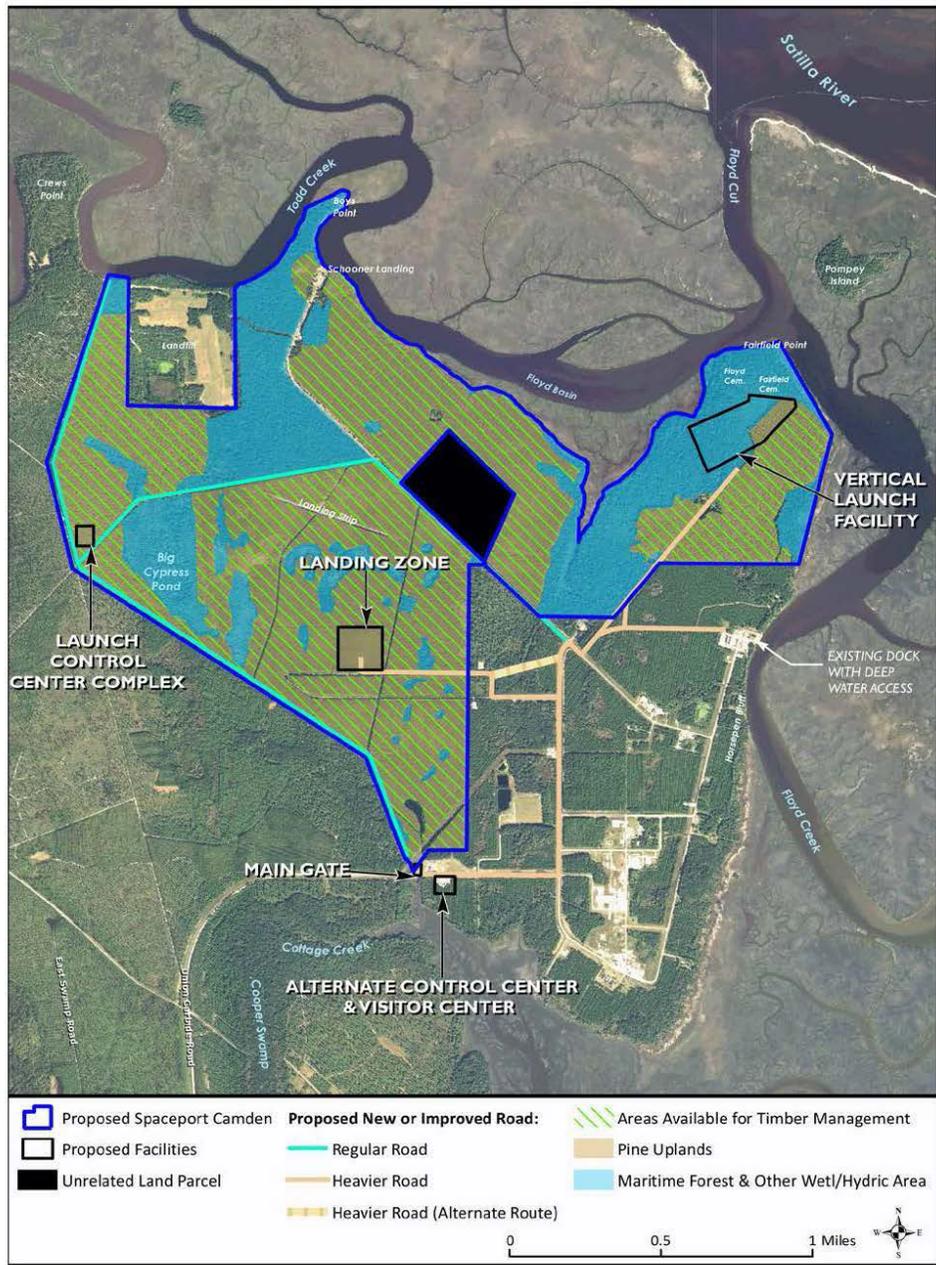


Exhibit 2-22. SCC Potential Timber Management Areas

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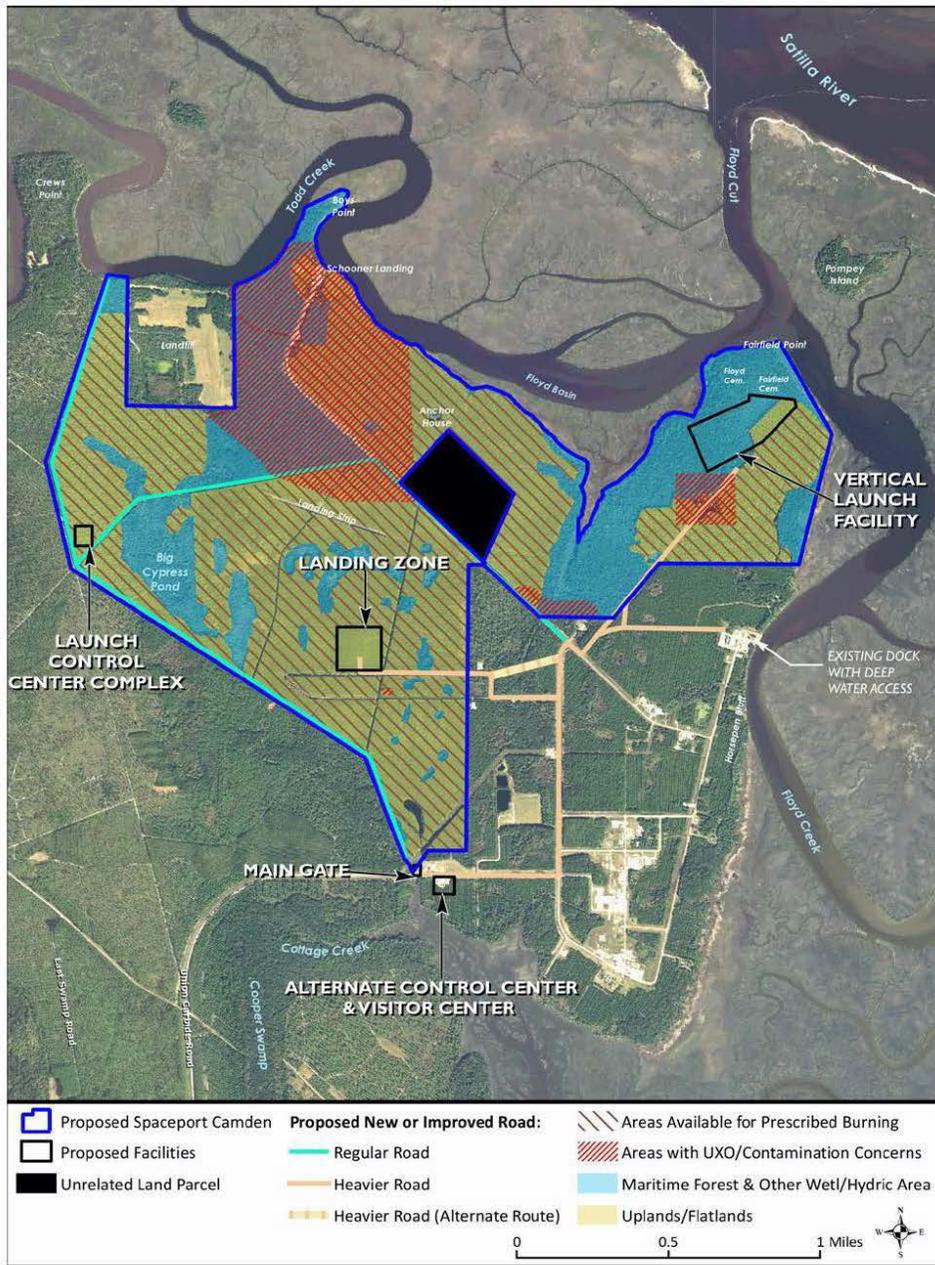


Exhibit 2-23. SCC Potential Prescribed Burn Areas

d. Artificial Lighting Management

The goal for artificial light management is to minimize to the extent possible visibility of facility glow, sky glow, or direct light to sea turtle nesting beaches. The objectives for the program would be to (1) provide clear guidance to project and/or facility managers, (2) determine the extent of sky glow/direct lighting from spaceport operations, and (3) identify corrective actions. This module would provide details on spaceport lighting (e.g., type [wavelengths, etc.] and location of lights via a plan drawing of exterior lighting), timing and positioning considerations for exterior lighting, measures to minimize light glow (shielding mechanisms, directed lighting, etc.), and processes and procedures for lighting installation and management. Additionally, the module would include lighting-related measures listed below for construction and operations, as well as applicable terms and conditions identified by the USFWS resulting from this consultation. Camden County would consult the International Dark-Sky Association or another similar professional organization when developing the lighting design and management module for the spaceport.

e. Environmental Education

The goal of the environmental education program is to provide a comprehensive natural resources-related education program for spaceport employees, contractors, launch applicants, and visitors. The objectives supporting this goal include 1) educating personnel on the sensitive habitats and species present at the site, and associated avoidance and impact minimization requirements for spaceport activities, 2) tracking training/education (e.g., utilization of rosters/sign-in sheets, etc.), and 3) ensuring compliance of the habitat and species management programs. The module would support these objectives by including educational materials that Camden County would develop to train spaceport employees and educate visitors about protected species, how to avoid affecting protected species, and what to do if a protected species is encountered (see related educational measure below in Section 2.3.2, *Construction Measures*). The employee training materials would also highlight the civil and criminal penalties for harming, harassing, or killing a federally listed species.

2. Camden County and the current land owners are mutually considering an appropriate form of conservation easement on portions of the proposed spaceport site. The overall site is approximately 4,000 acres; currently Camden County has set aside approximately 90 percent of the spaceport site (3,600 acres) for potential conservation easement, identified in Exhibit 2-24. The details of the conservation easement will be finalized prior to transferring ownership of the property to Camden County.

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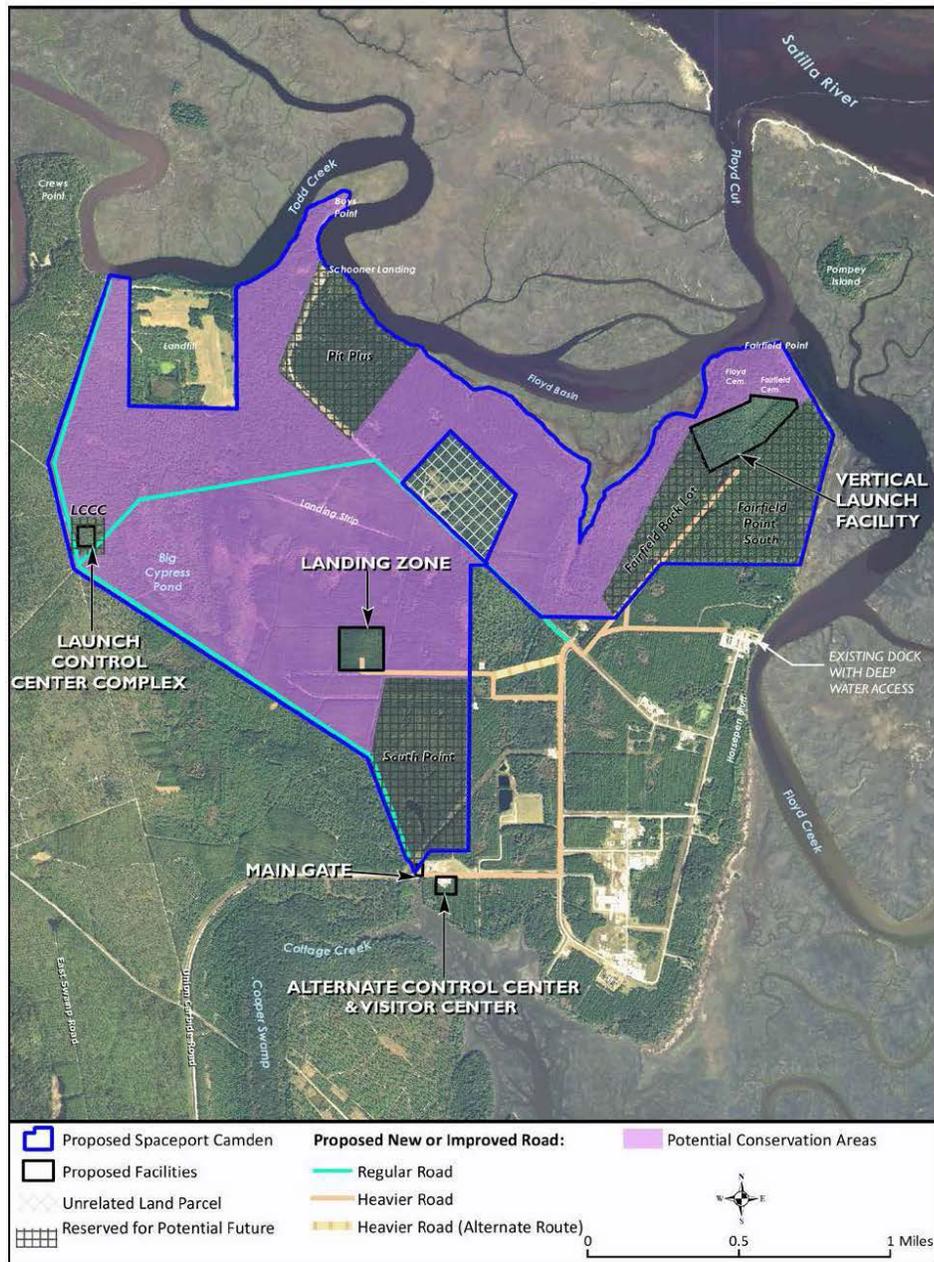


Exhibit 2-24. SCC Conservation Easement Areas

2.3.2 Construction Measures

1. Surveys¹⁵ for gopher tortoise, indigo snake, striped newt, red-cockaded woodpecker (RCW), and wood stork would be required at least 30 days before construction. Surveys would identify suitable habitat, presence/absence of the species, and confirm locations of nest sites, roost sites, and burrows. Appropriate buffers or relocation of species would be coordinated with the USFWS and GDNR. Species surveys would be discussed in the PSHMP.
2. Surveys for and relocation of gopher tortoises would follow Florida Fish and Wildlife Conservation Commission (FWC) protocols in agreement/coordination with the GDNR and associated permit requirements.
3. To prevent gopher tortoises and indigo snakes from re-entering construction sites after relocation, construction fencing (i.e., trenched silt fence) would be erected around the construction site. Camden County would coordinate with the USFWS and/or GDNR regarding installation of the silt fence. Fencing details would be included in the PSHMP. Should gopher tortoises or indigo snakes make their way past the fence, then site workers would assist in the identification of individual tortoises and snakes (based on the educational materials in the PSHMP). Once identified, the site worker(s) would contact the Natural Resources Specialist, who would attempt to capture and relocate the gopher tortoise(s) and indigo snake(s) as permitted.
4. The closest known wood stork colony is approximately 5 miles north of the proposed Spaceport Camden site. As applicable, construction activities would follow management zones and guidelines from the USFWS Habitat Management Guidelines for the Wood Stork in the Southeast Region (1990), including the following.
 - a. At feeding sites:
 - i. Human activity should be at least 300 feet away (where vegetation screen is present) and 750 feet (when no vegetation screen exists).
 - ii. Ensure no alteration of traditional water levels or the seasonally normal drying rates and patterns.
 - iii. Avoid deposition of contaminants, herbicides, or fertilizers into wetlands.
 - iv. Avoid construction of tall towers (particularly those with guy wires) within 3 miles or high power lines within 1 mile.
 - b. At nesting sites, within the primary zone (500 to 1,500 feet):
 - i. Avoid timber or vegetation removal.
 - ii. Avoid activities that alter the flooding of wetlands under and surrounding the colony.
 - iii. Avoid construction of buildings, roadways, towers, power lines, and canals.

¹⁵ Surveys would consider seasonal species requirements to ensure surveys are accurate and relevant (USFWS, 2017).

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- iv. When the colony is active, avoid unauthorized human entry closer than 300 feet, any increase or irregular pattern in human or animal activity within the primary zone, and any aircraft operation within 500 feet.
- c. At nesting sites, within the secondary zone (out to 2,500 feet):
 - i. Avoid increases in human activity above that from the first year that the colony formed.
 - ii. Avoid hydrologic alteration.
 - iii. Avoid substantial decrease (more than 20 percent) in areas of wetlands and woods potentially used for roosting and feeding.
 - iv. Avoid high-tension power lines within 1 mile and tall transmission towers within 3 miles of active colonies.
 - v. Limit expansion of any roads or facilities that are already located within the primary or secondary zones.
- d. At roosting sites:
 - i. Avoid human activities within 500 to 1,000 feet of roost sites during seasons of the year and times of day that storks might be present, particularly activities at night.
 - ii. Preserve the hydrological and vegetative characteristics of important roosting sites (i.e., those that are used annually by flocks of more than 25 storks).
- 5. To reduce potential impacts (e.g., soil loss and sedimentation) to water quality during construction, activities would follow the Coastal Stormwater Supplement (CSS) to the Georgia Stormwater Management Manual (GSMM), including techniques to hold, diffuse, and slow the velocity of stormwater. The applicant would follow the criteria in the CSS to the GSMM (Sections 4.4.3, 4.4.5, and 4.5.1) for primary conservation areas, extreme flood protection, and special criteria.
- 6. Construction would follow USFWS recommendations for communications tower siting, construction, operation, and decommissioning (USFWS, 2016a) unless structural or human safety would be compromised.
- 7. Construction would follow the guidelines for the Georgia Power Avian Protection Plan developed in coordination with the Avian Power Line Interaction Committee (APLIC) and USFWS (2005) to minimize impacts from power lines, unless structural or human safety would be compromised.
- 8. Construction vehicles and equipment would use existing roads and parking areas to the greatest extent possible. Any construction staging sites and vehicle routes off existing disturbed areas would be surveyed for protected species prior to use.
- 9. The perimeter of all areas to be disturbed during construction or maintenance activities would be clearly demarcated using flagging or temporary construction fence (i.e., silt fence), and no disturbance outside that perimeter would be authorized, particularly in tidal flats. All access routes into and out of the proposed disturbance area would be flagged, and no construction travel outside those boundaries would be authorized. When available, areas already disturbed by past activities or those

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that would be used later in the construction period would be used for staging, parking, and equipment storage.

10. Construction speed limits would not exceed 35 miles per hour (mph) on major unpaved roads and 25 mph on all other unpaved roads. Nighttime travel speeds of construction equipment would not exceed 25 mph.
11. Roads would be designed and located where roadbed erosion into federally listed species habitat is avoided or minimized, and the potential for entrapment of surface flows within the roadbed due to grading would also be avoided or minimized.
12. The depth of any pits created would be minimized so animals do not become trapped. The Natural Resources Specialist would monitor for trapped animals during construction.
13. Materials such as gravel or topsoil would be obtained from existing developed or previously used sources, not from undisturbed areas adjacent to the property.
14. Drip pans would be used underneath equipment and containment zones would be used when refueling vehicles or equipment.
15. Non-hazardous waste materials, litter, and other discarded materials, such as construction waste, would be contained within secured containers until removed from the construction site. All trash containers would have secured closures to prevent animal foraging.
16. Prior to entry into the project area, all equipment would be cleaned to prevent importation of nonnative plant species and inspected to ensure hydraulic fittings are tight, hydraulic hoses are in good condition and replaced if damaged, and there are no petroleum leaks.
17. No excavated or fill material would be placed in delineated Clean Water Act (CWA) Section 404 waters of the U.S. except as authorized by a permit from the U.S. Army Corps of Engineers (USACE). Concrete mixing and placement activities would be conducted to ensure discharge water associated with these activities would not reach surrounding water bodies or pools, unless specifically authorized in a CWA discharge permit.
18. The Natural Resources Specialist would provide all construction personnel and spaceport employees with an environmental worker education briefing that would include, but not be limited to, the following:
 - a. Information regarding special status species with potential to occur in the area, impacts that may occur, conservation measures being implemented, their responsibilities under the ESA, and avoidance and reporting procedures (e.g., avoid gopher tortoises and indigo snakes on roads).
 - b. Wildfire prevention measures, including restricting smoking to areas clear of vegetation, ensuring no fires of any kind are ignited, and equipping vehicles with spark arrestors and fire extinguishers.
 - c. Requirements for safe handling and disposal of hazardous wastes.
 - d. The potential for vehicle collisions with wildlife and onsite speed limits. Speed limit signs would be clearly posted and enforced, and signs showing gopher tortoises and indigo snakes would also be posted along roads to the spaceport site to remind drivers to be alert to their presence.

19. Camden County would maintain clear shoulders on road edges to allow drivers to more easily see wildlife along the road edge and reduce incidents of vehicle/wildlife collisions.
20. Personnel would be instructed to avoid work within 4 meters of a gopher tortoise burrow (FWC, 2017).
21. Personnel would follow applicable measures from the CSS to the GSMM to reduce potential impacts to manatees and their habitat.
22. Spaceport-related and controlled boat and vessel operations by spaceport personnel would follow these manatee protection measures:
 - a. Personnel would be informed of the civil and criminal penalties for harming, harassing, or killing manatees.
 - b. Vessels would operate at “no wake/idle” speeds at all times while near the dock unless human safety considerations dictate otherwise. All vessels would follow routes of deep water when entering or exiting the project area and while operating in the project area (all areas of shoreline, marsh, and open waters within 100 feet of the outermost perimeter of the authorized dock facility), whenever possible.
 - c. Personnel would be responsible for observing for the presence of manatees in the project area. Boats would avoid manatees by 50 feet whenever possible, and animals would not be harassed into leaving.
 - d. If an injured or dead manatee is found near the project site, Camden County would immediately notify the GDNR at 912-264-7218 or 1-800-272-8363 on weekdays between 8:00 a.m. to 4:30 p.m. or 1-800-241-4113 on nights and weekends. When possible, within one hour of a manatee injury or mortality, Camden County would notify the USFWS, Georgia Ecological Services Field Office at 912-832-8739. Any dead manatee found in the project area would be secured to a stable object to prevent the carcass from moving with the current.
 - e. Spaceport employees would periodically inspect and maintain hoses, faucets, and other potential sources of fresh water, and immediately stop any freshwater leak.
 - f. Camden County would work with GDNR (912-264-7218) to develop a permanent manatee awareness sign plan, and install signs in accordance with the GDNR-approved plan.
 - g. As part of the education briefing noted above, the Natural Resources Specialist would educate spaceport-affiliated boaters on manatee biology, how watercraft can adversely affect the manatee, and actions that boaters can take to avoid impacts to the manatee. The Natural Resources Specialist would use the GDNR video *Sharing the Coast – Manatees* as a manatee education awareness program (available at www.youtube.com/watch?v=whD8KX4PBNA). Camden County would ensure all spaceport-related boat and vessel operators view this video before using the docks.
 - h. Camden County would develop and maintain spill contingency plans in accordance with the requirements of the GDNR Coastal Resources Division.

2.3.3 Operational Measures

2.3.3.1 Daily Operations

1. Spaceport vehicle operators would observe speed limits not to exceed 25 mph at night to reduce collisions with protected species.
2. The Natural Resources Specialist would be responsible for:
 - a. Coordinating implementation of the PSHMP.
 - b. Providing an environmental worker education briefing, as described in Section 2.3.2, *Construction Measures*.
 - c. Educating the public that visits the spaceport site on protected species in the area and posting areas to avoid in locations where spectators are allowed.
3. As applicable, operational activities would follow management zones and guidelines from the USFWS Habitat Management Guidelines for the Wood Stork in the Southeast Region (1990).
4. Spaceport Camden would have procedures, equipment, site staff, and local first responders trained on emergency response for hazardous materials and activities at the site. Spills would be contained and cleaned up per the procedures identified in a Hazardous Materials Emergency Response Plan.
5. Spaceport affiliated boat and vessel operations would follow the manatee protection measures described in Section 2.3.2, *Construction Measures*.

2.3.3.2 Launches, Landings, and Static Test Fires

1. The proposed closure area (refer to Section 2.2.2.5, *Security and Safety Zones*) would be developed in consultation with the FAA, USFWS, GDNR, and NPS to ensure the Cumberland Island National Seashore and the Satilla River, Andrews Sound, and Cumberland River areas are properly secured, with minimal impact to USFWS, GDNR, and NPS activities and operations related to habitat and wildlife management.
2. All spaceport security employees, contractors, and tenants would be briefed on special status species prior to conducting patrols via unmanned aerial systems, boats, or all-terrain vehicles, or on foot. Vehicle operators would observe speed limits not to exceed 25 mph, or other speeds as safety allows and/or dictates, while traveling in the vertical launch facility and control center complex. Except in case of an emergency or a safety or security issue, Camden County and/or the launch operator would not conduct ground sweeps.
 - a. A 24-hour emergency contact for the USFWS and GDNR would be provided to security employees, should an injured or dead protected species be found during security patrols.
 - b. During a launch-related closure, monitoring would be conducted via video surveillance (e.g., high-definition video cameras with zoom lenses placed well above ground level on the water tower and/or lightning protection towers) (see Section 2.2.2.5, *Security and Safety Zones*). If video surveillance was insufficient at maintaining security and safety zones, other monitoring methods may be used, such as security patrol routes on Cumberland Island National Seashore. These patrol routes would abide by the following requirements:

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- i. Avoid marked and clearly visible sea turtle nests by a minimum of 50 feet.
 - ii. Stay below the mean high tide water line.
 - iii. If an adult sea turtle were observed on the beach, personnel would remain quiet, allowing the turtle to continue its activities. If hatchling turtles were observed, all security patrol activities would cease until the hatchlings reached the ocean.
 - iv. Ruts or disturbed areas created by security patrol vehicles greater than 2 feet long and deeper than 2 inches would be removed prior to sunset during sea turtle hatching season.
 - v. Vehicles would not be allowed within piping plover critical habitat; personnel would be required to patrol on foot or by boat along shore in this area.
- c. Spaceport-affiliated boats and vessels 65 feet in length or longer conducting clearance within the Southeast Seasonal Management Area of the Atlantic Ocean would restrict speed to 10 knots or less to avoid potential strikes to manatees.
3. To detect possible impacts to special status species, during the first three years of operations, the Natural Resources Specialist would conduct pre- and post-launch on-site visual surveys for gopher tortoises, indigo snakes, piping plovers, red knots, and wood storks. The visual surveys would also include the brown pelican, which was ESA delisted in 2009 due to recovery (the only brown pelican rookery in Georgia is approximately 1.4 miles from the launch pad; the USFWS is monitoring the brown pelican population). The on-site visual survey would be conducted within the area of impact of the vertical launch or landing area the day before and the day after the event. The on-site visual survey would include presence/absence surveys and would record the number and location of listed species observed. Once a year, an annual monitoring report would be sent to the USFWS. After three years, the USFWS and Spaceport Camden would mutually determine the need for continued pre- and post-launch on-site visual surveys.
4. Prior to static fire tests, launches, and landings, warning sirens may be employed to deter birds and minimize the probability of bird strikes. The launch team would also look for birds on the radar prior to liftoff, assuming primary radar is in use.

2.4 Description of the Action Area

The action area is defined as all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR §402.02). Exhibit 2-25 provides a depiction of the various habitats at the proposed spaceport site. The action area for the project includes the construction action area (Exhibit 2-26) and the operational action area (Exhibit 2-27). The areas depicted in Exhibit 2-26 and Exhibit 2-27 are expected to encompass all of the effects of the proposed project.

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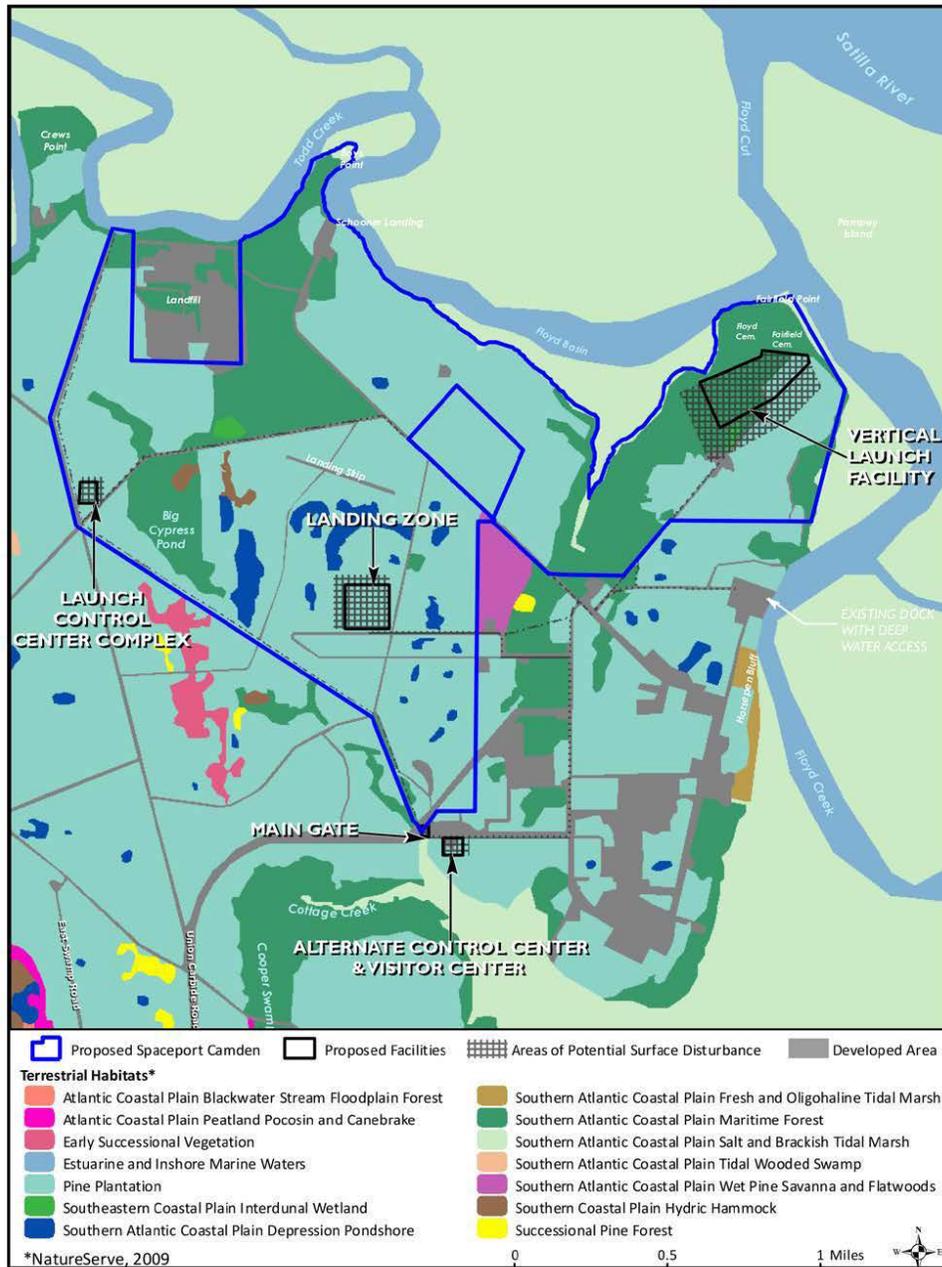


Exhibit 2-25. Habitats Associated with the Proposed Spaceport Site

Biological Assessment, Spaceport Camden

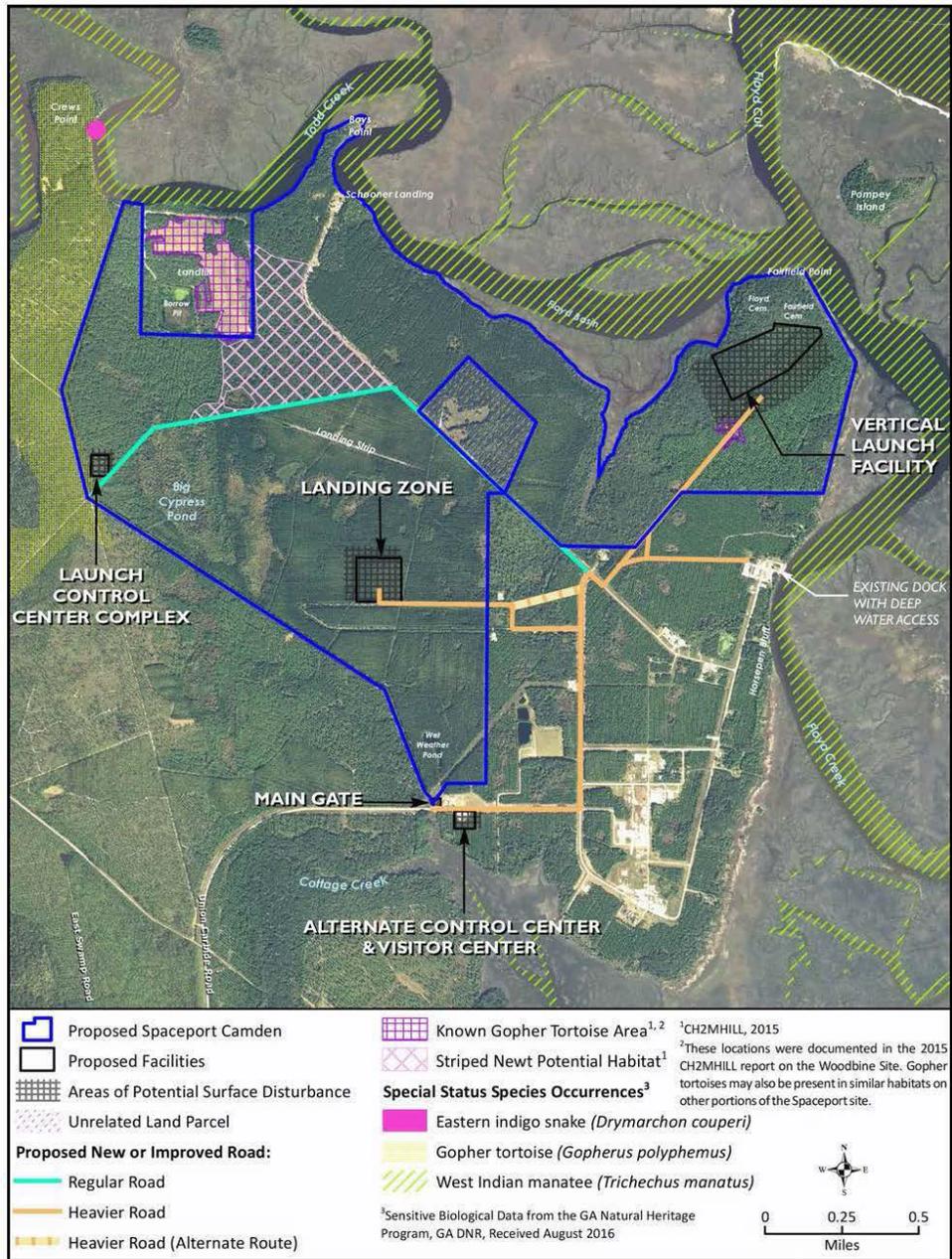


Exhibit 2-26. Protected Species within the Construction Action Area

Biological Assessment, Spaceport Camden

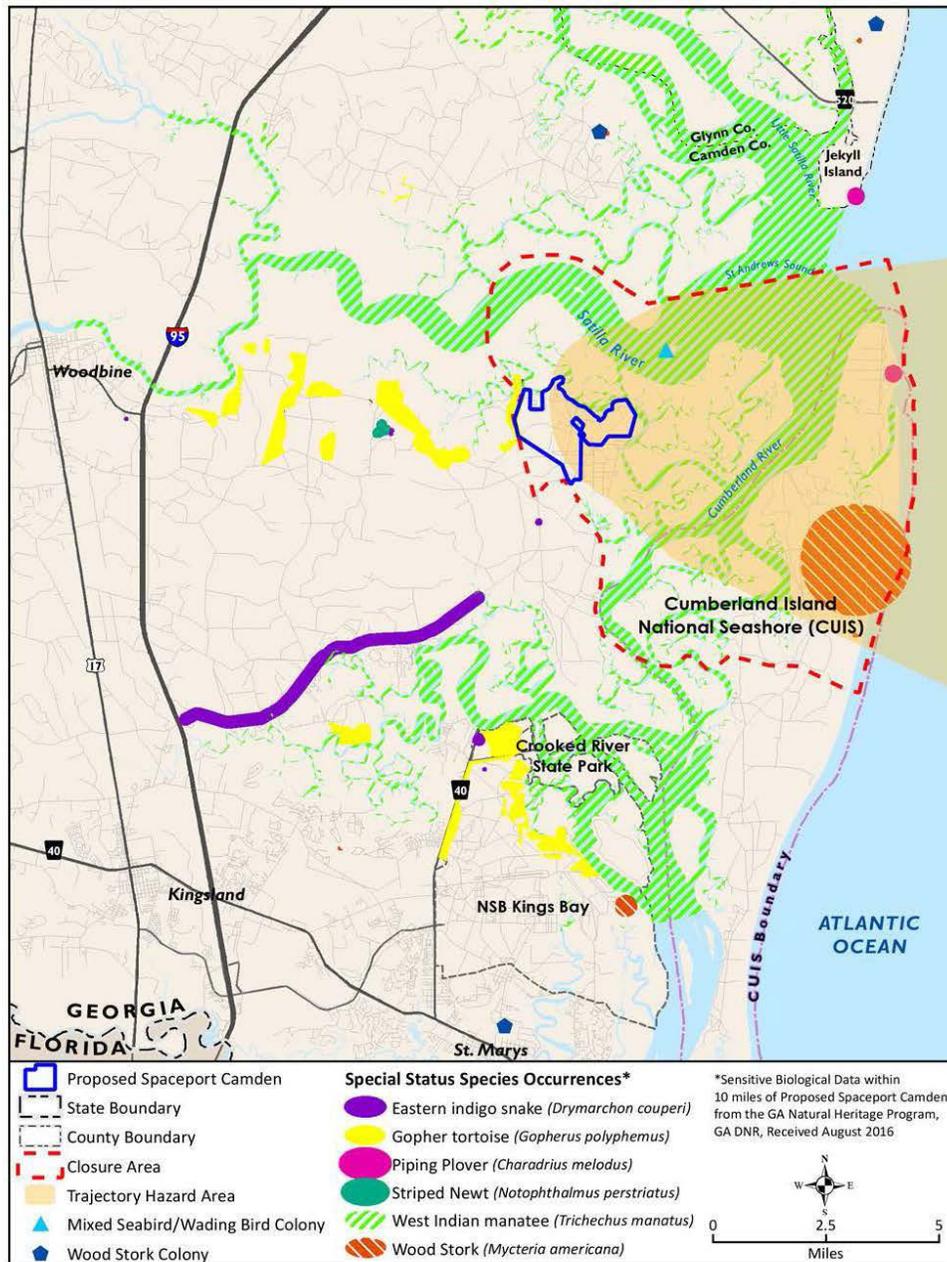


Exhibit 2-27. Protected Species within the Operational Action Area

3.0 Biological Information

The 11 federally listed endangered, threatened, or candidate species that are known to occur or might occur in the construction action area and/or the operational action area for Spaceport Camden are identified in Table 3-1.

Table 3-1. Threatened, Endangered, and Candidate Species in the Construction and Operational Action Areas

Species	Federal Status	Occurs Within Construction Action Area	Occurs Within Operational Action Area
Striped newt (<i>Notophthalmus perstriatus</i>)	C	Potential, but ponds are degraded. Survey would be conducted prior to construction.	Yes. Four miles west of project site
Eastern indigo snake (<i>Drymarchon couperi</i>)	T	Yes, likely present in most habitats onsite.	Yes
Gopher tortoise (<i>Gopherus polyphemus</i>)	C	Yes, present in sandy upland areas.	Yes
Piping plover (<i>Charadrius melodus</i>)	T; critical habitat	No.	Yes. Within/near sounds, marshes, beach areas
Red knot (<i>Calidris rufa</i>)	T	No.	Yes. Within/near sounds, marshes, beach areas
Red-cockaded woodpecker (<i>Picoides borealis</i>)	E	No, but survey would be conducted prior to tree clearing activities.	Potential habitat
Wood stork (<i>Mycteria americana</i>)	T	No, but survey would be conducted prior to construction for rookeries.	Yes. Project site is within 13-mile radius of five known active rookeries
West Indian manatee (<i>Trichechus manatus</i>)	T	No.	Yes. In waters adjacent to project site
Loggerhead sea turtle (<i>Caretta caretta</i>)	T; critical habitat	No.	Yes. Closest nesting beach 7.5 miles east of project site; within waters off coast
Leatherback sea turtle (<i>Dermochelys coriacea</i>)	E	No.	Yes. Closest nesting beach 7.5 miles east of project site; within waters off coast
Green sea turtle (<i>Chelonia mydas</i>)	T	No.	Yes. Closest nesting beach 7.5 miles east of project site; within waters off coast

Notes: C = candidate; E = endangered; T = threatened.

3.1 Striped Newt

The striped newt (*Notophthalmus perstriatus*) is a Federal candidate species that is found within longleaf pine-wiregrass communities. Striped newts prefer pine flatwoods and sandhills as adults while using isolated, ephemeral wetlands for breeding and larval development. These wetlands are typically vegetated with emergent sedges, grasses, and forbs. Striped newts breed in late winter and early spring when ponds fill with rainwater. After larval development and transformation, striped newts are typically exclusively terrestrial for one to three years. Upon reaching sexual maturity, they migrate to ponds to

breed and live as aquatic adults until the ponds dry, forcing them back to land. Striped newts feed on crustaceans, insects, and frog eggs (GDNR, 2016a).

The range of the striped newt extends from the Georgia side of the Savannah River into northern and peninsular Florida. Where they are found within the Coastal Plain of Georgia, major threats include agricultural and pine plantation conversion, fire suppression, and wetland alteration. Striped newts have not been documented within the construction action area, but they may occur in the oak hammocks between the airstrip and landfill (Exhibit 2-26); this area contains ephemeral depression ponds that historically were surrounded by native pine forest (CH2MHill, 2015). However, these areas are now degraded by the bedding and planting of pine plantations. The site would be surveyed prior to construction to confirm that striped newts are not present in the construction action area; they have been found on the adjacent property during a 2008 survey (USFWS, 2017).

3.2 Eastern Indigo Snake

The federally threatened eastern indigo snake (*Drymarchon corais couperi*) is a wide-ranging snake primarily found in sandhills habitat, but during warmer months it may also be found in stream bottoms, swamps, and flatwoods. The average home range of the indigo snakes varies by season, with an individual using up to 100 hectares for foraging during late summer and fall and as limited a range as 10 hectares during the winter (NatureServe, 2016). Indigo snakes frequently utilize gopher tortoise burrows as refugia from cold temperatures in winter, for egg laying, and for protection during shedding when they are more vulnerable to predation. Mating occurs from November through March, and eggs are laid in late spring and hatch approximately three months later. Indigo snakes feed on small mammals, snakes, frogs, birds, and other small vertebrates.

The current range from the indigo snake includes southern Georgia and Florida, with rare occurrences in Alabama, Mississippi, and South Carolina. Critical habitat for the indigo snake does not occur within the action area. Habitat destruction and fragmentation are the primary threats to this species. The indigo snake has been found within the construction action area in the sandy portions that extend south from Todd Creek to the abandoned airstrip (Exhibit 2-26) and may be found throughout the site, both in wetlands and uplands, particularly in areas with gopher tortoise burrows (CH2MHill, 2015). The indigo snake uses gopher tortoise burrows during the cold weather months and forages in wetlands during warm weather months.

3.3 Gopher Tortoise

The gopher tortoise (*Gopherus polyphemus*) is a Federal candidate species in the eastern portion of its range (east of the Mobile and Tombigbee Rivers). The 12-month finding on a petition to list it as threatened within its eastern range stated that the listing of the gopher tortoise is warranted. However, listing is currently precluded by higher-priority actions, and a proposed rule to list the gopher tortoise will be developed as priorities allow.

The gopher tortoise is found primarily in longleaf pine and oak sandhills but may also be found in pine flatwoods, dry hammock, scrub, coastal grasslands, and in disturbed habitats, such as roadsides and power line rights-of-way. Gopher tortoises excavate tunnel-like burrows for shelter from climatic extremes and refuge from predators that can vary from 9 to 23 feet deep and 3 to 52 feet long, but burrows typically are closer to 15 feet long and 6.5 feet deep (USFWS, 2016b) (Exhibit 2-27).

The primary features of good tortoise habitat are well-drained sandy soils, open canopy with plenty of sunlight, and abundant food plants (forbs and grasses). Prescribed fire is often employed to maintain these conditions. During warmer months when tortoises are active, they typically dig and use multiple burrows. Breeding season is April to November, with nest construction from mid-May to mid-June. Eggs are typically laid at the opening to the burrow.

The current range of the gopher tortoise extends from Louisiana to southern South Carolina, primarily in the Coastal Plain. Populations are threatened by habitat destruction, degradation, and fragmentation, incompatible herbicide use, and predation. Gopher tortoises are found within the construction action area in the open sandy areas between Todd Creek and the airstrip and on the peninsula near the Floyd Family Cemetery (Exhibit 2-26). The pine plantation areas may have also historically supported a large gopher tortoise population before the dense plantings shaded out suitable forage plants (CH2MHill, 2015).

3.4 Piping Plover

The piping plover (*Charadrius melodus*) is federally listed as threatened in the Atlantic coast region. The south Atlantic coast is utilized as winter breeding grounds for the Atlantic coast population, as well as other U.S. populations (USFWS, 2007). Piping plovers forage along intertidal mudflats and beaches, and the shorelines of streams, ephemeral ponds, lagoons, and salt marshes (Exhibit 2-27). They feed by probing the ground for insects, molluscs, worms, and small crustaceans. Small sand dunes, debris, and sparse vegetation on beach and shoreline habitat provide shelter from wind and extreme temperatures (USFWS, 2007). Wintering birds (July through late October) utilize a variety of habitats, including beaches, mudflats, sandflats, and spoil islands.

Piping plovers do not nest in Georgia but can be found regularly during migration and wintering. Populations are threatened by habitat destruction from coastal development and predation. Piping plovers may be found within the operational action area foraging along intertidal mudflats and beaches and the shorelines of streams, ephemeral ponds, lagoons, and salt marshes. Piping plover critical habitat includes portions of Cumberland Island and Jekyll Island (Exhibit 3-1).

Piping Plover Critical Habitat

Critical habitat refers to specific geographic areas that contain the essential habitat features necessary for the conservation of threatened and/or endangered species. At the time of designation, the critical habitat areas do not necessarily have to be occupied by the species. Piping plover essential habitat features are found in coastal areas that support intertidal beaches and flats (between annual low tide and annual high tide) and associated dune systems and flats above annual high tide. Critical habitat areas may require special protection or management considerations for current populations as well as potential population increases necessary to achieve species recovery. Exhibit 3-1 shows critical habitat in the region of influence for protected species. As shown in this exhibit, the designated overwintering critical habitat for the piping plover occurs along the eastern shoreline of Cumberland Island and two small islands along the south side of the St. Marys River entrance channel (USFWS, 2007). Critical habitat includes the intertidal zone from the mean lower low water line to higher elevations where densely vegetated habitat occurs (areas not utilized by the plover).

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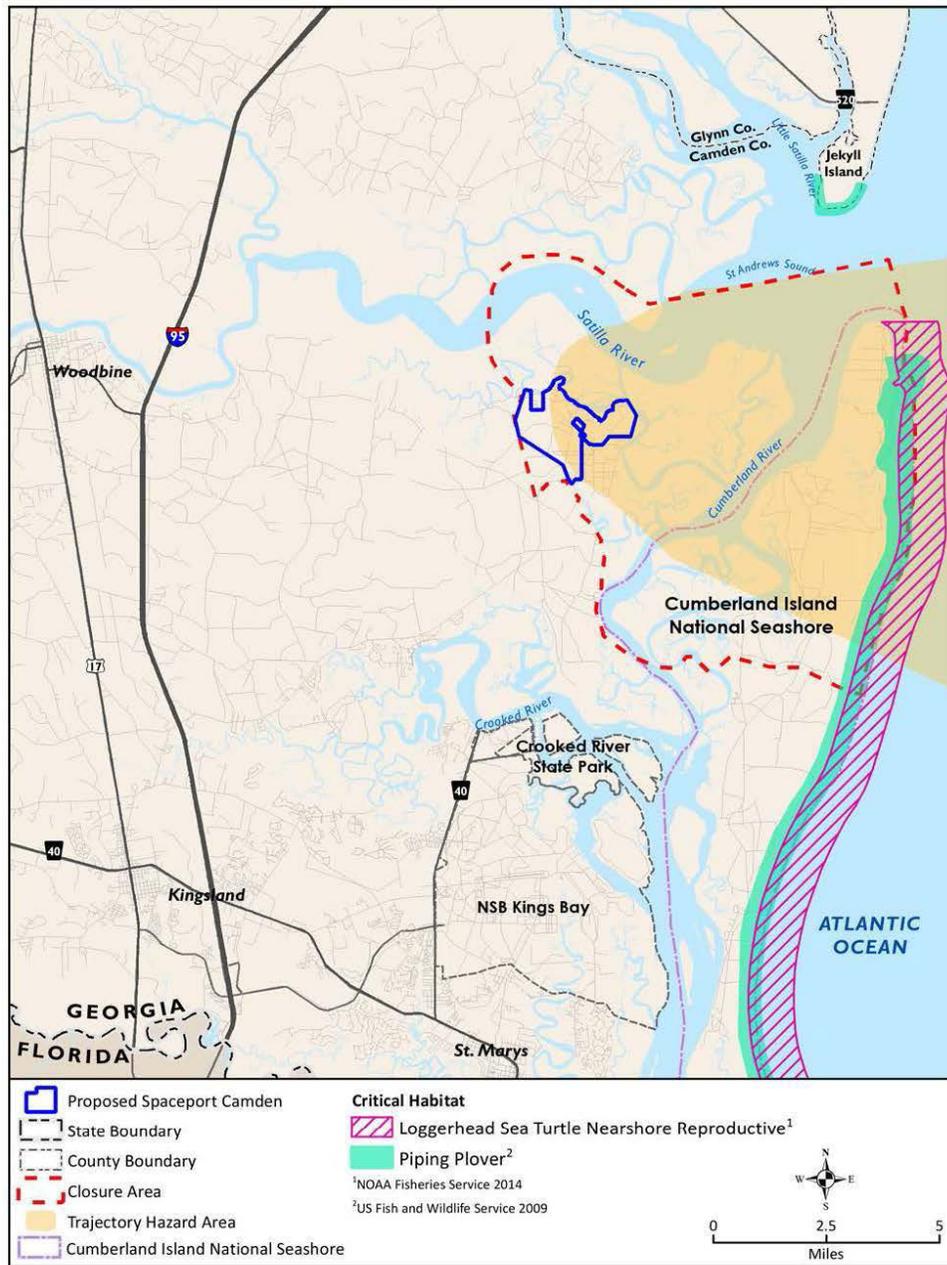


Exhibit 3-1. Critical Habitat for Protected Species within the Operational Action Area

3.5 Red Knot

The red knot (*Calidris rufa*) is federally listed as threatened. The red knot breeds in central and eastern Russia, Alaska, Canada, and Greenland. Wintering areas occur along the southeast Atlantic coast, including Georgia. During migration and in the winter, red knots eat bivalves, small snails, and crustaceans. In Georgia, small clams including coquina (*Donax* spp.) and dwarf surf (*Mulinia lateralis*) are an important part of their fall and winter diet; horseshoe crab eggs are consumed heavily during spring staging along the Georgia coast. Populations are threatened by reduced food availability (commercial harvest of horseshoe crabs), habitat destruction from coastal development, beach cleaning (wrack removal), and predation. Red knots are found within the operational action area primarily in intertidal marine habitats, especially near coastal inlets, estuaries, and bays. Red knots may occur on Cumberland Island and Jekyll Island (Exhibit 2-27). Critical habitat for the red knot does not occur within the action area.

3.6 Red-Cockaded Woodpecker

The RCW (*Picoides borealis*) is federally listed as endangered. This small woodpecker requires large expanses of mature, open pine forest, particularly longleaf, slash, or loblolly pine. These habitats are typically maintained by fire. Nest and roost cavities are excavated only in old living pines, and the process may take several years to complete. Trees selected for cavities are usually infected with red heart fungus, which softens the heartwood, making excavation easier.

RCWs exist in family groups that typically consist of an adult breeding pair and up to four helpers that are usually male offspring from previous years. The group roosts in a cluster of cavity trees, with an average cluster size of about 10 acres and a typical group territory area of 125 to 200 acres (USFWS, 2016c). Mid-April, the female lays eggs in the tree cavity selected by the breeding male, and eggs incubate for 10 to 11 days. Both the parents and helpers participate in incubating eggs and brooding and feeding nestlings, which fledge from the nest cavity 24 to 27 days after hatching (USFWS, 2016c). RCWs feed primarily on insects but may also forage on fruits and seeds.

The current range of the RCW includes Alabama, Arkansas, Florida, Georgia, Louisiana, North Carolina, Mississippi, Oklahoma, South Carolina, Virginia, and Texas. Critical habitat for the RCW does not occur within the action area. Habitat degradation, destruction, and fragmentation are the major threats to RCWs, including conversion to nonforested land uses and fire suppression. Currently, there is no suitable nesting habitat within the construction action area for RCWs, as most of the upland areas are in young plantation pine (CH2MHill, 2015), and GDNR records¹⁶ did not indicate any RCWs within 3 miles of the site (GDNR, 2014) (Exhibit 2-27). The site would be surveyed prior to construction to confirm that RCWs are not present in the construction action area.

3.7 Wood Stork

Wood storks (*Mycteria americana*) are federally listed threatened birds that nest in large colonies, primarily in cypress or mangrove swamps, where they often nest in the upper branches of large trees. In Georgia, the nesting period begins in late winter or early spring, with fledging in July and August (USFWS,

¹⁶ The Georgia Department of Natural Resources provided a list of natural communities, plants, and animals of highest priority conservation status within a 3-mile radius of the project site from the Natural Heritage Database.

2016d). Preferred foraging habitats for wood storks include narrow tidal creeks, freshwater marshes, and flooded tidal pools, especially depressions where fish become concentrated when water levels fall.

Nesting of the threatened southeastern wood stork population is limited to Georgia, Florida, and South Carolina, with storks moving northward after breeding as far as North Carolina, Alabama, and eastern Mississippi. Critical habitat for the wood stork does not occur within the action area. Primary threats to the wood stork include loss of feeding habitat, human manipulation of water levels at nesting sites, predation, and lack of nest tree regeneration. To minimize adverse impacts to wood storks, the USFWS has identified management zones for activities in close proximity to rookeries, foraging areas, and roosting sites (USFWS, 1990). Wood stork colonies occur outside of the construction action area but within the operational action area approximately 5 miles north of the Spaceport Camden site at Black Hammock, 10 miles northeast of the site at Jekyll Island, 15 miles to the south near St. Marys, and 7 miles southeast on Cumberland Island (GDNR, 2016b) (Exhibit 2-27). Historically, they have been seen foraging at the borrow pit near the landfill, in the wet weather pond near the southern boundary of the site, and along shallows and mudflats along Todd Creek (CH2MHill, 2015), but wood storks may vary the areas they use for foraging and roosting based on environmental conditions.

3.8 West Indian Manatee

West Indian manatees are currently listed as threatened under the ESA (82 FR 64, April 5, 2017). Federally designated critical habitat (i.e., pursuant to Section 7 of the ESA) occurs approximately 15 miles south of NSB Kings Bay, near the confluence of the Intracoastal Waterway and St. Marys River, stretching south to the Florida State Highway A1A Bridge south of Fernandina Beach (USFWS, 2001). No critical habitat has been designated in the immediate vicinity of the construction or operational action area (Exhibit 2-27).

The West Indian manatee is divided into the Florida (*Trichechus manatus latirostris*) and Antillean (*Trichechus manatus manatus*) subspecies (Lefebvre et al., 2001), but only the Florida manatee occurs in the action area. The Florida manatee population is divided into four management units: the Upper St. Johns River (4 percent of the population), Atlantic Coast (46 percent), Southwest Florida (38 percent), and Northwest Florida (12 percent). Data indicate that the Atlantic Coast Management Unit is likely stable. The Florida manatee is negatively impacted by cold stress, hurricanes, toxic red tide poisoning, habitat destruction (such as loss of seagrass), and other natural and human-induced factors. However, vessel strikes are the single greatest cause of death for Florida manatees (Jett & Thapa, 2010).

West Indian manatees are found in Florida and southeastern Georgia (USFWS, 2001) but broaden their range seasonally based on a preference for warm water temperatures (warmer than 68 degrees Fahrenheit). They utilize a variety of aquatic habitats (marine, brackish, and fresh water; canal systems; mangroves; salt marsh complexes) provided water depths are greater than 1 to 2 meters (3.3 to 6.6 feet) (USFWS, 2001). In southern Georgia, the principal manatee foods appear to be bank emergents and salt marsh vegetation (USFWS, 2001), which occur along extensive areas of the Naval Submarine Base Kings Bay shoreline.

Manatees use the open-water areas, river channels, and smaller creeks within Cumberland Sound for many different activities, including resting, traveling, and foraging, primarily from April to August (GDNR, 2007; Zoosma, 1998; Deutsch et al., 2003), and they are most frequently sighted in waters of Camden County from April through October (GDNR, 2016b).

3.9 Sea Turtles

Three species of sea turtles may potentially nest within the operational action area (Exhibit 2-27): the Atlantic loggerhead (*Caretta caretta*), Atlantic green (*Chelonia mydas*), and leatherback (*Dermochelys coriacea*). Sea turtle populations are threatened by entanglement in fishing equipment, poaching and illegal trade of eggs, coastal development, and plastic/marine debris.

3.9.1 Loggerhead Sea Turtles

Loggerhead sea turtles are federally threatened and found throughout the marine and estuarine waters of Georgia during the warm months of spring, summer, and fall. They have been observed swimming or basking on the surface as far as the Gulf Stream, 104 kilometers (62.4 miles) offshore and are seen regularly as close as the creeks and tidal rivers of Georgia's extensive saltmarshes. Loggerheads are Georgia's primary nesting sea turtle, laying eggs on the beaches of every barrier island during the summer nesting season. The loggerheads that breed here have been identified genetically as part of a distinct breeding cohort that includes the turtles that nest in North Carolina, South Carolina, and north Florida south to Cape Canaveral.

Cumberland Island's 18-mile undeveloped beach is one of the most important loggerhead sea turtle nesting areas in Georgia and is designated critical habitat for the loggerhead sea turtle (Exhibit 3-1). Each year, it accounts for 25 to 30 percent of the statewide nesting total (NPS, 2016). In the last 3.5 seasons, over 1,800 nests have been observed on Cumberland Island (NPS, 2016).

3.9.2 Green Sea Turtle

The green sea turtle is federally listed as threatened, and nesting occurs in Georgia from May through August. In the United States, it nests in small numbers in Georgia, South Carolina, and North Carolina and in larger numbers in Florida. The average size of nesting green sea turtles in the Atlantic Ocean is over 100 centimeters (39 inches) carapace length. These turtles are thought to be at least 19 years old before they nest for the first time, with nesting occurring every two to three years. A significant proportion of Georgia's green turtle nesting habitat is in conservation ownership, including Little Cumberland Island and Cumberland Island National Seashore (GDNR, 2016b). The green sea turtle female nesting abundance in Georgia was estimated to be five individuals between 2011 and 2012 (NOAA, 2015). Critical habitat was designated for the green sea turtle in 1998 (63 FR 46693) but does not occur within the action area.

3.9.3 Leatherback Sea Turtle

The leatherback sea turtle is federally endangered and is highly pelagic but may also forage in coastal waters. Leatherback turtles make long-distance migrations from nesting sites in the tropics to foraging sites in the sub-Arctic. Leatherback turtles are found along the Georgia coast during annual migrations in the fall and spring. They are also commonly seen in the winter months foraging on sea jellies. Little is known about habitat used by post-hatchlings and small juveniles. The leatherback sea turtle occurrence in the action area is expected to be seasonal, rare, and correlate with the availability of preferred species of prey. Leatherback turtles may also occur in the in the action area while migrating between nesting habitat south and more productive foraging habitat in the North Atlantic. Very few nests have been confirmed in Georgia, although a consistent pattern of low annual nesting (less than 10 nests) has emerged since 2000 (GDNR, 2016b). Critical habitat for the leatherback sea turtle does not occur within the action area.

4.0 Effects Analysis

This section discusses potential direct and indirect effects to federally protected species and habitat located within the construction and operational action areas. Analysis focuses on assessing the potential for impacts from Spaceport Camden construction activities, daily operations, launch, and landing operations and on identifying methods to reduce the potential for negative impacts to protected species from these activities. Table 4-1 summarizes the potential effects on listed species from threats and stressors associated with the Proposed Action; Sections 4.1 through 4.5 provide detailed analyses. Prior to construction, surveys would be conducted for eastern indigo snakes, wood storks, RCWs, gopher tortoises, and striped newts.

Table 4-1. Potential Stressors on Listed Species Associated with the Proposed Action

Stressor/Threat	Sources	Species Potentially Affected ¹
Direct physical impact	Construction equipment Vehicles UAS Boats Rocket debris Towers Utility lines Spills Disturbance of contaminants in soils Stormwater runoff Launch vapor	Striped newt Eastern indigo snake Gopher tortoise Wood stork Piping plover Red knot Sea turtles Manatee
Noise, light, and human presence	Construction equipment Pile driving Daily operations/ maintenance, launch setup Ground vibrations Launches/ rehearsals Landings Spaceport Camden personnel Spectators	Eastern indigo snake Gopher tortoise Wood stork Piping plover Red knot Sea turtles
Habitat loss/ degradation/ fragmentation	Land clearing Wetland fill Construction Launch vapor Invasive species Stormwater runoff Wildfires	Striped newt Eastern indigo snake Gopher tortoise Wood stork

Notes: UAS = unmanned aerial system.

¹Species potentially affected by these stressors were determined through discussions with FAA, the USFWS, and Leidos (USFWS, 2017).

4.1 Direct Physical Impacts on Protected Species

4.1.1 Construction

The main cause of direct physical impacts associated with the Proposed Action is physical contact, which could involve the crushing/trampling of, or collision with, a species resulting from interactions with vehicles, equipment, power lines, towers, or personnel. Direct physical impacts are also possible from

exposure to chemical materials. During the 15 months of facilities construction, 40 to 50 workers would transit to and from the site six days per week; during the seven months of infrastructure construction, an additional 20 workers would commute to and from the site. There also would be delivery of construction materials for roads, parking lots, concrete pads at the launch facility, landing pad, plus 12 buildings of various sizes, four lightning towers, a water tower, security fencing, parking lots, and septic equipment and other associated equipment. Land clearing and construction equipment (i.e., cranes, concrete pump trucks, pile driving equipment, excavators) would be used during daylight hours only. Crushing by vehicles and equipment may occur to smaller, less mobile species (i.e., striped newt, gopher tortoise, and eastern indigo snake), but the majority of animals would move away from roads and the construction sites into surrounding areas. Similar habitats surround the construction sites where the species could relocate.

Direct physical impacts to birds (i.e., wood stork and RCW) from construction activities are unlikely because birds can easily avoid (fly away from) construction equipment. However, injury or mortality would be possible from bird collisions with the four lightning towers (250 feet tall) and existing above-ground power lines (approximately 4 miles). Within the construction action area, new power lines at the facilities would be installed underground but would tie into existing above ground power lines at the site. The four lightning towers would be in close proximity to wetlands which may be near wood stork feeding, nesting, or roosting grounds, where the frequency of collisions is the highest (APLIC and USFWS, 2005). To reduce the risk of electrocution and collision mortality, construction would follow the guidelines for the Georgia Power Avian Protection Plan developed in coordination with the APLIC and USFWS (2005). Part of this process would include an evaluation of data on established flyways, adjacent wetlands, areas of high avian use, avian mortality, perch availability, prey populations, and other factors that may increase bird interactions with utilities. New power lines would be constructed to avian-safe standards, including exclusion devices to discourage perching and nesting in unsafe areas.

Tower lighting has the potential to disorient birds (i.e., wood stork and RCW), causing them to circle the lights to exhaustion or to fly into the lights. To minimize potential impacts from tower lighting, tower construction would follow *Recommended Best Practices for Communication Tower Design, Siting, Construction, Operation, Maintenance, and Decommissioning* to the greatest extent possible (USFWS, 2016a). Practices would include using the minimum amount of pilot warning and obstruction avoidance lighting required by FAA and using only white or red strobe lights at night at the minimum intensity, number, and number of flashes per minute allowed by FAA.

The accidental spill of chemical materials has a low potential to affect animal species (i.e., striped newt, gopher tortoise, eastern indigo snake, wood stork, RCW, and manatees), but could cause respiratory, reproductive, or other physiological impacts. Hazardous materials and hazardous wastes would be handled in accordance with developed protocols, to prevent the exposure of fish and wildlife to chemicals. Spills would be contained and cleaned up per the procedures identified in a Hazardous Materials Emergency Response Plan as is standard practice.

4.1.2 Operations

Daily operations would increase human presence and traffic within the Spaceport Camden site. Visual presence of people, in concert with associated noise, may startle species or deter use of surrounding habitats (i.e., gopher tortoise, eastern indigo snake, wood stork, and RCW). Over time, animals using the

area would become acclimated to the presence of humans. Permanent staffing at Spaceport Camden would consist of approximately 77 full-time employees, with up to 200 personnel present starting about two weeks before a launch. This number of people is fewer than the average during historical uses of the property dating back to the 1950s (approximately 400 personnel), during the production of rocket engines, munitions, and pesticides (Nelson, 2017). Industrial activities ended around 2007, and Bayer CropScience closed and demolished the manufacturing facility in 2012 (CH2MHill, 2015). As described in the Section 2.2.2.3, *Launch Operations*, under “Pre-Launch Activities,” a closure area would be required during pre-launch, launch, and landing operations (including land and water areas). Closures for safety could last up to 12 hours on a launch day, with 4 to 6 hours being the typical closure time for a nominal launch. Checkpoints would be established to control access as depicted in Exhibit 2-15 (refer to the “Closure Area”). During a closure, monitoring would be done from vehicles along existing roads and video surveillance.¹⁷ To reduce the potential for impacts to terrestrial animals from being injured, killed, startled, or temporarily displaced by daily operations, personnel would be notified in verbal or written form with maps and photos to identify potential sensitive species (i.e., gopher tortoise, indigo snake, and West Indian manatee) to avoid during daily operations and during closure procedures (refer to Section 2.3, *Conservation Measures*).

4.2 Potential Impacts on Protected Species from Noise, Light, and Human Presence

4.2.1 Construction

Noise and human presence associated with construction may affect local wildlife by disturbing foraging, breeding, migration, and wintering activities (i.e., gopher tortoise, eastern indigo snake, wood stork, and RCW). An animal’s response to construction noise would depend on various factors, including noise level and frequency, distance and event duration, equipment type and conditions, frequency of noisy events over time, slope, topography, weather conditions, previous exposure to similar noises, hearing sensitivity, reproductive status, time of day, behavior during the noise event, and an animal’s location relative to the noise source.

The common measure for construction point source noise (i.e., pile driving) is maximum decibel level (L_{max}), which is the highest value of a sound pressure over a certain time interval. Noise levels for construction activities range from 73 (for a generator) to 101 dBA L_{max} (for pile driver) at 50 feet from the activities (FHWA, 2006). As most of the Spaceport Camden site is vegetated or unpaved, there would be a reduction in noise transfer such that the extent of noise impacts would be less than these levels.

Construction of the facilities and infrastructure would result in temporary increases in daytime noise over a 15-month period. Noise from these activities could disturb normal behaviors temporarily, or in some cases, animals may permanently avoid the area. When exposed to noise from construction, animals in the area may startle or move to adjacent habitat, causing extra caloric expenditures and temporary stress, but these impacts would be short term. Noise during critical life cycle activities (i.e., nesting, rearing of young) is of the most concern. For any animals nesting in the area, noise from construction could lead to

¹⁷ Ground sweeps would only occur in emergency situations. Other monitoring methods would only be used if video surveillance is insufficient (as noted in Section 2.2.2.3, *Launch Operations*, under “Pre-Launch Activities”).

abandonment of nesting activities and the stranding of young, which could ultimately lead to animal mortality (e.g., death of nestlings).

Pile-driving activities are estimated to occur over the period of a month for each location (launch pad and landing pad structures). Pile driving would likely elicit a flush/startle response behavior. This effect could temporarily interfere with normal behaviors, such as breeding, feeding, or sheltering, and cause increased stress and extra caloric expenditure. This could also leave offspring or nests vulnerable to predators (i.e., feral cats, coyotes); however, predators would also likely be affected by increased noise levels. Due to the short duration of high noise levels, the behavioral effects to terrestrial species would be temporary, and animals would resume normal behavior shortly after the disturbance.

Although construction would occur only during daylight hours, outdoor lighting would be established for site security and, eventually, additional exterior lighting would be installed as facilities are completed. Exterior lighting could interfere with normal resting or hunting behaviors for wildlife and may disorient bird species (i.e., wood stork and RCW). Lighting systems would be designed and operated to reduce light pollution (refer to Section 2.3, *Conservation Measures*).

4.2.2 Operations

Noise, sound pressure-induced vibration, and the visual effect (stimuli) from pre-launch, launch, and landing activities have the highest potential to impact animals (i.e., striped newt, gopher tortoise, eastern indigo snake, wood stork, RCW, piping plover, red knot, and sea turtles). Operations at the site would not produce any noticeable seismic effects (ground vibrations) (TetraTech, 2017). Animals within an 8-mile radius of the launch site would be exposed to a short duration (less than seven seconds for a static fire; up to five minutes for a launch) of noise levels ranging from 70 to 117 dBA during pre-launch, launch, and landing activities (Exhibit 2-17 through Exhibit 2-21). Launches/takeoffs would not generate sonic booms at or above 0.25 psf on land (Exhibit 2-20). First stage landings at the landing pad would generate sonic booms that would fall, at least partially, on land (Exhibit 2-21). Land areas affected at between 1 and 2 psf could include portions of Jekyll and Cumberland Islands as well as inland areas. The sonic boom noise levels generated during launches and landings would not materially increase the area exposed to noise levels of 65 dBA day-night average sound level or greater when combined with propulsion noise. Sound pressure-induced vibration would also occur within a 3-mile radius. During the day, visual impacts would be minimal, while the one yearly launch event conducted at night could be seen up to 5 miles from the launch site for up to two minutes. Most commonly, the reaction from animals to noise or sound pressure-induced vibration, particularly when the source is visible to the animal, is some degree of startle response. A startle response can cause an animal to temporarily change its normal behavior, such as a stop in feeding or breeding, or leaving the nest/young exposed. The most susceptible species to impacts from noise, sound pressure-induced vibration, and visual effect are birds, which may be startled. Other terrestrial species may not be as susceptible to noise but may be sensitive to sound pressure-induced vibration, which may cause temporary changes in behavior. Bowles (1995a) suggests that outcome measures, such as reproductive success, are better indicators of distress in animals than short-term responses (i.e., startle reaction).

Animal species differ greatly in their responses to noise, sound pressure-induced vibration, and visual stimuli. Each species has adapted, physically and behaviorally, to fill its ecological role in nature, and its

hearing ability usually reflects that role. Animals rely on their hearing to avoid predators, obtain food, and communicate with and attract other members of their species. Noise, sound pressure-induced vibration, and the visual effect from pre-launch, launch, and landing activities may mask or interfere with these functions. Secondary effects may include auditory effects similar to those exhibited by humans: stress, hypertension, and other nervous disorders. Tertiary effects may include interference with mating and resultant population declines. Most of the effects of noise on terrestrial animals are mild enough such that the effects might never be detectable as changes in population size or population growth against the background of normal variation (Bowles, 1995b). Many other environmental variables (e.g., predators, weather, changing prey base, ground-based human disturbance) may influence reproductive success and confound the ability to tease out the ultimate factor in limiting productivity of a certain nest, area, or region (Smith, Ellis, & Johnson, 1988).

Artificial lighting at night may alter the feeding, resting, or reproductive behavior of animals (i.e., striped newt, gopher tortoise, eastern indigo snake, wood stork, RCW, piping plover, red knot, and sea turtles). Lighting systems would be designed and operated to reduce light pollution (refer to Section 2.3, *Conservation Measures*). Area lighting would consist of perimeter/security lighting, general illumination for parking lots, and walkway lighting for staff and visitor areas. Typical (non-launch weekday) operations would dictate that external lighting be turned on until about 9:00 p.m., then go into an automatic dim mode. Security lighting would be on trip sensors after 9:00 p.m. and would only be activated and on when triggered by a security alert. For launch operations, external lighting may be active from dusk until dawn due to the potential for three-shift operations at all four facilities. Exterior lighting for buildings and infrastructure would comply with the Lighting Management Plan (refer to Section 2.3, *Conservation Measures*).

4.3 Potential Impacts on Protected Species from Habitat Loss/Degradation/ Fragmentation

4.3.1 Construction

Construction of the facilities and infrastructure for Spaceport Camden would result in the clearing of 122 acres and may increase the potential for erosion/sedimentation and invasive nonnative species infestations. The physical footprint of the facilities and infrastructure would result in the permanent removal of approximately 58 acres of pine plantation, 38 acres of maritime forest, 1.3 acres of interdunal wetlands, 24 acres of developed area, and 0.3 acre of savanna and flatwoods (Table 4-2; Exhibit 2-26). The remainder of the site would remain in its current state. The wetland survey found that up to 2.54 acres (1.17 acres at the Vertical Launch Facility; 1.37 acres of roads) of jurisdictional wetlands potentially may be impacted by construction (Leidos, 2016). The County will obtain a Section 404 wetland permit from USACE prior to any work in the jurisdictional wetland areas or in areas adjacent to these wetlands. Compensatory mitigation would be required for any unavoidable wetland impacts.

Table 4-2. Acres of Habitat Types to be Cleared¹

Proposed Project	Developed Area	Pine Plantation	Southeastern Coastal Plain Interdunal Wetland	Southern Atlantic Coastal Plain Maritime Forest	Southern Atlantic Coastal Plain Wet Pine Savanna and Flatwoods	Total
Alternate Control Center & Visitor Center	0.8	2.3	0	0	0	3.1
Heavier road	12.5	2.2	0	0.8	0.1	15.6
Landing Zone	0	21.4	0	0	0	21.4
Launch Control Center Complex	0	4.1	0	0	0	4.1
Main gate	0.6	0	0	0	0	0.6
Regular road	7.2	0.9	0	0.2	0.2	8.5
Regular road (perimeter)	0.6	5.9	0	0.7	0	7.2
Vertical Launch Facility	2.4	20.8	1.3	36.5	0	61
Total	24.1	57.6	1.3	38.2	0.3	121.5

¹ This table reflects the entire area to be removed of vegetation (disturbed) for construction, not just the facility footprints. The table also includes the additional clearing for the rights-of-way for the roads. This Biological Assessment analyzes the entire disturbed area from land-clearing activities.

Habitat loss and degradation may involve changes in vegetation, water quality, and the addition of artificial lighting, with resulting impacts to animal feeding, reproduction, resting, movement patterns, and physiological functions. The total amount of habitat affected by the Proposed Action would be a relatively small portion of available habitat at the site; thus, species would likely move to similar habitat in surrounding areas. There may be localized increases in predation and competition for foraging and nesting areas for certain species, but these increases are not expected to affect the overall health of any populations.

Species would lose foraging, nesting, and roosting areas within these sites but would have access to many acres of suitable adjacent habitat. Most development would take place in areas that are not considered suitable or optimal wildlife habitat (i.e., developed areas, pine plantations). Increased traffic on existing roads, the development of new roads and utility corridors, and fencing installation would fragment habitat for some wildlife species (i.e., indigo snake, gopher tortoise); however, the facilities and infrastructure footprints do not block any known major terrestrial migration corridors.

Impacts from new impervious surfaces have the potential to increase stormwater discharge, introducing contaminants from runoff, which could impact terrestrial vegetation during storm events. Appropriate permits and requirements, such as retention ponds, would be in place to minimize impacts from new impervious surfaces in order to decrease stormwater discharge to surrounding vegetation within the Spaceport Camden site. Operational stormwater discharges would be permitted under National Pollutant Discharge Elimination System Industrial Stormwater General Permit Number GAR050000. The County would be required to submit a notice of intent to discharge under this permit no less than seven days before commencing to discharge.

Although the potential for erosion is low, any erosion could result in increased turbidity in aquatic habitats, which can impair respiration, reproductive success, feeding, and physiological functions of

aquatic animals. Erosion control best management practices and stormwater controls would be implemented to avoid such impacts.

If invasive nonnative species were introduced to the site, native wildlife species may suffer due to increased competition for resources and degradation of their habitats. However, requirements for equipment cleaning, weed-free landscaping materials, and prompt treatment of any invasive species that are discovered would minimize the potential for impacts from invasive species.

4.3.2 Operations

Habitat loss, degradation, and fragmentation associated with Spaceport Camden operations would result from road maintenance, vapor and wildfires from launches/landings, artificial lighting, and possible chemical spills or invasive species introductions.

Daily operations of Spaceport Camden are not expected to cause significant impacts to vegetation. It is expected that most of the hazardous materials would be consumed, and that no substantial volumes of hazardous waste would require disposal. Launch vehicle maintenance, propellant and fuel storage and dispensing, and facility and grounds maintenance are among those activities that may generate very small quantities of hazardous wastes. In addition, appropriate permits and requirements would be in place to reduce accidental spills, fires, explosions, or other potential incident risks that could adversely impact vegetation at, or downgradient from, the Vertical Launch Facility and Launch Control Center Complex.

The area around the launch and landing pads would be primarily cleared of vegetation during the construction phase; however, pre-launch, launch, and landing activities may still result in indirect impacts from launch vapor and vegetation scorch. Minimal impacts to vegetation are anticipated from particulate deposition, because launch vehicles would use liquid fuels and the majority of the vapor is water. Small fires could result from pre-launch, launch, and landing activities. These small fires may scorch surrounding vegetation, but vegetation would likely return as the surrounding habitats are fire tolerant.

The introduction of invasive nonnative species from operational vehicles, equipment, and supplies would have the potential to alter native plant communities through increased competition. In keeping with EO 13112 and to reduce introduction of potential invasive species, equipment would be inspected and cleaned prior to first-time use at Spaceport Camden. If areas of invasive species infestations were to be discovered, they would be treated with approved herbicides in accordance with guidance provided on the label. Operational vehicles and equipment would avoid areas known to contain invasive species. In addition, all out-of-area vehicles or equipment to be used onsite would be inspected for invasive nonnative species prior to use at Spaceport Camden (refer to Section 2.3, *Conservation Measures*).

4.4 Effects Analysis and Determination for ESA-Listed Species

4.4.1 Red-Cockaded Woodpecker

4.4.1.1 Construction

Currently, there is no suitable nesting habitat for RCWs on the Spaceport Camden site, as most of the upland areas are in young plantation pine (CH2MHill, 2015), and GDNR records did not indicate any RCWs within 3 miles of the site (GDNR, 2014). Although much of the area around the site is also degraded, there is the potential for RCWs, as the area is within the historical range of the RCW. Due to the degraded

condition of upland habitats at the Spaceport Camden site, it is unlikely that RCWs would nest or forage at the site; thus, no direct impacts or habitat impacts are anticipated. As described in Section 4.2.1, *Construction*, any RCWs near the site may be disturbed by construction noise, particularly from pile-driving activities, which may elicit a startle response. This would result in extra energy expenditure, with the bird likely moving to an adjacent area to forage, but noise related to construction would be short term and temporary, and thus insignificant. Therefore, construction activities **may affect but are not likely to adversely affect** the RCW due to the potential for noise disturbance during construction activities.

4.4.1.2 Operations

There are no known occurrences of RCWs within a 3-mile radius (GDNR, 2016b), and there is no suitable habitat for RCWs within the Spaceport Camden site (CH2MHill, 2015). Due to the small size of the parcel, the degraded condition of the forests on and around the site, the amount of resources that would be required to manage the site for woodpeckers, and the planned use of the site for launches, it is not anticipated this site will ever support RCWs. However, if RCWs are located within an 8-mile radius, they would be exposed to short-duration (from seven seconds up to five minutes) noise levels ranging from 70 to 117 dBA (Exhibit 2-17 through Exhibit 2-21). As described in Section 4.2.2, *Operations*, these noise levels could temporarily interfere with normal behaviors such as breeding, feeding, or sheltering and cause increased stress resulting in extra caloric expenditure. This could also leave offspring or nests vulnerable to predators (i.e., feral cats, coyotes); however, predators would also likely be disturbed by increased noise levels. Due to the short duration and infrequency of high noise levels, the behavioral effects would be temporary, and bird species would be expected to resume normal behavior after the disturbance was over. Potential effects from operations on the RCW are expected to be insignificant; therefore, operations **may affect but are not likely to adversely affect** the RCW.

4.4.2 Eastern Indigo Snake

4.4.2.1 Construction

Eastern indigo snakes have been documented at the Spaceport Camden site and may be found in areas surrounding the site. Indigo snakes are vulnerable to direct physical impacts, noise, human presence, and habitat loss/degradation/fragmentation. As discussed in Section 4.3.1, *Construction*, there would be a permanent loss of habitat at the four facility sites and in the areas cleared for infrastructure and increased fragmentation of their habitat. The physical footprint of the facilities and infrastructure would result in the permanent removal of approximately 58 acres of pine plantation, 38 acres of maritime forest, 1.3 acres of interdunal wetlands, and 0.3 acre of savanna and flatwoods, which is suitable habitat for the indigo snake (Table 4-2; Exhibit 2-26). Indigo snakes would likely use similar adjacent habitats; however, they may be subject to increased predation or competition pressures in these areas. Also, the indigo snakes could be more vulnerable to cold temperatures if the habitat remaining for them lacks gopher tortoise burrows, which are important refugia areas for indigo snakes. The USFWS recommends measures to avoid or minimize effects to the indigo snake, such as a prescribed fire, to improve habitat at the site for the indigo snake (USFWS, 2017). Measures to offset impacts to the indigo snake will be developed within the comprehensive PSHMP in cooperation with the USFWS and GDNR (refer to Section 2.3, *Conservation Measures*).

Indigo snakes may be crushed or struck by vehicles, equipment, or personnel; therefore, surveys would be conducted prior to commencing construction. Any indigo snakes found would be relocated to nearby suitable habitat that has gopher tortoises and tortoise burrows. The construction area would be fenced using silt fencing, which would help prevent indigo snakes from reentering the construction site but would increase fragmentation of their habitat. Potential vehicle strikes on the roads accessing the site would be minimized through reduced speed limits and the education of personnel through protected species briefings, which would address the requirement to avoid harming, harassing, or killing the indigo snake. Noise and human presence would likely cause indigo snakes to move away from the construction area, thus reducing the potential for direct impacts to the snake. Potential effects from construction on eastern indigo snake are expected to be insignificant; therefore, construction activities **may affect but are not likely to adversely affect** the eastern indigo snake.

4.4.2.2 Operations

Impacts to the eastern indigo snake from daily operations would be similar to those described for terrestrial animals in Section 4.3.2, *Operations*. Indigo snakes would be vulnerable to vehicle strikes on roads from commuters and ground transportation support vehicles. The likelihood of such occurrences would be reduced by relocation of indigo snakes during construction and by fencing the launch site perimeter (or the western boundary). Personnel would be notified and provided with photos to identify sensitive species to avoid during daily operations and during launch closure procedures (refer to Section 2.3, *Conservation Measures*). In addition, signs indicating the potential presence of indigo snakes and the posting of low speed limits on roads would reduce the potential for vehicle strikes.

Although snakes are not sensitive to sound pressure, they are sensitive to sound-induced vibrations. They sense vibrations associated with ground and airborne sound as transmitted through their jaw, skull, and lungs. Christensen et al. (2012) found that snakes were most sensitive to low frequencies between 80 to 160 Hz (19 dB to 22 dB). Eastern indigo snakes within an 8-mile radius of the launch site would be exposed to noise levels ranging from 70 to 117 dB. The study also found that snakes responded to 80-Hz vibrations produced in the ground by the airborne sound, but the vibrations produced in the surface by higher frequencies were too weak for snakes to respond. Sound pressure-induced vibrations from pre-launch, launch, and landing activities would not affect eastern indigo snakes. Because eastern indigo snakes would be relocated and are unlikely to be affected during operations, potential effects to an eastern indigo snake from operations are discountable. Therefore, operational activities **may affect but are not likely to adversely affect** the eastern indigo snake.

4.4.3 Wood Stork

4.4.3.1 Construction

Construction activities may disturb wood storks by human presence and noise. Construction activities may also result in indirect effects to wood storks if a wood stork collided with a power line or lightning tower collisions and may. As discussed in Section 4.3.1, *Construction*, there would be a permanent loss of habitat at the four facility sites. These areas are not suitable habitat for the wood stork; thus, habitat impacts from land clearing are not anticipated for wood storks. Wood storks have been documented on and near the Spaceport Camden site. Historically, they have been seen foraging at the borrow pit near the landfill, in the wet weather pond near the southern boundary of the site, and along shallows and mudflats along

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Todd Creek (CH2MHill, 2015), but wood storks may vary the areas they use for foraging and roosting based on environmental conditions. Surveys for nesting, roosting, and foraging areas would occur prior to construction to determine current use of the area.

If present during construction, wood storks may flush from the area due to noise and visual presence. Eggs or downy young may die quickly (in less than 20 minutes) if they are exposed to direct rain or sun (USFWS, 1990). Thus, activities that startle nesting storks may result in egg or young mortality if parents remain away from the nest for more than 20 minutes. Feeding birds would expend extra energy to move to nearby feeding areas where disturbance levels were less. Once construction begins, it is unlikely that storks would move into the area; however, if this were to occur, personnel would need to follow the USFWS guidelines detailed in Section 2.3, *Conservation Measures*. The close spacing of repeated disturbances in the area have the potential to cause abandonment of nesting, roosting, and feeding areas. Repeated loud noises, such as those associated with pile driving, have the potential to lead to abandonment of nests and feeding areas. Pile driving activities would occur for a month at the launch pad site and the landing pad site. The nearest wood stork colony to the Spaceport Camden site is over 5 miles to the north; however, if wood storks are within 0.5 mile of pile driving activities, then the repeated loud noises could disturb storks and potentially lead to the abandonment of these areas. As noted, wood storks have been spotted at the site, with prior Temik® insecticide manufacturing activities in the near vicinity (approximately 80 employees), including the southern boundary of the site (Nelson, 2017). Therefore, wood storks may continue using the site for feeding opportunities.

Wood storks are particularly sensitive to wetland changes that affect food availability. It is important that wetlands used for nesting remain flooded, as this is a significant defense against mammalian predators. Direct hydrologic changes would occur in up to 2.45 acres of wetlands due to construction, and alterations in flow rates may result from stormwater runoff. Although no wood stork nesting has been documented at the site, stormwater runoff would be directed into retention ponds to avoid such impacts to natural wetlands.

There would be the potential for collisions with power lines and lightning towers; however, these would be designed per the *Recommended Best Practices for Communication Tower Design, Siting, Construction, Operation, Maintenance, and Decommissioning* (USFWS, 2016a) and the guidelines for Avian Protection Plans (APLIC and USFWS, 2005) to the greatest extent possible. The USFWS stated that impacts from artificial lighting are not likely to modify wood stork behavior, as wood storks are known to occur near airports (USFWS, 2017). To minimize the potential for effects, lighting systems would be designed and operated using best practices for wildlife, as described in Section 2.2.1.2, *Infrastructure*.

USFWS habitat management guidelines discourage construction of tall transmission towers within 3 miles of active wood stork colonies and removal of timber/vegetation, buildings, roadways, and power lines within 1,500 feet of active colonies (USFWS, 1990). The nearest wood stork colony to the Spaceport Camden site is over 5 miles to the north; thus, construction activities are not anticipated to impact nesting colonies (Exhibit 2-27). If a new colony were to establish within the zones discussed above prior to construction, construction activities would follow the USFWS habitat management guidelines for the wood stork (USFWS, 1990) during the nesting period in Camden County (late February to July or August) to minimize potential impacts such as temporary or permanent nest abandonment (refer to Section 2.3, *Conservation Measures*). If feeding sites are established in the area, human activity would remain from

300 feet away (where vegetation screen is present) to 750 feet away (where no vegetation screen). If roosting sites are established, then human activities would be avoided within 500 to 1,000 feet of roost sites during seasons of the year and times of day that storks might be present, particularly at night.

Because wood storks do not nest near the proposed Spaceport Camden site and are not regular visitors to the site, potential effects from construction on wood storks are expected to be discountable. If a foraging wood stork was near the area during construction, effects would be insignificant. Therefore, construction activities **may affect but are not likely to adversely affect** the wood stork.

4.4.3.2 Operations

Impacts to wood storks from Spaceport Camden operations would be similar to those described in Sections 4.1.2, 4.2.2, 4.3.2, 4.4.3.1, including potential impacts to feeding, roosting, and nesting due to noise and visual disturbance. Wood storks have been documented within a 3-mile radius of the Spaceport Camden site (GDNR, 2016b). To minimize adverse impacts to wood storks, the USFWS has identified management zones and guidelines for activities in close proximity to rookeries, foraging areas, and roosting sites (USFWS, 1990), which Spaceport Camden would follow. A major concern for the USFWS is that wood stork eggs or downy young may die quickly (in less than 20 minutes) if they are exposed to direct rain or sun (USFWS, 1990). Thus, any launches that startle nesting storks may result in egg or young mortality if parents remain away from the nest for more than 20 minutes. Noise, sound pressure-induced vibration, and visual effects from pre-launch, launch, and landing activities may cause birds to flush from the area, but would last less than five minutes over the 8-mile range up to 36 times per year. This effect could temporarily interfere with normal behaviors such as breeding, feeding, or sheltering and cause increased stress, resulting in extra caloric expenditure. Due to the short duration and infrequency of high noise levels, the behavioral effects would be temporary, and bird species would be expected to resume normal behavior after the disturbance was over. Monitoring of wood storks would be conducted within the area of impact of the vertical launch or landing area the day before and the day after the event; measures to offset impacts to the wood stork will be developed within the comprehensive Protected Species and Habitat Management Plan in cooperation with the USFWS and GDNR (refer to Section 2.3, *Conservation Measures*). Potential effects from operations on wood storks are expected to be insignificant; therefore, operations **may affect but are not likely to adversely affect** the wood stork.

4.4.4 Piping Plover and Red Knot

4.4.4.1 Construction

The closest area where piping plovers and red knots are known to forage is Cumberland Island National Seashore. None of the proposed construction areas are located in or near piping plover or red knot foraging habitat or piping plover critical habitat. Construction activities would have **no effect** on piping plovers or red knots and **no effect** on piping plover critical habitat.

4.4.4.2 Operations

Impacts to piping plover and red knot from Spaceport Camden operations would be similar to those described in Section 4.2.2, *Operations*. Piping plover and red knots are known to inhabit Cumberland Island and may flush from the area due to noise and visual presence associated with pre-launch, launch, and landing activities. However, these noise impacts would be short term, lasting less than five minutes over the 8-mile range and occur up to 36 times per year. In addition, in a previous ESA Section 7

consultation between the USFWS and the National Aeronautics and Space Administration (NASA) for proposed launches at the Wallops Flight Facility, Virginia, it was determined that due to the short duration of disturbance and the limited number of launches, no significant impacts would be expected (NASA, 2005). Monitoring of snowy plovers (a similar species) during more than 20 rocket launches from Vandenberg Air Force Base has shown no adverse effects to nesting or wintering snowy plovers (Vandenberg Air Force Base, 2009). Thus, potential effects from operations on piping plover and red knot are expected to be insignificant. Therefore, operations **may affect but are not likely to adversely affect** the piping plover and red knot; operations would have **no effect** on piping plover critical habitat.

4.4.5 West Indian Manatee

4.4.5.1 Construction

Manatees typically occupy the nearshore shallow waters of the southeastern U.S. Atlantic coast. None of the proposed construction areas would occur within manatee habitat. Construction activities would occur approximately 840 feet to the southeast of Floyd Basin and 200 feet west of Floyd Creek. Turbidity and chemicals associated with stormwater runoff have the potential to impair feeding and physiological functions of manatees. Stormwater runoff during construction activities would be minimized by following the CSS to the GSMM, which includes techniques to hold, diffuse, and slow the velocity of stormwater. Therefore, construction activities would have **no effect** on the West Indian manatee.

4.4.5.2 Operations

A launch event may increase boat traffic during clearance of ocean areas and from spectators who want to watch launch events which would increase the risk for manatee boat strikes. Spaceport personnel would also use boats during an ocean landing if a barge is used as a landing platform for the first stage. This could occur up to 12 times annually. The number of potential spectators on boats is unknown and would likely vary between each launch event. Security boats would clear an area out to 60 miles from shore. Security personnel would restrict boat speed to 10 knots or less in areas where manatees may occur, such as shallow, nearshore, vegetated areas. If a manatee is observed while performing closure or recovery activities, security boats would maintain a 50-foot distance from the observed manatee(s) and would not pass over a submerged manatee. Furthermore, impacts to manatees would be avoided or minimized through the use of an educational outreach program to inform spectators about manatees in the area and why and how to avoid them. Manatees do not occupy offshore waters of the Atlantic Ocean where water landings are proposed to occur.

Chemical degradation of manatee habitat areas from spills is not likely to occur, as the Vertical Launch Facility would be approximately 840 feet to the southeast of Floyd Basin and 200 feet west of Floyd Creek and preventative measures to prevent spills would be implemented. Access restrictions from monitoring, including the rescue of distressed manatees, is also considered unlikely given that launch events involving closure of water areas around Camden County would occur up to 36 times a year. The spaceport operator would coordinate with the USFWS prior to each launch event to ensure all conflicts associated with access restrictions are resolved prior to launch day. Potential effects from operations on manatees are expected to be discountable; therefore, operations **may affect but are not likely to adversely affect** the manatee.

4.4.6 Sea Turtles

4.4.6.1 Construction

Sea turtles occur in the nearshore and offshore areas of the Atlantic Ocean and are known to nest along the Cumberland Island National Seashore. None of the proposed construction areas are located along the Atlantic shoreline or near known sea turtle nesting habitat. Therefore, construction activities would have **no effect** on sea turtles or loggerhead critical habitat.

4.4.6.2 Operations

Impacts to nesting sea turtles from pre-launch, launch, and landing activities would be similar to those described in Section 4.2.2, *Operations*, regarding noise impacts. The time of greatest potential impacts from pre-launch, launch, and landing activities to sea turtles would be at night during the nesting season (May 1 to October 31).¹⁸ Operations at the spaceport and the one nighttime annual launch have a low potential to affect the behavior of adult female sea turtles approaching the beach to select a suitable nesting site, as the spaceport would be over 5.5 miles from Cumberland Island. Effects from launches would be discountable as the probability of female turtles and hatchlings using the beach at the time of a launch is low. Nesting and hatchling sea turtles have a potential for disorientation due to artificial light from general operations. Tower lighting may be visible from Cumberland Island, and, therefore, lighting systems would be designed and operated to reduce light pollution (urban glow). Access restrictions due to typical closure periods during launches and landings (approximately four to six hours) should not prevent Cumberland Island National Seashore biologists and volunteers from identifying and marking sea turtle nests, given the advanced planning and stakeholder coordination processes to be implemented. Noise from pre-launch, launch, and landing activities would last less than five minutes over the 8-mile range, and only one out of the 12 launches would occur at night. Potential effects from operations on sea turtles are expected to be discountable. Therefore, operations **may affect but are not likely to adversely affect** the nesting or hatchling sea turtles and would have **no effect** on loggerhead critical habitat.

4.5 Effects Analysis for Candidate Species

4.5.1 Gopher Tortoise

4.5.1.1 Construction

Gopher tortoises are known to occur on and near the Spaceport Camden site. Gopher tortoises may be affected by direct physical impacts, noise, human presence, and habitat loss/degradation/fragmentation. As discussed in Section 4.3.1, *Construction*, the footprints for the four facilities and associated infrastructure would result in habitat loss and fragmentation. The physical footprint of the facilities and infrastructure would result in the permanent removal of approximately 58 acres of pine plantation, 38 acres of maritime forest, and 0.3 acre of savanna and flatwoods, which is suitable habitat for the gopher tortoise (Table 4-2; Exhibit 2-26). Surveys would be conducted within 30 days of initiation of clearing within the footprints for the facilities, infrastructure, rights-of-way, fencing, staging areas, and any other areas cleared. The County would coordinate gopher tortoise relocations through the GDNR and follow established relocation protocol (FWC, 2017). These relocations would stress the gopher tortoises, and the establishment of new burrows would require extra energy expenditure. Quality and quantity of forage

¹⁸ The leatherback sea turtle is a daytime nester; however, occurrences are rare within the action area (GDNR, 2016b).

resources and proximity to other tortoises must be considered to avoid negative impacts to feeding and breeding activity. The USFWS has suggested measures to avoid or minimize effects to the gopher tortoise, such as a prescribed fire, to improve habitat at the site for the gopher tortoise (USFWS, 2017). Measures to offset impacts to the gopher tortoise will be developed within the comprehensive PSHMP in cooperation with the USFWS and GDNR (refer to Section 2.3, *Conservation Measures*).

Gopher tortoises may be crushed or struck by vehicles, equipment, or personnel. The likelihood of such occurrences would be reduced by relocation of gopher tortoises from the construction areas and subsequent fencing of the construction areas. Potential vehicle strikes on the roads accessing the site would be minimized by reduced speed limits and the education of personnel through protected species briefings, which would address the requirements to avoid harming, harassing, or killing gopher tortoises and avoid gopher tortoise burrows by at least 4 meters. Noise and human presence may cause gopher tortoises to avoid construction areas, and they may have to expend excess energy to forage in new areas and establish new burrows. Any potential effects to gopher tortoises are expected to be insignificant; therefore, construction activities **may affect but are not likely to adversely affect** the gopher tortoise.

4.5.1.2 Operations

Impacts to the gopher tortoise from daily operations would be similar to those described in Section 4.2.2, *Operations*. Gopher tortoises would be vulnerable to vehicle strikes on roads from commuters and ground transportation support vehicles. The likelihood of such occurrences would be reduced by relocation of gopher tortoises during construction and by fencing of the launch site perimeter (or the western boundary). Personnel would be notified and provided with photos to identify sensitive species to avoid during daily operations and during closure procedures (refer to Section 2.3, *Conservation Measures*). In addition, signs indicating possible presence of gopher tortoise and low speed limits on roads would reduce the potential for vehicle strikes. Potential effects from operations are expected to be discountable. Therefore, operational activities **may affect but are not likely to adversely affect** the gopher tortoise.

4.5.2 Striped Newt

4.5.2.1 Construction

The closest known location of striped newt is 2.9 miles west of the Spaceport Camden site (GDNR, 2014). Striped newts have not been documented at the Spaceport Camden site, but ephemeral depression ponds between the airstrip and landfill may be suitable habitat (CH2MHill, 2015). None of these ponds would be affected by construction activities, and these areas are now degraded by the bedding and planting of pine plantations. If striped newts were to be found at or near the facility locations, there would be the potential for habitat loss/degradation, direct physical impacts from equipment and fill material, and physiological stress from water quality degradation. However, the USFWS believes the likelihood of striped newts at the site is low. The USFWS has suggested measures to avoid or minimize effects to the striped newt, such as a prescribed fire management plan, to improve habitat at the site for the striped newt (USFWS, 2017). Per Section 2.3, *Conservation Measures*, the Spaceport Camden site would be surveyed prior to construction. In the unlikely event that striped newts are found, then the USFWS would be contacted to determine future actions. Potential effects are expected to be discountable; therefore, construction activities **may affect but are not likely to adversely affect** the striped newt.

4.5.2.2 Operations

Although not expected, a launch-induced wildfire has the potential to negatively affect the striped newt if fire suppression equipment is necessary; newts may be directly impacted, hydrology in wetlands may be altered, and water quality temporarily degraded. However, any identified newt habitat would be delineated as sensitive and indicated as areas where fire suppression equipment should not be used. Potential effects from operations on striped newt are expected to be discountable; therefore, operations may affect but are not likely to adversely affect the striped newt.

5.0 Effects Summary

Effects determinations to listed species are listed in Table 6-1. Camden County and the future Spaceport Operator would implement the conservation measures listed in Section 2.3, *Conservation Measures*, to minimize potential adverse effects from construction and operational activities. Overall, the construction and operation of Spaceport Camden is not expected to adversely affect ESA-listed or candidate species and critical habitat.

Table 6-1. Summary of Effects Determinations

Species	ESA Status	Effects Determinations
Striped newt	C	Construction and operational activities may affect but are not likely to adversely affect the striped newt.
Eastern indigo snake	T	Construction and operational activities may affect but are not likely to adversely affect the eastern indigo snake.
Gopher tortoise	C	Construction and operational activities may affect but are not likely to adversely affect the gopher tortoise.
Wood stork	T	Construction and operational activities may affect but are not likely to adversely affect the wood stork.
Red-cockaded woodpecker	E	Construction and operational activities may affect but are not likely to adversely affect the red-cockaded woodpecker.
Red knot	T	Construction activities would have no effect on the red knot. Operational activities may affect but are not likely to adversely affect the red knot.
Piping plover	T, CH	Construction activities would have no effect on the piping plover and would not affect piping plover critical habitat. Operational activities may affect but are not likely to adversely affect the piping plover and would not affect piping plover critical habitat.
Manatee	T	Construction activities would have no effect on the manatee. Operational activities may affect but are not likely to adversely affect the manatee.
Loggerhead sea turtle	T, CH	Construction activities would have no effect on the loggerhead sea turtle and would not affect loggerhead sea turtle critical habitat. Operational activities may affect but are not likely to adversely affect the loggerhead sea turtle and would not affect loggerhead sea turtle critical habitat.
Green sea turtle	T	Construction activities would have no effect on the green sea turtle. Operational activities may affect but are not likely to adversely affect the green sea turtle.
Leatherback sea turtle	E	Construction activities would have no effect on the leatherback sea turtle. Operational activities may affect but are not likely to adversely affect the leatherback sea turtle.

Notes: C = candidate; CH = critical habitat; E = endangered; ESA = Endangered Species Act; T = threatened.

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The USFWS would be notified immediately if any of the actions considered in this BA were to be modified or if additional information on ESA-listed species became available, as a re-initiation of consultation may be required. If impacts to listed species or critical habitat occur beyond what has been considered in this assessment, all construction/operation activities would cease and the USFWS would be notified. Any modifications or conditions resulting from consultation with the USFWS would be implemented prior to commencement of construction/operation activities.

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Biological Assessment

Spaceport Camden
Camden County, Georgia

October 2017

d. Artificial Lighting Management

The goal for artificial light management is to minimize to the extent possible visibility of facility glow, sky glow, or direct light to sea turtle nesting beaches. The objectives for the program would be to (1) provide clear guidance to project and/or facility managers, (2) determine the extent of sky glow/direct lighting from spaceport operations, and (3) identify corrective actions. This module would provide details on spaceport lighting (e.g., type [wavelengths, etc.] and location of lights via a plan drawing of exterior lighting), timing and positioning considerations for exterior lighting, measures to minimize light glow (shielding mechanisms, directed lighting, etc.), and processes and procedures for lighting installation and management. Additionally, the module would include lighting-related measures listed below for construction and operations, as well as applicable terms and conditions identified by the USFWS resulting from this consultation. Camden County would consult the International Dark-Sky Association or another similar professional organization when developing the lighting design and management module for the spaceport.

e. Environmental Education

The goal of the environmental education program is to provide a comprehensive natural resources-related education program for spaceport employees, contractors, launch applicants, and visitors. The objectives supporting this goal include 1) educating personnel on the sensitive habitats and species present at the site, and associated avoidance and impact minimization requirements for spaceport activities, 2) tracking training/education (e.g., utilization of rosters/sign-in sheets, etc.), and 3) ensuring compliance of the habitat and species management programs. The module would support these objectives by including educational materials that Camden County would develop to train spaceport employees and educate visitors about protected species, how to avoid affecting protected species, and what to do if a protected species is encountered (see related educational measure below in Section 2.3.2, *Construction Measures*). The employee training materials would also highlight the civil and criminal penalties for harming, harassing, or killing a federally listed species.

2. Camden County and the current land owners are mutually considering a form of conservation easement on portions of the proposed spaceport site. The overall site is approximately 4,000 acres; currently Camden County has set aside approximately 90 percent of the spaceport site (3,600 acres) for potential conservation easement, identified in Exhibit 2-24. The details of the conservation easement will be finalized prior to transferring ownership of the property to Camden County.

2.3.2 Construction Measures

1. Surveys¹⁵ for gopher tortoise, indigo snake, striped newt, red-cockaded woodpecker (RCW), and wood stork would be required at least 30 days before construction. Surveys would cover all areas within or near land disturbance footprints and identify all suitable habitat for each species, presence/absence of the species, and confirm locations of nest sites, roost sites, and burrows. Appropriate buffers or relocation of species would be coordinated with the USFWS and GDNR. Species surveys would be discussed in the PSHMP.

¹⁵ Surveys would consider seasonal species requirements to ensure surveys are accurate and relevant (USFWS, 2017).

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ponds to breed and live as aquatic adults until the ponds dry, forcing them back to land. Striped newts feed on crustaceans, insects, and frog eggs (GDNR, 2016a).

The range of the striped newt extends from the Georgia side of the Savannah River into northern and peninsular Florida. Where they are found within the Coastal Plain of Georgia, major threats include agricultural and pine plantation conversion, fire suppression, and wetland alteration. Striped newts have not been documented within the construction action area, but they may occur in the oak hammocks between the airstrip and landfill (Exhibit 2-26); this area contains ephemeral depression ponds that historically were surrounded by native pine forest (CH2MHill, 2015). However, these areas are now degraded by the bedding and planting of pine plantations. According to the USFWS, two newts were found on the adjacent property and similar habitats are anticipated on the project site (USFWS, 2015); the USFWS has determined that soils, topography and wetlands on the project site are typical for striped newt habitat (USFWS, 2018). ~~However, these areas are now degraded by the bedding and planting of pine plantations. The site would be surveyed prior to construction to confirm that striped newts are not present in the construction action area; they have been found on the adjacent property during a 2008 survey (USFWS, 2017).~~

3.2 Eastern Indigo Snake

The federally threatened eastern indigo snake (*Drymarchon corais couperi*) is a wide-ranging snake primarily found in sandhills habitat, but during warmer months it may also be found in stream bottoms, swamps, and flatwoods. The average home range of the indigo snakes varies by season, with an individual using up to 100 hectares for foraging during late summer and fall and as limited a range as 10 hectares during the winter (NatureServe, 2016). Indigo snakes frequently utilize gopher tortoise burrows as refugia from cold temperatures in winter, for egg laying, and for protection during shedding when they are more vulnerable to predation. Mating occurs from November through March, and eggs are laid in late spring and hatch approximately three months later. Indigo snakes feed on small mammals, snakes, frogs, birds, and other small vertebrates.

The current range from the indigo snake includes southern Georgia and Florida, with rare occurrences in Alabama, Mississippi, and South Carolina. Critical habitat for the indigo snake does not occur within the action area. Habitat destruction and fragmentation are the primary threats to this species. The indigo snake has been found within the construction action area in the sandy portions that extend south from Todd Creek to the abandoned airstrip (Exhibit 2-26) and may be found throughout the site, both in wetlands and uplands, particularly in areas with gopher tortoise burrows (CH2MHill, 2015). The indigo snake uses gopher tortoise burrows during the cold weather months and forages in wetlands during warm weather months.

3.3 Gopher Tortoise

The gopher tortoise (*Gopherus polyphemus*) is a Federal candidate species in the eastern portion of its range (east of the Mobile and Tombigbee Rivers). The 12-month finding on a petition to list it as threatened within its eastern range stated that the listing of the gopher tortoise is warranted. However, listing is currently precluded by higher-priority actions, and a proposed rule to list the gopher tortoise will be developed as priorities allow.

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for the gopher tortoise (Table 4-2; Exhibit 2-26). Surveys would be conducted within 30 days of initiation of clearing within the footprints for the facilities, infrastructure, rights-of-way, fencing, staging areas, and any other areas cleared. The County would coordinate gopher tortoise relocations through the GDNr and follow established relocation protocol (FWC, 2017). These relocations would stress the gopher tortoises, and the establishment of new burrows would require extra energy expenditure. Quality and quantity of forage resources and proximity to other tortoises must be considered to avoid negative impacts to feeding and breeding activity. The USFWS has suggested measures to avoid or minimize effects to the gopher tortoise, such as a prescribed fire, to improve habitat at the site for the gopher tortoise (USFWS, 2017). Measures to offset impacts to the gopher tortoise will be developed within the comprehensive PSHMP in cooperation with the USFWS and GDNr (refer to Section 2.3, *Conservation Measures*).

Gopher tortoises may be crushed or struck by vehicles, equipment, or personnel. The likelihood of such occurrences would be reduced by relocation of gopher tortoises from the construction areas and subsequent fencing of the construction areas. Potential vehicle strikes on the roads accessing the site would be minimized by reduced speed limits and the education of personnel through protected species briefings, which would address the requirements to avoid harming, harassing, or killing gopher tortoises and avoid gopher tortoise burrows by at least 4 meters. Noise and human presence may cause gopher tortoises to avoid construction areas, and they may have to expend excess energy to forage in new areas and establish new burrows. Any potential effects to gopher tortoises are expected to be insignificant; therefore, construction activities **may affect but are not likely to adversely affect** the gopher tortoise.

4.5.1.2 Operations

Impacts to the gopher tortoise from daily operations would be similar to those described in Section 4.2.2, *Operations*. Gopher tortoises would be vulnerable to vehicle strikes on roads from commuters and ground transportation support vehicles. The likelihood of such occurrences would be reduced by relocation of gopher tortoises during construction and by fencing of the launch site perimeter (or the western boundary). Personnel would be notified and provided with photos to identify sensitive species to avoid during daily operations and during closure procedures (refer to Section 2.3, *Conservation Measures*). In addition, signs indicating possible presence of gopher tortoise and low speed limits on roads would reduce the potential for vehicle strikes. Potential effects from operations are expected to be discountable. Therefore, operational activities **may affect but are not likely to adversely affect** the gopher tortoise.

4.5.2 Striped Newt

4.5.2.1 Construction

According to GDNr data, the closest known location of striped newt is 2.9 miles west of the Spaceport Camden site (GDNr, 2014). According to the USFWS, two newts were found on the adjacent property and similar habitats are anticipated on the project site (USFWS, 2015). Striped newts have not been documented at the Spaceport Camden site, but ephemeral depression ponds between the airstrip and landfill may be suitable habitat (CH2MHill, 2015), and the USFWS has determined that soils, topography and wetlands on the project site are typical for striped newt habitat (USFWS, 2018). None of these

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ponds would be affected by construction activities, and these areas are now degraded by the bedding and planting of pine plantations. If striped newts were to be found at or near the facility locations, there would be the potential for habitat loss/degradation, direct physical impacts from equipment and fill material, and physiological stress from water quality degradation. ~~However, the USFWS feels that the likelihood of striped newts at the site is low.~~ There is 1.3 acres of intertidal wetland adjacent to maritime forest, listed in Table 4-2, to be cleared for the vertical launch facility that may be suitable striped newt habitat. It will be reviewed for suitability by a striped newt species expert and surveyed for newts if warranted. The USFWS has suggested measures to avoid or minimize effects to the striped newt, such as a prescribed fire management plan, to improve habitat at the site for the striped newt (USFWS, 2017). Per Section 2.3, *Conservation Measures*, the Spaceport Camden site would be surveyed prior to construction. Any isolated, ephemeral wetlands or similar features, which would include the isolated wetlands to the south of the airstrip and the wetland adjacent to the maritime forest, would be surveyed by a striped newt species expert if these areas were to be impacted by land disturbing activities. In the unlikely event that striped newts are found, then the USFWS would be contacted to determine future actions. Potential effects are expected to be discountable; therefore, construction activities **may affect but are not likely to adversely affect** the striped newt.

4.5.2.2 Operations

Although not expected, a launch-induced wildfire has the potential to negatively affect the striped newt if fire suppression equipment is necessary; newts may be directly impacted, hydrology in wetlands may be altered, and water quality temporarily degraded. However, any identified newt habitat would be delineated as sensitive and indicated as areas where fire suppression equipment should not be used. Potential effects from operations on striped newt are expected to be discountable; therefore, operations **may affect but are not likely to adversely affect** the striped newt.

5.0 Effects Summary

Effects determinations to listed species are listed in Table 5-1. Camden County and the future Spaceport Operator would implement the conservation measures listed in Section 2.3, *Conservation Measures*, to minimize potential negative effects from construction and operational activities. Overall, the construction and operation of Spaceport Camden would not result in significant impacts to listed species and critical habitat.

Table 5-1. Summary of Effects Determinations

Species	ESA Status	Effects Determinations
Striped newt	C	Construction and operational activities may affect but are not likely to adversely affect the striped newt.
Eastern indigo snake	T	Construction and operational activities may affect but are not likely to adversely affect the eastern indigo snake.
Gopher tortoise	C	Construction and operational activities may affect but are not likely to adversely affect the gopher tortoise.
Wood stork	T	Construction and operational activities may affect but are not likely to adversely affect the wood stork.
Red-cockaded woodpecker	E	Construction and operations may affect but are not likely to adversely affect the red-cockaded woodpecker.
Red knot	T	Construction activities would have no effect on the red knot.

References:

USFWS, 2015. Spaceport Camden scoping letter provided by USFWS. December 22, 2015.

USFWS, 2018. Email correspondence between Mr. Bill Wikoff, USFWS Biologist, and FAA regarding striped newt habitat. February, 2018.



U.S. Department
of Transportation
Federal Aviation
Administration

Office of Commercial Space Transportation

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FWS Log No.

2017-0488

October 31, 2017

Donald W. Imm, Ph.D.
U.S. Fish and Wildlife Service
Georgia Ecological Services
105 West Park Drive, Suite D
Athens, GA 30606

Based on information provided, we concur with your determination that the project is not likely to adversely affect federally-listed species. No further action is required under Section 7(a)(2) of the Endangered Species Act. However, consultation should be resumed if the project changes, a new species is listed, or new data shows impacts to listed species may occur.

for Donald W. Imm, Ph.D., Field Supervisor

February 12, 2018

Date

RE: Endangered Species Act Section 7 Consultation

Dear Dr. Imm:

The Federal Aviation Administration (FAA) is evaluating the Camden County Board of Commissioners' (County's) proposal to construct and operate a commercial space launch site—referred to as Spaceport Camden—in Camden County, Georgia. The County is proposing to construct the launch site over approximately 100 acres within an existing 11,800-acre site, consisting of property currently owned by the Union Carbide Corporation and Bayer CropScience. In order to operate a commercial space launch site, the County must obtain a Launch Site Operator License from the FAA. The FAA is currently assessing the potential environmental impacts of issuing a Launch Site Operator License to the County, including potential effects to species listed and critical habitat designated under the federal Endangered Species Act (ESA).

The FAA is submitting the attached Biological Assessment (BA) to fulfill requirements under section 7 of the ESA. The BA addresses potential effects from construction and operation of Spaceport Camden on eastern indigo snake (*Drymarchon corais couperi*), wood stork (*Mycteria americana*), red-cockaded woodpecker (*Picoides borealis*), piping plover (*Charadrius melodus*), red knot (*Calidris rufa*), West Indian manatee (*Trichechus manatus latirostris*), loggerhead sea turtle (*Caretta caretta*), green sea turtle (*Chelonia mydas*), leatherback sea turtle (*Dermochelys coriacea*), striped newt (*Notophthalmus perstriatus*), and gopher tortoise (*Gopherus polyphemus*). The FAA is conducting a separate informal consultation with the National Marine Fisheries Service for ESA-listed marine species.

The BA analyzes the potential direct and indirect effects to the listed species from construction; daily operations; and pre-launch, launch, and landing activities. In order to avoid or minimize potential effects to protected species, conservation measures outlined in the BA would be implemented through coordinated efforts by the FAA, County, and the future launch site operator. Based on the analysis in the BA, the FAA has determined that issuing a Launch Site Operator License to the County would not

adversely affect any ESA-listed or candidate species or critical habitat. The individual determinations of effect are summarized in the following table.

Species	ESA Status	Effects Determinations
Striped newt	C	Construction and operational activities may affect, but are not likely to adversely affect, the striped newt.
Eastern indigo snake	T	Construction and operational activities may affect, but are not likely to adversely affect, the eastern indigo snake.
Gopher tortoise	C	Construction and operational activities may affect, but are not likely to adversely affect, the gopher tortoise.
Wood stork	T	Construction and operational activities may affect, but are not likely to adversely affect, the wood stork.
Red-cockaded woodpecker	E	Construction and operational activities may affect, but are not likely to adversely affect, the red-cockaded woodpecker.
Red knot	T	Construction activities would have no effect on the red knot. Operational activities may affect, but are not likely to adversely affect, the red knot.
Piping plover	T, CH	Construction activities would have no effect on the piping plover and piping plover critical habitat. Operational activities may affect, but are not likely to adversely affect, the piping plover and would not affect piping plover critical habitat.
West Indian manatee	T	Construction activities would have no effect on the manatee. Operational activities may affect, but are not likely to adversely affect, the manatee.
Loggerhead sea turtle	T, CH	Construction activities would have no effect on the loggerhead sea turtle and would not affect loggerhead sea turtle critical habitat. Operational activities may affect, but are not likely to adversely affect, the loggerhead sea turtle and would not affect loggerhead sea turtle critical habitat.
Green sea turtle	T	Construction activities would have no effect on the green sea turtle. Operational activities may affect, but are not likely to adversely affect, the green sea turtle.
Leatherback sea turtle	E	Construction activities would have no effect on the leatherback sea turtle. Operational activities may affect, but are not likely to adversely affect, the leatherback sea turtle.

Notes: C = candidate; CH = critical habitat; E = endangered; ESA = Endangered Species Act; T = threatened.

We seek your written concurrence on our “may affect, not likely to adversely affect” determinations as summarized in the table above and detailed in the BA. Thank you for your assistance in this matter. Please contact Stacey Zee, FAA Environmental Specialist, at Stacey.Zee@faa.gov or (202) 267-9305 to discuss any questions or concerns.

Sincerely,



Daniel Murray
 Manager, Space Transportation Development Division

Attachment: Biological Assessment – Spaceport Camden