Final
Spaceport Camden
Environmental Impact Statement

June 2021

Federal Aviation Administration

Office of Commercial Space Transportation

SPACEPORT CAMDEN

FINAL

ENVIRONMENTAL IMPACT STATEMENT

CAMDEN COUNTY, GEORGIA

VOLUME I

EXECUTIVE SUMMARY AND CHAPTERS 1 – 11

June 2021

Prepared by:

Federal Aviation Administration

Office of Commercial Space Transportation

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DOCUMENT ORGANIZATION

VOLUME 1

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TITLE: Spaceport Camden Final Environmental Impact Statement (EIS), Camden County, Georgia

AGENCIES: Federal Aviation Administration (FAA) Office of Commercial Space Transportation, lead agency; National Aeronautics and Space Administration, cooperating agency; National Park Service, cooperating agency.

PUBLIC REVIEW PROCESS: FAA is publishing this Final EIS pursuant to the following public law requirements: Section 102(2)(C) of the National Environmental Policy Act of 1969 (NEPA) as amended (42 United States Code [U.S.C.] §§4321 et seq.); Council on Environmental Quality (CEQ) NEPA-implementing regulations (40 Code of Federal Regulations Parts 1500–1508); Section 4(f) of the Department of Transportation (DOT) Act (49 U.S.C. §303); Section 106 of the National Historic Preservation Act (54 U.S.C. §§300101 et seq.); FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures;* Executive Order (EO) 11988, *Floodplain Management*; DOT Order 5650.2, *Floodplain Management and Protection*; EO 11990 *Protection of Wetlands*; DOT Order 5660.1A, *Preservation of the Nation's Wetlands*; and the Coastal Zone Management Act. In this Final EIS, FAA has provided responses to comments on the Draft EIS. In accordance with the applicable requirements, FAA is initiating the 30-day pre-decisional waiting period for the Final EIS. The U.S. Environmental Protection Agency's Notice of Availability of the Final EIS, published in the *Federal Register*, starts the 30-day waiting period. FAA is not required to respond to comments on the Final EIS; however, all comments received will become part of the administrative record and will be considered during the decision-making process.

The Final EIS and more information about public involvement may be found at the FAA website: https://www.faa.gov/space/environmental/nepa_docs/camden_eis/.

DEPARTMENT OF TRANSPORTATION, FEDERAL AVIATION ADMINISTRATION, ABSTRACT: The Final EIS for the proposed spaceport (Spaceport Camden) in Camden County, Georgia, incorporates modifications to the Proposed Action from the Draft EIS, as well as addresses applicable public and agency review comments on the Draft EIS. Modifications include the following: (1) change from medium-large launch vehicles to small launch vehicles as defined in Title 14 Code of Federal Regulations Part 420; (2) removal of first-stage returns and ocean landings; and (3) change from an 83- to 115-degree trajectory range to a single 100-degree trajectory. Guidance contained in the CEQ Regulations and FAA Order 1050.1F requires the preparation of a Supplemental EIS if the agency makes substantial modifications in the proposed action that are relevant to environmental concerns or there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts. FAA made its decision to prepare a Final EIS, rather than a Supplemental or revised Draft EIS, in part based on its belief that the modifications to the Proposed Action associated with the Camden County Board of Commissioners' (the County's) amended application were not "substantial" in the context of presenting new or additional potential impacts beyond the scope already addressed in the Draft EIS. The Final EIS evaluates the potential environmental impacts that may result from FAA's Proposed Action of issuing a Launch Site Operator License to the County, which would allow the County to offer Spaceport Camden to commercial launch operators to conduct launches of liquid-fueled, small, orbital, vertical-launch vehicles on a site the County would purchase for the spaceport. Development of the launch site includes construction of supporting buildings and infrastructure. Operations would include up to 12 vertical launches, up to 12 wet dress rehearsals, and up to 12 static fire engine tests per year. Alternatives under consideration include the Proposed Action and the No Action Alternative. Under the No Action Alternative, FAA would not issue a Launch Site Operator License to the County, the County would not purchase the site, and no activities related to constructing or operating a commercial spaceport would occur at the site. The Proposed Action is the Preferred Alternative.

FOR FURTHER INFORMATION: Requests for information regarding this document should be directed to Ms. Stacey M. Zee, FAA Environmental Specialist, Spaceport Camden EIS, Federal Aviation Administration, 800 Independence Ave SW, Washington, DC 20591, or via email at spaceportcamdeneis@icf.com.

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Executive Director, Office of Operational Safety

June 15, 2021

Date

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EXECUTIVE SUMMARY

The Federal Aviation Administration (FAA) Office of Commercial Space Transportation (AST) has prepared this Final Environmental Impact Statement (EIS) to evaluate the potential environmental impacts that may result if FAA issues a Launch Site Operator License to the Camden County Board of Commissioners (the County) to operate a commercial space launch site, called Spaceport Camden, on the Atlantic seaboard in Camden County, Georgia (Exhibit ES-1).

FAA released a Draft EIS in 2018 for public and agency review, the scope of which addressed the potential environmental impacts associated with development of a spaceport and the launching of medium-large launch vehicles at trajectories between 83 and 115 degrees from true north. Since the conclusion of the Draft EIS public comment period, the County made the following modifications to the Spaceport Camden Launch Site Operator License Application, submitted to FAA in January 2020:

- Change from medium-large launch vehicles to small launch vehicles, as defined in Title 14 Code of Federal Regulations (CFR) Part 420; this is due to further feasibility analyses based on perceived market demand as well as, in part, public input.
- Removal of first-stage returns and ocean landings; this is because all current small launch vehicles are expendable.
- Change from an 83- to 115-degree trajectory range to a single 100-degree trajectory; addressing one trajectory is compliant with the requirements of 14 CFR §420.19. Future Launch Operator License applications would require additional environmental review under the National Environmental Policy Act (NEPA) by FAA before such licenses would be authorized.

Guidance contained in the Council on Environmental Quality (CEQ) Regulations Implementing the Procedural Provisions of the National Environmental Policy Act and in FAA Order 1050.1F, Environmental Impacts: Policies and Procedures, requires the preparation of a Supplemental EIS if the agency makes substantial modifications in the proposed action that are relevant to environmental concerns or there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts. See 40 CFR §1502.9(c)(1) and FAA Order 1050.1F, Section 9-3. FAA made its decision to prepare a Final EIS, rather than a Supplemental or revised Draft EIS, in part based on its belief that the modifications to the Proposed Action associated with the County's amended application were not "substantial" in the context of presenting new or additional potential impacts beyond the scope already addressed in the Draft EIS.

The County could offer the commercial space launch site to vertical launch vehicle operators for the orbital launch of small, liquid-propellant launch vehicles. Orbital launch vehicles are classified based on the maximum payload weight in pounds according to orbital inclination as defined in 14 CFR Part 420; at 90-degrees inclination: a small launch vehicle is less than or equal to 3,300 pounds; medium is greater than 3,300 to less than or equal to 8,400 pounds; a medium-large launch vehicle is greater than 8,400 to less than or equal to 15,000 pounds. Launch operations would include preparatory activities to ready and test launch vehicles and systems, including mission rehearsals and static tests.

The operation of commercial space launch sites are licensed by FAA under 14 CFR Part 420, and the County has applied to FAA for a Launch Site Operator License. Because issuance of this license would be a major Federal action, this EIS has been prepared by FAA's Office of Commercial Space Transportation to assist in its decision-making process as required by NEPA as amended (42 United States Code [U.S.C.] §§4321 et seq.), CEQ Regulations (40 CFR Parts 1500–1508), and FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*.

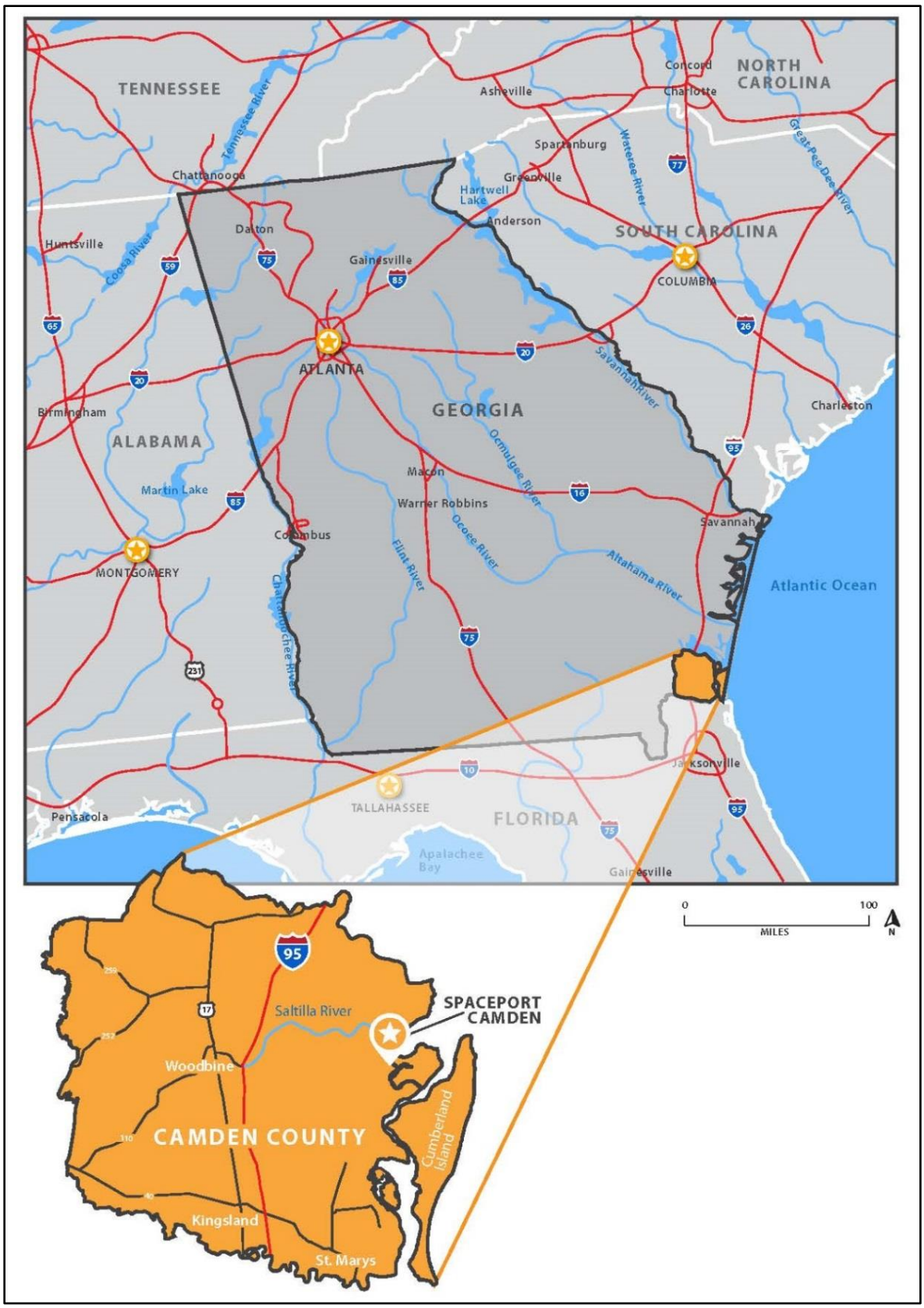


Exhibit ES-1. Proposed Spaceport Camden Location

This EIS evaluates the potential direct, indirect, and cumulative environmental impacts of construction and operation of the proposed launch site that would result from FAA's Proposed Action to issue a Launch Site Operator License to the County for Spaceport Camden. Any launch vehicle operator would be required to obtain a license to launch the specific vehicle from the launch site. Impacts evaluated in this EIS include those related to construction and operation of the proposed Spaceport Camden, including impacts that could result from the launches of a representative launch vehicle. Future Launch Operator License applications would require additional environmental review under NEPA by FAA before such licenses would be authorized. A supplemental environmental analysis would be required if one or more of the parameters of the proposed construction or launch activities fall outside what is analyzed in this EIS.

ES.1 Purpose and Need (EIS Section 1.3)

ES.1.1 Camden County Board of Commissioners Purpose and Need

The purpose of the County's proposal is to enhance Camden County's economic diversification through the construction and operation of a commercial space launch site. Construction and operation of a commercial space launch site would allow the County to offer the site to a growing number of small, orbital, vertical-launch vehicle operators to conduct commercial launches from the east coast of the United States. The County's proposal, which is also discussed in the *2018–2038 Joint Comprehensive Plan*, has been developed in response to commercial market interest from launch companies that are seeking launch capabilities in a flexible, commercial environment that is not on Federal property.

The proposed commercial space launch site is needed to enhance the County's economic diversification, which was first identified in a 2005 report prepared by Georgia Tech's Office of Economic Development & Technology Ventures, and to further the County's vision, as established in the County's *Strategic Plan 2020–2025–2035*. The County's vision is to create a strong regional economy with diverse job opportunities with four major pillars of economic growth and sustainment, one of which is developing a world-class spaceport that would also attract businesses to support its operation. The County's proposal is also needed to create launch site redundancy on the east coast.

ES.1.2 FAA's Purpose and Need

The purpose of FAA 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 CFR, 1984 Comp., p. 163), and the Commercial Space Launch Act of 2015 (51 U.S.C. §§50901–50923) as amended by the U.S. Commercial Space Launch Competitiveness Act of 2015 (Public Law 114-90) for oversight of commercial space launch activities, including issuing Launch Site Operator Licenses for the operation of commercial space launch sites, and Vehicle Operator Licenses to operate expendable and reusable orbital and suborbital launch vehicles.

The need for the FAA action of issuing a Launch Site Operator License and Vehicle Operator Licenses results from the statutory direction from Congress under the Commercial Space Launch Act to protect the public health and safety, safety of property, and national security and foreign policy interests of the United States and to encourage, facilitate, and promote commercial space launch and reentry activities by the private sector in order to strengthen and expand U.S. space transportation infrastructure.

ES.2 Public Involvement (EIS Section 1.5)

Scoping

FAA gathered input from the public during the scoping process, which is an early and open process for determining the range of issues to be addressed in the EIS. Detailed information about the scoping process, public scoping comments, and public scoping meetings can be found on FAA's *Spaceport Camden EIS* website: https://www.faa.gov/space/environmental/nepa_docs/camden_eis/.

Draft EIS Public Involvement

In accordance with 40 CFR §§1506.6 and 1503.4, FAA must provide the public and interested agencies with an opportunity to review and comment on the Draft EIS and must formally respond to those public comments in the Final EIS. The Draft EIS review and comment period was initiated with the publication of the U.S. Environmental Protection Agency's (USEPA) Notice of Availability (NOA) in the *Federal Register* on March 16, 2018. In addition, FAA also published an NOA in the *Federal Register* on March 16, 2018, indicating that the Draft EIS was available for review online and in local libraries.

Notifications were also placed in local newspapers indicating the availability of the Draft EIS in the "Georgia" insert of the *Florida Times Union* (March 11 and April 8, 2018), the *Tribune & Georgian* (March 8 and April 5, 2018), and the *Brunswick News* (March 10 and April 7, 2018). The NOA, local newspaper advertisements, Draft EIS distribution letters, and the website also provided notification of public hearings occurring to gather public input on the Draft EIS. The public hearings occurred on April 11 and 12, 2018, at the Camden County Public Services Authority Recreation Center located at 1050 Wildcat Drive in Kingsland, Camden County, Georgia. Regional notification of the Draft EIS availability was also provided by placing NOAs on March 11, 2018, in the following newspapers: *The Island Packet* (Hilton Head, South Carolina); *Savannah Morning News* (Savannah, Georgia); main section of the *Florida Times-Union* (Jacksonville, Florida); and the *St. Augustine Record* (St. Augustine, Florida).

The Draft EIS public comment period lasted for 90 days, from March 16, 2018, to June 14, 2018. Persons or agencies wishing to have their comments considered for the Final EIS were encouraged to provide their comments no later than June 14, 2018. During the comment period, FAA received over 15,500 comments, the large majority of which were form letters sent by three different organizations expressing opinions regarding the Proposed Action and alternatives.

In accordance with 40 CFR §1503.4, FAA assessed and considered Draft EIS comments, both individually and collectively, to evaluate applicability of comments given the modified scope of the Proposed Action. Comments were evaluated and addressed in the following manner:

- Comments were assessed to determine whether they identified fundamental or technical issues with the Draft EIS. Examples include technical issues with descriptions of the affected environment, perceived inadequacies with analyses, clarifications regarding the purpose and need, etc. FAA provided responses to these comments and revised discussions in this Final EIS, where applicable.
- Comments were also assessed to identify those specifically associated with the following topics: medium-large launch vehicles, returns, trajectories outside 100 degrees, or the Ocean-Landing Only Alternative. Examples include topic-specific safety discussions, impacts to resources, project-related details, etc. Such comments were evaluated to determine if the substance of the comment was still applicable under the modified scope. If still relevant, responses were provided as appropriate, and associated changes were made to the document if necessary. For those comments identified as no longer applicable given the modifications to the Proposed Action, responses were provided to indicate that the comment is no longer applicable.

A more detailed discussion of the comment response process for the Draft EIS, as well as all substantive comments received and the associated FAA responses are provided in Appendix A, *Public Involvement/Agency Coordination and Consultation*, of the EIS.

ES.3 Licenses, Permits and Approvals (EIS Section 1.4.2)

Two FAA licenses would be required for commercial space launch operations at Spaceport Camden: a Launch Site Operator License and a Vehicle Operator License. The Launch Site Operator License would authorize the County to operate Spaceport Camden, and the Vehicle Operator License would authorize a launch operator proposing to launch a vehicle from the launch site. This EIS addresses FAA issuance of the Launch Site Operator License only. As part of the license application process, FAA would require an additional environmental review under NEPA for any Vehicle Operator License.

Construction and operation of Spaceport Camden would require environmental permits and regulatory approvals for liquid discharges and airborne emissions from the facility, management of wastes, and storage of hazardous materials. Permits or approvals could also be required for withdrawal of groundwater, provision of drinking water, and management of sanitary wastes. FAA has identified additional environmental permits and approvals for Spaceport Camden construction and operation that are detailed in Section 1.4.2, *Other Licenses, Permits, and Approvals*, in the EIS.

ES.4 Proposed Action and Alternatives (EIS Chapter 2)

This EIS evaluates two alternatives: the Proposed Action and the No Action Alternative.

In addition to the Launch Site Operator License (14 CFR Part 420), any commercial launch operator would be required to obtain a Vehicle Operator License from FAA for operation of their vehicle(s) from Spaceport Camden. This EIS addresses issuance of a Launch Site Operator License. As stated previously, FAA would require an additional environmental review under NEPA for any Vehicle Operator License.

ES.4.1 Proposed Action (Preferred Alternative – EIS Section 2.1)

Under the Proposed Action, which is the Preferred Alternative, FAA would issue a Launch Site Operator License to the County. The Proposed Action is the Preferred Alternative because it satisfies the project's purpose and need. The proposed spaceport would be constructed within an existing 11,800-acre industrial location, consisting of property currently owned by the Union Carbide Corporation and Bayer CropScience, shown in Exhibit ES-2. The spaceport (the physical spaceport boundary is outlined in blue in Exhibit ES-2) would be constructed on the uplands portion of this location. Within the context of this EIS, the terms "launch site," "spaceport," and "spaceport boundary" refer to the area outlined in blue on Exhibit ES-2, while "industrial site" refers to the current status of the entire property owned by Union Carbide Corporation and Bayer CropScience. The total 11,800 acres of these two properties are intended to provide an appropriate buffer to ensure the safety of the public. Buffer, in this context, refers to an area that would serve to shield, cushion, screen, and/or guard against unauthorized access to the site, as well as serve as a protected vegetated space between the developed portion of the site and the local waterways.

Construction Activities

The facilities of the proposed Spaceport Camden would encompass less than 100 noncontiguous acres as shown in Exhibit ES-2 and Exhibit ES-3. Related infrastructure (e.g., roads and utilities) would also be improved within the existing industrial site. Each of the launch site facilities and the western boundary of the spaceport site would be fenced to provide security and control access. The Spaceport Camden site boundary, which is fully within the uplands portion of the location, is outlined in blue on Exhibit ES-2. Note that the location of one of the facilities, the Alternate Control Center and Visitor Center, is located outside of the Spaceport Camden site boundary on what is currently Bayer CropScience property. 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 review under NEPA. The remainder of the spaceport site, much of which is marshland, would be used as buffer.

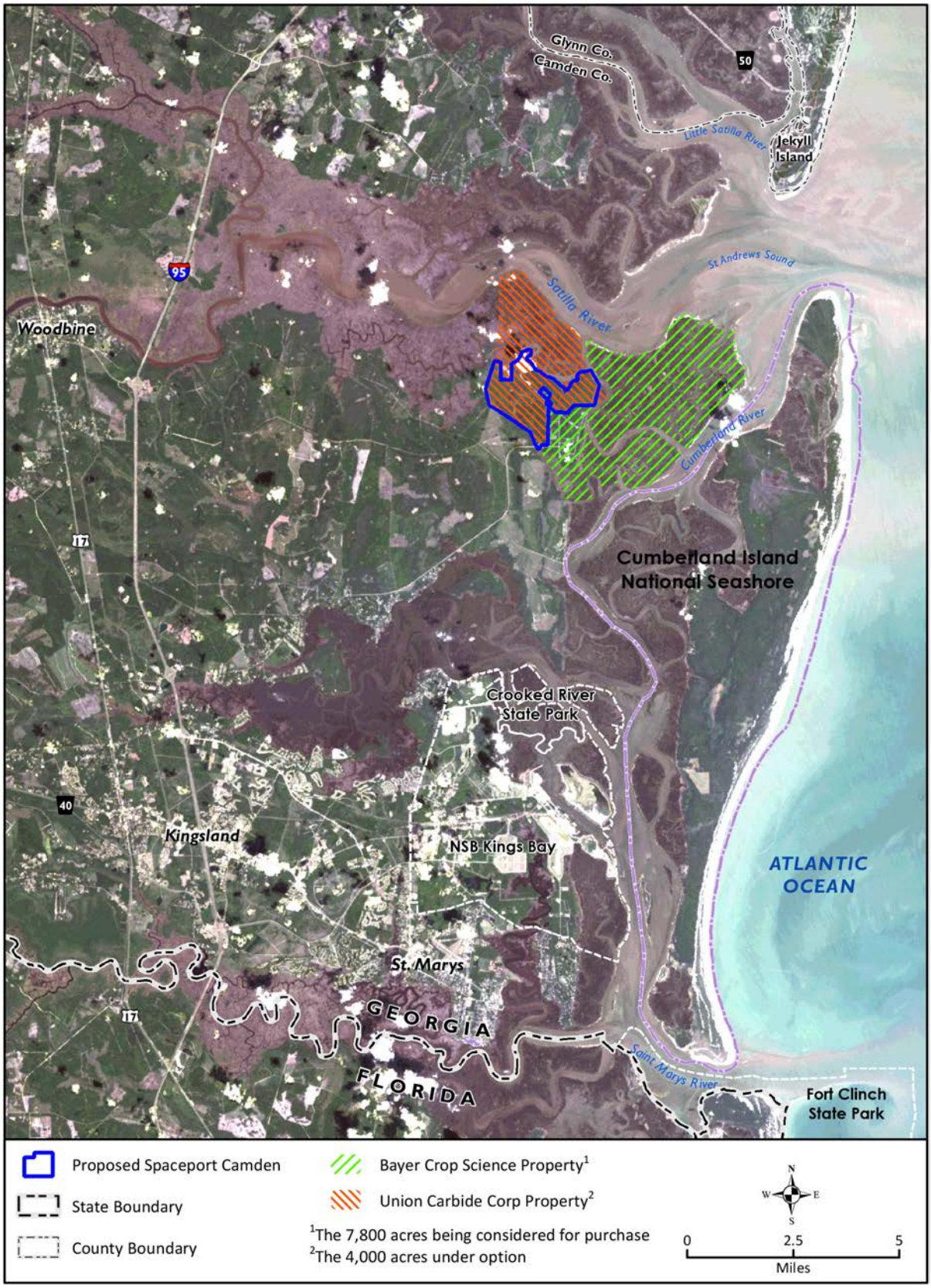
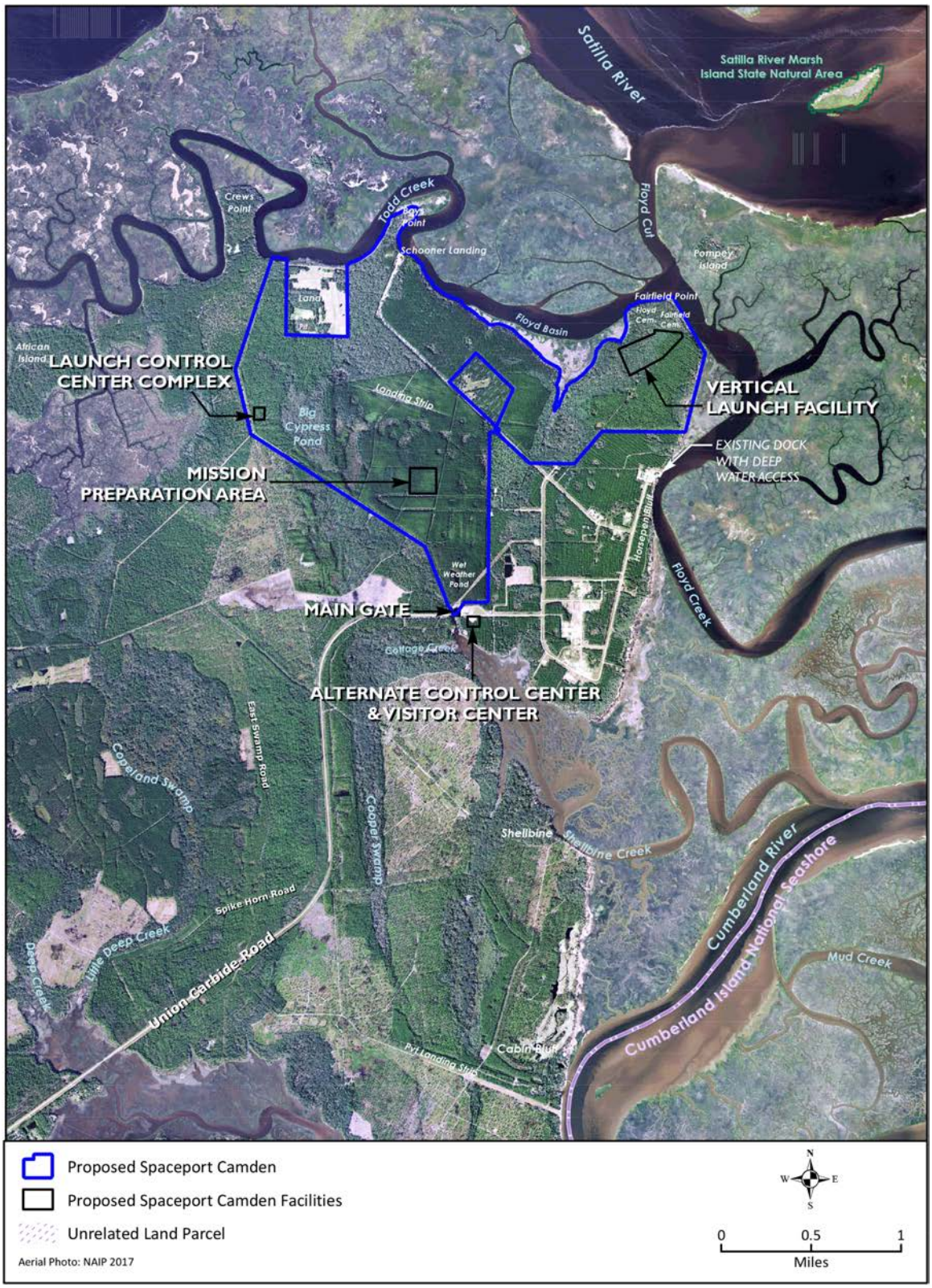


Exhibit ES-2. Proposed Spaceport Camden Regional Location



Note: The parcel of land identified in the exhibit as "Unrelated Land Parcel" is property owned and utilized by Bayer CropScience and is not included in the land that the County is considering purchasing from Bayer CropScience.

Exhibit ES-3. Proposed Spaceport Camden Site Plan and Improvements

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 access road to the launch site. The County does not anticipate improvements or expansions required for Harrietts Bluff Road/Union Carbide Road outside the proposed spaceport site, which would provide access to the site. Additionally, the County does not anticipate required expansions or improvements to the utilities that bring electricity and communications to the external boundary of the industrial property, although expansions and improvements may be required within the spaceport site to provide utilities to various 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, 5 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, including issuance of a Record of Decision, has been completed and any required permits or approvals have been granted.

Operations

Operations would consist of up to 12 launches and up to 12 static fire engine tests and 12 wet dress rehearsals per year. One of the 12 launches could be a night launch. The reference trajectory in the Spaceport Camden Launch Site Operator License Application is 100 degrees from true north. Consequently, for purposes of analysis, all vehicles would be assumed to launch to the east at 100 degrees (approximately east-southeast), over the Intracoastal Waterway, Cumberland Island National Seashore (including Little Cumberland Island), and the Atlantic Ocean. The booster rocket(s) providing the initial powered ascent of the launch vehicle (i.e., the “first stage”) would drop into the Atlantic Ocean and not be recovered. This trajectory is depicted in Exhibit ES-4.

As part of the Vehicle Operator 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 meet all applicable 14 CFR Part 400 requirements, including submitting a flight safety analysis to FAA that accounts for the potential hazards associated with the specific vehicle and trajectory. Any proposed trajectories, launch vehicles, and/or propellant types identified during the licensing process that are outside the scope of those addressed in this EIS would require additional environmental review under NEPA.

Spaceport Camden would be available to a range of launch operators, each of which offers various launch vehicles. While these vehicles would include only small launch vehicles 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 site, a representative small launch vehicle is used in this EIS to evaluate the potential environmental impacts of launches from the site. The design features described for the launch vehicle described in the following paragraphs were selected as representative for a small launch vehicle. While these are not the only parameters that determine environmental impacts, the size of the vehicle, the type of propellant used by the launch vehicle, fuel capacity (total amount of propellant carried on the vehicle), and thrust are important parameters in the analysis of environmental impacts.

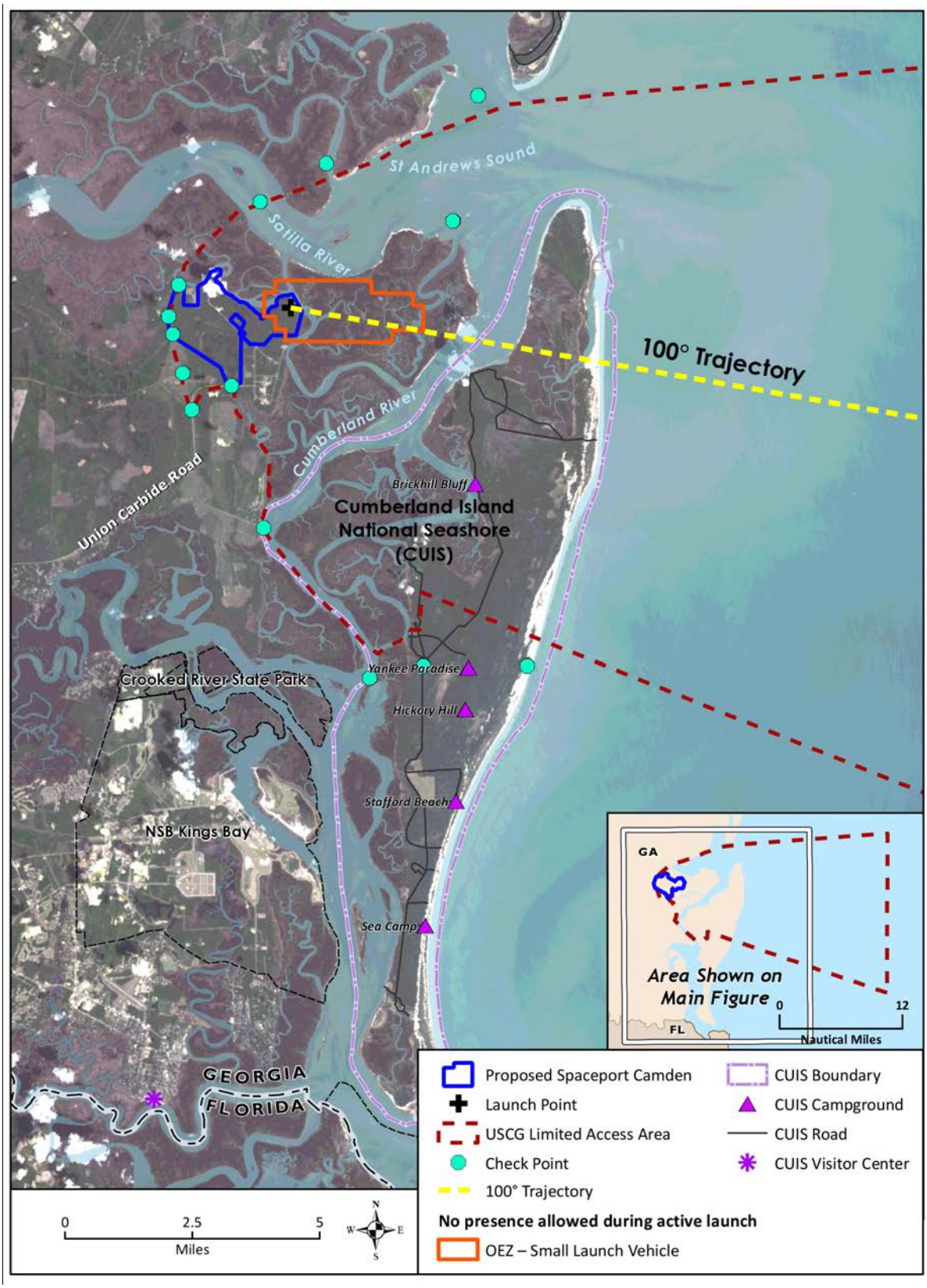


Exhibit ES-4. Overflight Exclusion Zone and Composite Launch U.S. Coast Guard Limited Access Area (100-degree Trajectory)

The representative small launch vehicle used for analysis in this EIS is a two-stage, liquid-fueled (liquid oxygen and RP-1) launch vehicle with approximately 18,500 pound-feet of thrust at lift-off, carrying a small (100- to 300-pound) payload/satellite to low Earth orbit. The representative launch vehicle is considered to be similar in design and performance to a RocketLab Electron launch vehicle. The representative launch vehicle is anticipated to carry approximately 1,000 gallons of liquid oxygen and 750 gallons of RP-1. The representative launch vehicle used for this analysis is anticipated to be between 40 to 60 feet tall.

The determination of the applicability of the analysis performed using the representative launch vehicle to a specific launch vehicle would be made by FAA. As part of a future Vehicle Operator License application process, FAA would require an additional environmental review under NEPA.

The first stage of the launch vehicle would drop about 200 to 300 miles offshore in the Atlantic Ocean and not be recovered. Any proposed trajectories, launch vehicles, and/or propellant types or changes to the maximum number or timing of launches identified during the licensing process that are outside the scope of those addressed in this EIS would require additional environmental review under NEPA.

ES.4.2 No Action Alternative

Under the No Action Alternative, FAA would not issue a Launch Site Operator License to the Camden County Board of Commissioners. No activities related to constructing or operating a commercial spaceport would occur at the site. The County would not exercise its option to purchase the site and the site would continue to be owned by the private landowner in accordance with its current industrial zoning. The site, currently under private ownership with no public access, is not being used. Under this No Action Alternative, it is assumed that the site would continue to be unused. Therefore, for this EIS, FAA will consider impacts associated with the assumption that no further development or change in the use of the site would occur.

ES.5 Summary of Environmental Effects (EIS Chapter 4)

Fourteen resource areas were considered to provide a context for understanding and assessing the potential environmental effects of the Proposed Action and alternatives including: air quality; biological resources (including fish, wildlife, and plants); climate; coastal resources; Department of Transportation Act Section 4(f) properties; farmlands; hazardous materials, solid waste, and pollution prevention; historical, architectural, archaeological, and cultural resources; land use (including wilderness); natural resources and energy supply; noise and compatible land use; socioeconomics, environmental justice, and children's environmental health and safety risks; visual effects (including light emissions); water resources (including wetlands, floodplains, surface waters, groundwater, and Wild and Scenic Rivers); and secondary (induced) impacts. Additional resource areas were also considered, including airspace, health and safety, and ground traffic and transportation. For each resource area discussed in this EIS, the region of influence (ROI) was determined. The ROI describes the area that could be affected by the Proposed Action and the No Action Alternative. The environmental consequences associated with the Proposed Action and the No Action Alternative were analyzed for the appropriate ROI for each resource area. Table ES-1 (beginning on the next page) provides a summary of potential environmental impacts from the Proposed Action and the No Action Alternative.

ES.6 Cumulative Impacts (EIS Chapter 5)

The CEQ regulations define a cumulative impact as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (see 40 CFR §1508.7). Cumulative impacts can be viewed as the total combined impacts on the environment of a proposed action or alternative(s) and other known or reasonably foreseeable actions.

Past, present, and reasonably foreseeable future actions are considered in determining whether there are potential cumulative impacts. Actions can be initiated by any entity (i.e., other Federal agencies, State, tribal, or local governments, or private entities). In this EIS, FAA has made an effort to identify actions on or near the action areas associated with the Proposed Action that are under consideration and in the planning stage at this time. These actions are included in the cumulative impact analysis sections to the extent that details regarding such actions exist and the actions have a potential to interact with the Proposed Action and associated "shared" resources. Although the level of detail available for those future actions varies, this approach provides the decision maker with the most current information to evaluate the consequences of the alternatives. The detailed cumulative impacts analysis can be found in Chapter 5 of the EIS.

ES.7 Mitigation (EIS Chapter 6)

The EIS describes mitigation measures that may be implemented to avoid or minimize identified adverse impacts associated with the Proposed Action. Some of these mitigation measures may be associated with permitting requirements (and in some cases exact mitigations would be outlined during the permitting process), while others may be associated with consultation with the U.S. Fish and Wildlife Service and Georgia State Historic Preservation Officer or recommended as part of impact analysis.

Mitigation measures to be implemented would be identified in the Record of Decision and incorporated into a Mitigation Plan that would indicate implementation and monitoring requirements, timelines for implementation, and roles and responsibilities with regards to mitigation measure implementation and monitoring. A detailed description of mitigation by resource can be found in Chapter 6 of this EIS.

ES.8 Unavoidable Adverse Impacts, Irreversible and Irretrievable Commitment of Resources, and Short-Term Uses and Long-Term Productivity (EIS Chapter 7)

As required by 40 CFR §1502.16 of the CEQ regulations, FAA must identify any irreversible or irretrievable commitments of resources that would be involved in the Proposed Action or reasonable alternative(s), should they be implemented. An irreversible or irretrievable commitment of resources refers to impacts on or losses to resources that cannot be recovered or reversed. Examples include permanent conversion of wetlands and loss of cultural resources, soils, wildlife, agricultural production, or socioeconomic conditions. Irreversible is a term that describes the loss of future options. It applies primarily to the impacts of use of nonrenewable resources, such as minerals or cultural resources, or to those factors, such as soil productivity, that are renewable only over long periods of time. Irretrievable is a term that applies to the loss of production, harvest, or use of natural resources. For example, if farmland is used for a nonagricultural event, some or all of the agricultural production from that area of farmland is lost irretrievably while the area is temporarily used for another purpose. The production lost is irretrievable, but the action is not irreversible.

Implementing the Proposed Action would require a commitment of natural, physical, human, and fiscal resources. In all these categories, irreversible and irretrievable commitments of resources would occur, with these commitments similar in nature across both alternatives. While the land area under consideration is currently designated as an industrial site with Munitions and Explosives of Concern (MEC) areas on the Union Carbide Corporation portion of the site, and land required for new construction would be irreversibly committed during the functional life of the facilities. In some cases, land uses would change from unimproved/semi-improved to improved, but for the most part designation as an industrial site would remain. Although it is possible for land to revert to its former state if the facilities were abandoned and destroyed, the likelihood of such an occurrence for established facilities would be low.

Table ES-1. Environmental Impacts Summary by Alternative

Resource Area	Proposed Action	No Action Alternative
Air Quality	There would be air emissions associated with construction activities resulting in short-term and temporary emissions during these activities. While emissions associated with operational activities would be temporary with respect to individual launches, they would continue as long as the Launch Site Operator License remains effective. However, launch-related emissions would be minimal compared to the regional baseline emissions. Based on air quality analysis the Proposed Action would not result in any significant adverse air quality impacts because emissions would not cause any pollutant concentrations to exceed one or more of the National Ambient Air Quality Standards (NAAQS) for any of the time periods analyzed. Air emissions would be permitted by the Georgia Department of Natural Resources (GDNR). Once the final construction plan is determined and facilities are constructed, an emissions inventory should be prepared in order to accurately determine if the facility will be required to obtain a Title V operating permit.	The No Action Alternative is the baseline condition, and air quality impacts under the No Action Alternative would consist of those generated by ongoing activities within the region.
Biological Resources	There would be a loss of vegetation associated with land clearing activities, although the area affected is negligible when compared to the overall undeveloped land area associated with the spaceport site. Wildlife species could be affected due to habitat alteration and loss, disturbance or displacement resulting from human activities and noise, and direct physical impacts. While some number of individual species would experience adverse impacts, which could include injury or mortality, quantification is difficult. The Proposed Action would not result in an overall decrease in population diversity or abundance for any species. Pre-construction management actions would minimize the potential for physical strikes and habitat disturbance. Effects would generally consist of short-term behavioral reactions, such as a startle response, and would not be considered significant. The Federal Aviation Administration (FAA) completed consultation with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) in December 2020 in accordance with Section 7 of the Endangered Species Act (ESA). FAA determined the Proposed Action would either have “no effect” or “may affect but is not likely to adversely affect” ESA-listed species depending on the particular species and scope of associated activity. Both the USFWS and NMFS provided concurrence that the Proposed Action is not likely to adversely affect federally listed species provided that conservation measures identified in the consultation are implemented. FAA also completed consultation with NMFS regarding potential impacts to essential fish habitat (EFH). NMFS concurred that there would be no significant adverse impacts to EFH provided conservation measures and other recommendations are implemented.	The No Action Alternative would not change the existing conditions for biological resources and, therefore, would not result in impacts on biological resources.

Table ES-1. Environmental Impacts Summary by Alternative (Continued)

Resource Area	Proposed Action	No Action Alternative
	Appendix A, *Public Involvement/Agency Coordination and Consultation*, provides all consultation documentation. The consultation documents provided in Appendix A outline conservation measures that would be implemented to avoid or minimize potential impacts. No significant impacts on biological resources are expected.	
Climate	The small amount of greenhouse gases resulting from construction and operation of the spaceport is not likely to have any impact on global climate change, sea level rise, or any potential impacts of climate change. However, sea level rise and other climatological changes such as increase in extreme weather events may impact the spaceport in the coming years.	The baseline climate of the area under the No Action Alternative would continue to change over time, affected by natural processes and ongoing activities within the region.
Coastal Resources	The Proposed Action is consistent with the Georgia Coastal Management Program; there would be no impacts to coastal barrier resources and no adverse impacts to the coastal environment that cannot be satisfactorily mitigated. The Camden County Board of Commissioners (the County) submitted a coastal consistency certification to the GDNR certifying the project is consistent with the State's Coastal Management Program (see Appendix A). The County will continue to coordinate with the GDNR regarding coastal consistency. Associated documentation regarding coastal consistency submittals is included in Appendix A. No significant impacts on coastal resources are expected.	The No Action Alternative would not change the existing conditions for coastal resources and, therefore, would not result in impacts on coastal resources.
Department of Transportation Act, Section 4(f)	Upland portions of Cumberland Island National Seashore at a distance of about 3.5 miles from the closest construction (Vertical Launch Facility) would experience noise levels of approximately 43 A-weighted decibels (dBA) day-night average sound level (DNL) (see Section 4.11.1.1, *Construction*). The noise would not substantially limit the use or diminish the quality of any of the Section 4(f) properties, such that their value would be impaired. Additionally, there would be no direct impact to historic properties and vibration from construction (e.g., pile driving) would be far enough away that there would also be no indirect effects. Outside of the proposed Spaceport Camden site boundary the Cumberland Island National Seashore historic properties and cultural landscape are also unlikely to experience audible or visual impacts related to construction activities. Therefore, FAA has made the determination that construction activities would not constitute a constructive use of Section 4(f) properties. Nearby Section 4(f) properties may experience perceptible noise and visual impacts during launch activities; however, the duration and intensity if these impacts would not result in substantial impairment of the Section 4(f) property necessary to constitute a constructive use. Although Overflight Exclusion Zones (OEZs) and U.S. Coast Guard (USCG) Limited Access Areas (LAAs) would be established to restrict and/or limit access to areas near the spaceport during launch activities, these would not result in closures of, or restricted access to, any Section 4(f) properties. FAA has made the determination	Under the No Action Alternative there would be no "use" of Section 4(f) properties. Such properties would continue to be affected by ongoing and future activities within the region.

Table ES-1. Environmental Impacts Summary by Alternative (Continued)

Resource Area	Proposed Action	No Action Alternative
	that the operations under the Proposed Action would not result in a constructive use of parks, recreation areas, or historic sites. FAA informed the National Park Service of its determination in October 2020 (see Appendix A, *Public Involvement/Agency Coordination and Consultation*).	
Farmlands	No farmlands pastureland, cropland, and forest considered to be prime, unique, or of State or local importance have been identified within the project region of influence (ROI). Aquaculture areas could be temporarily impacted from access limitations during launch operations; however, these limitations would be infrequent, of short duration, and notification of limitations would be provided to the public in advance. Additionally, should a launch failure occur, aquaculture areas could be impacted from pollutants dispersed. However, the scope of impact depends on a number of factors, including location of failure, weather and tidal conditions, and the actual quantity of pollutants dispersed. Given the size of the small launch vehicle and amount of propellants utilized, as well as implementation of emergency and contingency planning, potential impacts would not be expected to be significant.	Because there are no farmlands considered prime, unique, or of State or local importance identified within the project ROI there would be no impact to farmlands under the No Action Alternative.
Hazardous Materials, Solid Waste, and Pollution Prevention	While hazardous materials would be utilized and hazardous and solid wastes generated during construction and operation, impacts would be minimal. No National Priorities List properties are involved in the project, and landfill capacities would not be exceeded. There is the potential for effects to historical contamination sites. Once the land is acquired by the County, the potentially contaminated sites could continue to be managed under the existing hazardous waste facility permit, or it is possible that another State program such as the Georgia Brownfields Program could be utilized. Also, the County, as the owner of the property, would be responsible for any limitations placed on the property as part of State-approved corrective actions for the historical sites.	Under the No Action Alternative no impacts from hazardous materials and wastes or contamination sites over those under current conditions would occur.
Historical, Architectural, Archaeological and Cultural Resources	Temporary effects to architectural historic properties, identified through the Section 106 process, could arise from the changes to the audible and visual environment during operation of the spaceport through introduction of elements inconsistent primarily with the historic properties' setting, but there would be no adverse effect. Within the project area but outside the construction zone, three National Register of Historic Places (NRHP)-eligible components of the Floyd's Fairfield and Bellevue Plantations/Union Carbide Property would experience no adverse effect from vibration related to noise from wet dress rehearsals, static testing, and launches of small launch vehicles.	Under the No Action Alternative there would be no effect to historic properties, and thus no impact on cultural resources within the APE for direct effects and no impact on cultural resources within the APE for audible, vibratory, and visual effects. Cultural resources within the APE may be affected by ongoing and

Table ES-1. Environmental Impacts Summary by Alternative (Continued)

Resource Area	Proposed Action	No Action Alternative
	For construction, FAA has determined, at this time, is that there would be no adverse effects to aboveground historic properties associated with the construction of Spaceport Camden and that there is potential for adverse effects to archaeological historic properties during construction. FAA will prepare a Programmatic Agreement to resolve any potential adverse effects to archaeological properties. For spaceport operations, FAA has determined that there would be no adverse effects to archaeological resources. However, FAA has determined that there is a potential for adverse effects to aboveground historic properties from the operation of Spaceport Camden. The proposed launch vehicle is conceptual at this time. If a vehicle operator applies for a Vehicle Operator License to launch from Spaceport Camden, FAA will conduct a separate environmental review and Section 106 consultation. On April 15, 2021, the State Historic Preservation Officer (SHPO) concurred with the revised Finding of Effects and the area of potential effect (APE). FAA continues to work with all consulting parties on the Programmatic Agreement for effects to archaeological and aboveground historic resources (see Section 4.8 of this Environmental Impact Statement [EIS] for more details). Copies of all consultation correspondence are provided in Appendix A, and consultation will be completed prior to the signing of a Record of Decision.	future activities outside the scope of the Proposed Action.
Land Use	There would be no conflict with existing land use management plans, laws, or other policies and the site would remain within its current industrial land use designation. Adverse impacts on recreational use within the operational ROI would be short-term and temporary during launch operations and would not result in long-term preclusion of certain uses, prohibition or severe access limitations to certain areas, and/or severe alterations or diminished aesthetic recreational experiences (e.g., wilderness solitude). Long-term impacts to the solitude quality of the Cumberland Island Wilderness would result from the sky glow and visual intrusion of the spaceport towers/facilities, but only from west shoreline areas; implementation of a Light Management Plan and vegetative buffers will minimize these impacts. No substantial long-term annoyance (i.e., noise-compatible land use impacts) and/or permanent conflicts with landowners has been identified. However, there is the potential for impacts to the aesthetic recreational experience and access to the Floyd Cut and Floyd Creek areas used as part of the Georgia Coast Saltwater Paddle Trail. There could also be an annoyance impact to residential land uses on Cumberland Island.	The No Action Alternative would not result in any land use impacts beyond the scope of normal conditions and influences within the region.

Table ES-1. Environmental Impacts Summary by Alternative (Continued)

Resource Area	Proposed Action	No Action Alternative
Natural Resources and Energy Supply	While construction and operation of the spaceport would require the use of natural and energy resources, the Proposed Action would not have the potential to cause demand to exceed available or future supplies of applicable resources.	Under the No Action Alternative any changes to current energy usage or natural resource consumption at the site and surrounding areas would continue to be affected by ongoing and future activities associated with Union Carbide Corporation, Bayer CropScience, and other entities utilizing natural and energy resources throughout the region.
Noise and Noise-Compatible Land Use	Noise levels during launches and static fire events would be high in areas surrounding Spaceport Camden, but each event type would occur only up to 12 times per year and no land area outside of Spaceport Camden would experience significant noise impacts (i.e., exposed to noise levels of 65 dBA DNL—an average over a 24-hour period). Although individual noise events would temporarily alter the quiet setting that is a defining feature in surrounding areas (e.g., Cumberland Island), rocket noise events would be infrequent. Activities other than rocket launches (e.g., construction, loudspeaker announcements, etc.) would result in temporary localized noise level increases primarily affecting the area on and immediately surrounding Spaceport Camden. Because the sound environment in noise-sensitive locations near Spaceport Camden would be unchanged during the vast majority of the year, current land uses (e.g., recreation, residences, commercial) would remain compatible. The area exposed to greater than 115 dBA maximum A-weighted overall sound pressure level ($L_{A,max}$) is uninhabited, so the potential for noise-induced hearing loss would be negligible. Noise-induced vibrations in several structures on and near Spaceport Camden would remain below impact thresholds in all frequency bands during launches. Structures located farther away would be exposed to lesser structural vibration levels, and risk to all structures would be minimal. Sonic booms of up to 0.2 pounds per square foot (psf) would only affect open water, potentially intersecting the surface at approximately 55 miles offshore in the Atlantic Ocean. These overpressures would be potentially noticeable in low ambient-noise environments but would pose no risk to structures (e.g., windows in boats). During launches and static fire engine testing, noise levels at two nearby noise-sensitive locations, the closest residence (located southwest of Spaceport Camden) and the Settlement on Cumberland Island would be exposed to noise levels expected to disrupt normal speech (i.e., 66 dBA) for less than 51 seconds during each single noise event. In	Under the No Action Alternative no changes to existing noise levels would occur. Noise levels at the location would continue to be affected by ongoing activities unrelated to spaceport activities.

Table ES-1. Environmental Impacts Summary by Alternative (Continued)

Resource Area	Proposed Action	No Action Alternative
	cumulative total, over the course of a year, these two locations would be exposed to noise levels exceeding 66 dBA for up to about 12 minutes. Subsonic noise would be audible at Naval Submarine Base Kings Bay during launch events, but events would not be at an intensity that would be of concern. Noise at Cumberland Island National Seashore would be of particular concern because of the expectation among visitors of a completely natural soundscape. Because people's feelings about rockets can be expected to have a strong effect on their perception of rocket noise, previous research conducted on National Parks visitors' reactions to aircraft noise are not expected to be applicable to predicting the percentage of people highly annoyed by rocket noise. Although existing research does not support prediction of a specific percentage of visitors that would be highly annoyed by the noise of rocket operations, disruption of the natural soundscape, particularly in the designated Cumberland Island Wilderness Area could degrade the positive experiences of visitors to the island. Certain people exposed to elevated noise levels during launch and static fire events could become annoyed by the noise. There would be a very low risk of damage to structures due to noise. However, the noise events would be infrequent and FAA does not expect operational activities to result in significant adverse impacts.	
Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks	It is estimated that approximately 40 to 50 construction workers would be required for construction of new facilities, and 20 additional workers would be required for construction of new infrastructure. Approximately 77 full-time personnel are estimated to be required during operations. The aerospace industry operations are estimated to result in an additional 130 induced and indirect jobs, which would contribute to the local economy. Any temporary or permanent in-migration of construction workers or anticipated permanent in-migration of operation workers would represent less than 1 percent of the total county population and full-time and part-time jobs. Incoming personnel would require housing throughout Camden County. Demand for public service personnel would increase with incoming personnel but would not be significant. Access limitations within the composite USCG LAA under nominal launch situations would be up to 3.5 hours, 12 days a year, for a total of 42 hours. Areas outside of the USCG LAA would remain open. Any closures or access limitations would not be permanent. Restricted access to the OEZ and limited access to areas within the USCG LAA could impact unauthorized persons. "Authorized persons"[1] would be allowed	Under the No Action Alternative, the affected environment conditions of socioeconomics, environmental justice, and special risks to children would continue to be influenced by ongoing activities within the ROI now and into the future.

[1] "Authorized persons" are described in Section 1.4.2, *Other Licenses, Permits, and Approvals*, of the EIS.

Table ES-1. Environmental Impacts Summary by Alternative (Continued)

Resource Area	Proposed Action	No Action Alternative
	within the USCG LAA. Authorized persons would have the same rights of access on Little Cumberland Island and Cumberland Island as they currently experience. Tourism/ecotourism and commercial and recreational fishing in the ROI could be impacted from access limitations during operational activities. Advanced notice and communication of launches would be provided through issuance of Notices to Mariners. Implementation of mitigations identified in Chapter 6, *Mitigation*, would minimize the potential adverse impacts from spaceport operations to economic activity in the region. Construction and operation associated with the Proposed Action would not be expected to cause disproportionately high and adverse effects on minority and low-income populations. Environmental health and safety risks to children and elderly populations would not be anticipated during construction and operation of Spaceport Camden. All local, State, and Federal regulations; emergency plans; and possible mitigations would be implemented to minimize potential adverse impacts to the public.	
Visual Effects	Overall, the construction activities would have little effect on visual resources in the areas surrounding the proposed Spaceport Camden. The completed facilities would mostly be screened and not visible from most offsite locations. The tallest elements of the construction are situated at the Vertical Launch Facility and would rise above surrounding forest and vegetation. These elements would be visible from several locations and from open waterways. Notably, these elements would be noticeable but not dominant in the viewshed from the western shoreline of the wilderness areas on Cumberland Island National Seashore. Because these towers would have hazard lighting and markings, they could be annoying to some distant viewers and residents accustomed to nighttime views without artificial lights in this segment of the viewshed. Lighting at the launch pad during a launch event would be highly noticeable at nighttime for about one or possibly two nights each month on average. The directed light would be highly noticeable from nearby locations and could cause glare depending on the exact position of the viewer, conflicting with activities such as driving and aviation. A launch failure may produce a short-term, highly visible cloud of fire, smoke, and steam at the launch site or in the air, depending on where the failure occurs in the launch sequence. Following the extinguishing of the associated fire and recovery of any associated debris, no long-term offsite visual changes would result.	Under the No Action Alternative visual resources and light emissions would continue to be affected by ongoing baseline and future activities at or near the site.
Water Resources	Approximately 0.78 acre of wetland and 0.166 acre of waterways may be impacted from construction activities; this would require a Clean Water Act Section 404 permit	Under the No Action Alternative no impacts are anticipated to wetland,

Table ES-1. Environmental Impacts Summary by Alternative (Continued)

Resource Area	Proposed Action	No Action Alternative
	from the U.S. Army Corps of Engineers and compensatory mitigation would be required for any unavoidable impacts to jurisdictional wetlands and waterways. The partial filling of wetlands and waterways would result in a loss of wetland and stream function. The amount of wetlands and waterways filled represents a small percentage of the total wetlands and waterways on site. The Vertical Launch Facility and Alternate Control Center and Visitor Center would be constructed in the 100- and 500-year flood zone. The main gate area of the project is also within the 500-year flood zone. Approximately 82 acres of proposed facilities would be constructed within flood zones (19 acres in the 100-year flood zone, and 63.1 acres in the 500-year flood zone). This represents 0.9 percent of the approximately 9,470 acres of flood zones within the ROI. The Vertical Launch Facility is considered a critical facility under the County's definition in the County's Unified Development Code (UDC) as the facility would store and use flammable and volatile chemicals. Construction in the floodplain would require an exemption to the County's UDC, which states that critical facilities shall not be constructed in a floodplain; the Vertical Launch Facility's storage areas would be developed so that the storage of flammable and volatile chemicals would be above the 500-year flood zone. Potential indirect impacts from proposed construction activities could result in additional sediment loads being transported to surface waters in the vicinity of proposed construction. Increases in sedimentation could alter stream and wetland functions and result in the loss of wildlife habitat. However, during construction a Storm Water Pollution Prevention Plan (SWPPP) and Sediment and Erosion Control Plan would be prepared in compliance with Georgia's National Pollutant Discharge Elimination System requirements and Georgia's Erosion and Sedimentation Act of 1975. The SWPPP and Sediment and Erosion Control Plan would implement the use of management practices to minimize erosion and sedimentation. Implementation of these management practices would minimize indirect impacts and no significant adverse impacts to surface waters would be anticipated. Surface waters and wetlands could be impacted by spills of fuels and other hazardous materials during construction and during operation of Spaceport Camden. Spills could result in the loss of vegetation and pollution of wetlands or surface waters resulting in a short-term loss of wildlife habitat. However, all hazardous materials use would be conducted in accordance with standard operating procedures that minimize the potential for spills.	surface water and groundwater resources, or floodplains associated with spaceport development and operations as the site would remain in its current state. Water resources in the region would continue to be impacted by ongoing and future activities throughout the county and region.

Table ES-1. Environmental Impacts Summary by Alternative (Continued)

Resource Area	Proposed Action	No Action Alternative
	The operation of the spaceport would require an Industrial Stormwater Permit in accordance with Section 402 of the Clean Water Act to accommodate stormwater runoff and identify operational best practices to reduce the potential for onsite stormwater pollution. No adverse impacts to groundwater resources within the aquifers underlying the ROI have been identified and no Wild and Scenic Rivers are within the project vicinity. No construction related impacts to the Satilla River are anticipated that would adversely impact this river system. The river is located more than 1 mile from proposed construction activities and the potential for the offsite migration of sediments would be low. Operational impacts to the Satilla River would primarily be related to noise and the possible impacts to recreational use of the river. These impacts are described in Section 4.14, *Water Resources*, in the EIS. Launch failures on the launch pad or during ascent could result in the release of hazardous chemicals into wetland and surface water areas. These chemicals could be released as direct spills or burning byproducts. Direct spills and fire could result in the loss or alteration of vegetation and a corresponding loss of wetland or surface water habitat function. Chemicals that reach these waters could also degrade water quality. Emergency and contingency planning and response measures would serve to minimize potential adverse impacts, and emergency consultation with regulatory agencies (e.g., the USFWS, Georgia SHPO, U.S. Army Corps of Engineers) would be required should a launch failure result in impacts to sensitive resources.	

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ACRONYMS AND ABBREVIATIONS

Acronym	Definition
AC	Advisory Circular
ACHP	Advisory Council on Historic Preservation
ACS	American Community Survey
A-F	general agriculture-forestry
AGL	above ground level
ALMP	Artificial Light Management Plan
ANSI	American National Standard Institute
APE	area of potential effect
APLIC	Avian Power Line Interaction Committee
APLIC	Avian Power Line Interaction Committee
AST	Office of Commercial Space Transportation
ATV	all-terrain vehicle
B.P.	before present
BEA	Bureau of Economic Analysis
BG	Block Group
BLM	Bureau of Land Management
BLS	Bureau of Labor Statistics
BMP	best management practice
BTEX	benzene, toluene, ethylbenzene and xylene
c.	circa
°C	degrees Celsius
C&D	construction and demolition
CAA	Clean Air Act
CAP	Corrective Action Plan
CBCRR	Cabin Bluff Cumberland River Retreat
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CO	carbon monoxide
CO_2e	carbon dioxide equivalent
COC	community of comparison
C-P	conservation preservation
CS	orthochlorobenzalmalononitrile (“tear gas”)
CUIS	Cumberland Island National Seashore
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
dB	decibels
dBA	A-weighted decibel
DBC	Dover Bluff Club
DIN	German Institute of Standardization (Deutsches Institut für Normung)
DNL	day-night average sound level
DOT	U.S. Department of Transportation
EFH	essential fish habitat
EIS	Environmental Impact Statement
EO	Executive Order
EPCRA	Emergency Planning and Community Right-to-Know Act
EPD	Environmental Protection Division
ESA	Endangered Species Act
ESQDs	explosive safety quantity distances
°F	degrees Fahrenheit
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FICAN	Federal Interagency Committee on Aviation Noise
FICON	Federal Interagency Committee on Noise
FMU	Fire Management Unit
FR	*Federal Register*
ft	feet
GA	Georgia
GDNR	Georgia Department of Natural Resources
GHG	greenhouse gas
GWPS	groundwater protection standards
HAPCs	habitat areas of particular concern
HAPs	hazardous air pollutants
HD	historic district
HP-HMB	High Point-Half Moon Bluff
I-	Interstate Highway (I-95, I-75, etc.)
ICP	Institutional Controls Plan
IDA	International Dark-Sky Association
I-G	general industrial
IIP	instantaneous impact point
IPaC	Information for Planning and Consultation
I-R	residential industrial
KSC/CCSFS	Kennedy Space Center/Cape Canaveral Space Force Station
kV	kilovolt
kVA	kilovolt amps
$L_{A,max}$	Maximum A-weighted overall sound pressure level
LAA	Limited Access Area
LBP	lead-based paint
LED	light-emitting diode
LEED®	Leadership in Energy and Environmental Design
L_{max}	maximum overall sound pressure level
$\mu g/m^3$	microgram per cubic meter
MBTA	Migratory Bird Treaty Act
MEC	Munitions and Explosives of Concern
mm	millimeter
MMH	monomethylhydrazine
MMPA	Marine Mammal Protection Act

Acronym	Definition
MOVES	Motor Vehicle Emission Simulator
MPAs	marine protected areas
mph	mile per hour
MRAs	munitions response areas
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSATs	Mobile Source Air Toxics
MSW	Municipal Solid Waste
NAAQS	National Ambient Air Quality Standards
NASA	National Aeronautics and Space Administration
NEI	National Emissions Inventory
NEPA	National Environmental Policy Act of 1969
NHPA	National Historic Preservation Act
NI	no impact
NIMS	National Incident Management System
NIOSH	National Institute for Occupational Safety and Health
NM	nautical miles
NMFS	National Marine Fisheries Service
NOA	Notice of Availability
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NOTMAR	Notice to Mariners
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRI	Nationwide Rivers Inventory
NSB	Naval Submarine Base
NTO	nitrogen tetroxide
O.C.G.A.	Official Code of Georgia Annotated
O_3	ozone
OASPL	overall sound pressure level
OEZ	Overflight Exclusion Zone
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyl
PD	planned development
PEM	palustrine emergent
PFO	palustrine forested
pH	potential of hydrogen (acidity)
PM_{10}	particulate matter equal to or less than 10 microns
$PM_{2.5}$	particulate matter equal to or less than 2.5 microns
PPV	peak particle velocity
PSD	Prevention of Significant Deterioration
psf	pounds per square foot
PSHMP	Protected Species and Habitat Management Plan
PSS	palustrine scrub-shrub
PUB	palustrine unconsolidated bottom
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
ROI	region of influence
RP-1	rocket propellant-1
RSLs	Regional Screening Levels
S (LT)	Solitude (adverse, long-term impact)
S (ST)	Solitude (adverse, short-term impact)
SEL	Sound Exposure Level
SER HCD	Southeast Region's Habitat Conservation Division
SHPO	State Historic Preservation Officer
SIP	State Implementation Plan
SOPs	standard operational controls or practices
SPCC	Spill Prevention, Control, and Countermeasure
SR	State Route
SWMU	Solid Waste Management Unit
SWPPP	Storm Water Pollution Prevention Plan
TCDD	2,3,7,8-tetrachlorodienzo-p-dioxin
the County	Camden County Board of Commissioners
tpy	tons per year
TSCA	Toxic Substances Control Act
U.S.C.	United States Code
UAV	unmanned aerial vehicle
UDC	Unified Development Code
UDMH	unsymmetrical dimethyl hydrazine
USACE	U.S. Army Corps of Engineers
USACHPPM	U.S. Army Center for Health Promotion and Preventive Medicine
USCB	U.S. Census Bureau
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compound
VRMP	Visual Resources Management Plan
VSQG	very small quantity generator
WHSRN	Western Hemispheric Shorebird Reserve Network
WRAP	Wetland Rapid Assessment Procedure
WMA	Wildlife Management Area

1 INTRODUCTION

The Camden County Board of Commissioners (the County) is proposing to construct and operate a commercial space launch site, called Spaceport Camden, on the Atlantic seaboard in Camden County, Georgia. The County could offer the commercial space launch site to vertical launch vehicle operators for the orbital launch of small, liquid-propellant launch vehicles.[2,3] Launch operations would include preparatory activities to ready and test launch vehicles and systems, including mission rehearsals and static tests.

The operation of commercial space launch sites is licensed by the Federal Aviation Administration (FAA) under Title 14 Code of Federal Regulations (CFR) Part 420, and the County has applied to FAA for a Launch Site Operator License. Because issuance of this license would be a major Federal action, this Environmental Impact Statement (EIS) has been prepared by FAA's Office of Commercial Space Transportation to assist in its decision-making process as required by the National Environmental Policy Act of 1969 (NEPA) as amended (42 United States Code [U.S.C.] §§4321 et seq.), Council on Environmental Quality (CEQ) Regulations (40 CFR Parts 1500–1508), and FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*.

This EIS evaluates the potential direct, indirect, and cumulative environmental impacts of construction and operation of the proposed launch site that would result from FAA's Proposed Action to issue a Launch Site Operator License to the County for Spaceport Camden. Any future launch vehicle operator would be required to obtain a license from FAA to launch a specific vehicle or class of vehicle from Spaceport Camden. As part of the license application process, FAA would require an additional environmental review under NEPA for any Vehicle Operator License.

1.1 Background

While exploring opportunities to expand Camden County's and regional economies, the County identified the development and operation of a commercial launch site as a desirable means to support economic growth. The *Camden County Strategic Plan 2020–2025–2035*, which addresses the County's long-range planning, mission, and vision, identifies a launch site, or "spaceport," as one of four pillars of economic growth and sustainment (Camden County, 2015).[4] Additionally, the development of Spaceport Camden is identified as a top priority for the County's 2019 policy agenda.

In developing its plan for a spaceport, the County undertook a search for a suitable location. To help guide this search, the County identified several site-specific requirements and evaluation criteria to assess potential launch sites. Site-specific requirements and evaluation criteria are presented in Chapter 2, Section 2.3, *Alternatives Considered but Not Carried Forward.* During this search, the County identified the location shown in Exhibit 1.1-1, a former industrial site that is currently used for tree farming in discrete areas (Tetra Tech, 2013).

[2] Orbital launch vehicles are classified based on the maximum payload weight in pounds according to orbital inclination with weight increasing as orbital inclination decreases; for example, FAA regulations define vehicles launching to 90-degrees inclination as follows: a small launch vehicle is less than or equal to 3,300 pounds; medium is greater than 3,300 to less than or equal to 8,400 pounds; a medium-large launch vehicle is greater than 8,400 to less than or equal to 15,000 pounds.
[3] On January 15, 2020, the County modified the proposed project to limit operations to only the launch of small vehicles and to eliminate first-stage returns and ocean landings.
[4] See Chapter 10, References, for a bibliographical list of cited sources.

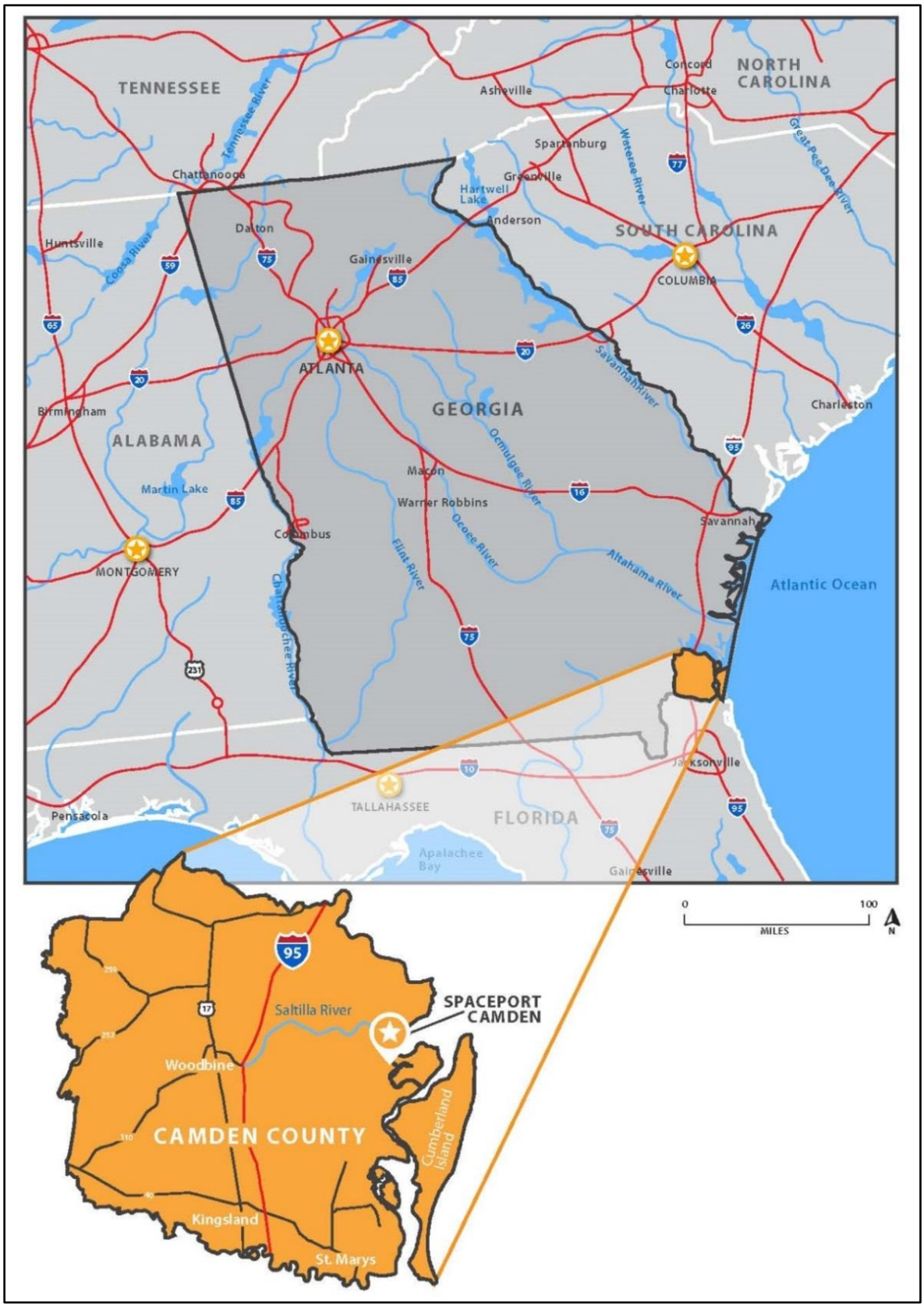

Exhibit 1.1-1. Proposed Spaceport Camden Location

The site is located in an unincorporated area of Camden County, Georgia, approximately 11.5 miles east of the city of Woodbine, at the mouth of the Satilla and Crooked Rivers and just west of Cumberland River and Cumberland Island. The site, on which two plantations and a ship-building enterprise operated in the 1800s, was redeveloped in 1927 as a hunting preserve. In the early 1940s, the site was used as a tree farm and source of fiber for a local paper mill. During the 1960s, the Thiokol Chemical Company produced and tested solid rocket motors for the National Aeronautics and Space Administration (NASA) (CH2M Hill, 2015). When NASA decided to focus on liquid-fueled rockets, the site was converted to manufacture military hardware and supplies, including mortar ammunition, illuminating ordnance devices (trip flares), tear gas, and assorted chemicals.

On February 3, 1971, an explosion destroyed the magnesium trip-flare assembly building and started a fire that burned 200 acres. The explosion killed 29 workers and injured 50 others (Jackson, 2001; Scardino, 1986; Thiokol Memorial Project, Inc., 2015). From the mid-1970s to 2012, the site was the location of a pesticide manufacturing facility (Tetra Tech, 2013).

The entire site, which totals approximately 11,800 acres, consists of two properties owned by two companies: the Union Carbide Corporation, who owns about 4,000 acres, and Bayer CropScience, who owns the remaining 7,800 acres. The site is a combination of uplands and marshlands. The County proposes to construct the majority of the Spaceport Camden infrastructure on upland within the Union Carbide Corporation property. One facility, the Alternate Control Center, is proposed for construction on the Bayer CropScience portion of the site near the front gate (the entrance to both properties). The County has entered into an option agreement to purchase most of the Union Carbide Corporation property and plans to purchase the Bayer CropScience property. If the County is unable to purchase the Bayer CropScience property, the County would secure access to and use of the spaceport site through a lease or easement. Regardless of whether the County purchases, leases, or has an easement for use of the Bayer Crop Science property, the Alternate Control Center and other related infrastructure improvements (roads) would be constructed.

1.2 Federal Agency Roles

FAA, as the licensing agency, is the lead agency in the preparation of this EIS. NASA and the National Park Service (NPS) are cooperating agencies. The U.S. Coast Guard (USCG) has been participating in the project development process as the agency with jurisdiction to establish waterway Limited Access Areas (LAAs).

1.2.1 FAA Role

FAA licenses and regulates U.S. commercial space launch and reentry activity, as well as the operation of non-Federal launch and reentry sites, as authorized by Executive Order (EO) 12465, *Commercial Expendable Launch Vehicle Activities*, and the Commercial Space Launch Act of 2015 (51 U.S.C. §§50901–50923) as amended by the U.S. Commercial Space Launch Competitiveness Act of 2015 (Public Law 114-90). The Commercial Space Launch Act directs FAA to ensure public health and safety and the safety of property while protecting the national security and foreign policy interests of the United States during commercial launch and reentry operations. In addition, FAA is directed to encourage, facilitate, and promote commercial space launches and reentries.

The FAA license application review process for a commercial Launch Site Operator License includes four major applicant reviews as defined below (policy, safety, launch site location, and environmental):

- Policy Review (14 CFR §420.15(a)(3)) – FAA reviews a license application to determine whether it presents any issues affecting U.S. national security or foreign policy interests or international obligations of the United States.

- Safety Review (14 CFR §§420.51–420.71) – FAA conducts a safety review to determine whether proposed operations can be conducted without jeopardizing public safety. Because the licensee is responsible for public safety, it is important that the applicant identifies the hazards to the public associated with the proposed operation and addresses those hazards to the extent required by Part 420 regulations.
- Launch Site Location Review (14 CFR §§420.19–420.29) – FAA evaluates an applicant's demonstration that, for each launch point proposed for the launch site, at least one type of expendable or reusable launch vehicle can be flown from the launch point safely.
- Environmental Review – NEPA requires Federal agencies to integrate environmental values into their decision-making processes. FAA considers the environmental impacts of proposed actions and reasonable alternatives to those actions in order to make decisions based on an understanding of environmental consequences. Because issuance of a Launch Site Operator License is a major Federal action under NEPA, FAA is preparing this EIS to identify the potential environmental impacts of the construction and operation of Spaceport Camden.

1.2.2 Cooperating Agency Roles

A cooperating agency may be any Federal agency other than the lead agency that has jurisdiction by law or special expertise with respect to the environmental impacts expected to result from a proposal (40 CFR §1508.6).

NASA is a cooperating agency for this EIS because the agency provides unique knowledge and special expertise regarding the potential impacts from launches and the operation of a launch site. NASA provides special expertise with respect to potential environmental impacts from space launches and the operation of a launch site. Additionally, NASA uses Space Act Agreements and contracts, as well as competitions to promote technology development and demonstration. NASA's partnerships with commercial suppliers and private enterprises are expanding such that NASA may have a direct or indirect contribution to a commercial payload. For these reasons, NASA requested to be a cooperating agency in the development of this EIS.

Cumberland Island National Seashore is managed by the NPS and is located less than 5 miles east of the proposed Spaceport Camden site. Cumberland Island National Seashore contains a diversity of wildlife and plant species, a federally designated wilderness area, and several historic sites listed on the National Register of Historic Places (NRHP). The NPS is a cooperating agency for this EIS because it has special expertise with respect to environmental issues and wildlife, as well as cultural and archaeological resources associated with Cumberland Island National Seashore and its wilderness area.

FAA entered into a Memorandum of Agreement with each of these cooperating agencies. The cooperating agencies are responsible for developing and verifying information, including portions of this EIS for which the cooperating agency has special expertise under 40 CFR §1506.1.

1.3 Purpose and Need

1.3.1 Camden County Board of Commissioners' Purpose and Need

The purpose of the County's proposal is to enhance Camden County's economic diversification through the construction and operation of a commercial space launch site. Construction and operation of a commercial space launch site would allow the County to offer the site to small, orbital, vertical-launch vehicle operators to conduct commercial launches from the east coast of the United States. The County's proposal, which is also discussed in the *2018–2038 Joint Comprehensive Plan*, has been developed in

response to commercial market interest from launch companies who are seeking launch capabilities in a flexible, commercial environment that is not on Federal property.

The proposed commercial space launch site is needed to enhance the County's economic diversification, which was first identified in a 2005 report prepared by Georgia Tech's Office of Economic Development & Technology Ventures, and to further the County's vision, as established in the County's *Strategic Plan 2020–2025–2035*. The County's vision is to create a strong regional economy with diverse job opportunities with four major pillars of economic growth and sustainment, one of which is developing a world-class spaceport that would also attract businesses to support its operation. The County's proposal is also needed to increase launch site robustness on the east coast. Site-specific requirements and evaluation criteria are presented in Chapter 2, Section 2.3, *Alternatives Considered but Not Carried Forward*.

1.3.2 FAA's Purpose and Need

The purpose of FAA action in connection with the County's proposal is to fulfill FAA's responsibilities as authorized by EO 12465, *Commercial Expendable Launch Vehicle Activities* (49 *Federal Register* [FR] 7099, 3 CFR, 1984 Comp., p. 163), and the Commercial Space Launch Act of 2015 (51 U.S.C. §§50901–50923) as amended by the U.S. Commercial Space Launch Competitiveness Act of 2015 (Public Law 114-90) for oversight of commercial space launch activities, including issuing Launch Site Operator Licenses for the operation of commercial space launch sites, and Vehicle Operator Licenses to operate expendable and reusable orbital and suborbital launch vehicles. The Proposed Action would be consistent with the objectives of the Commercial Space Launch Act, as amended. Further, FAA action is consistent with the finding of Congress, as expressed in the Act, that participation of State governments[5] in encouraging and facilitating private sector involvement in space-related activity, particularly through space transportation-related infrastructure, is in the national interest and of significant public benefit.

The need for the FAA action of issuing a Launch Site Operator License and Vehicle Operator Licenses results from the statutory direction from Congress under the Commercial Space Launch Act to protect the public health and safety, safety of property, and national security and foreign policy interests of the United States and to encourage, facilitate, and promote commercial space launch and reentry activities by the private sector in order to strengthen and expand U.S. space transportation infrastructure.

1.4 Agency Involvement

This section identifies the licenses, permits, and approvals that would be required for construction and operation of Spaceport Camden.

1.4.1 FAA Licenses

Two FAA licenses would be required for commercial space launch operations at Spaceport Camden: a Launch Site Operator License and a Vehicle Operator License. The Launch Site Operator License would authorize the County to operate Spaceport Camden, and the Vehicle Operator License would authorize any launch operator proposing to launch a vehicle from the launch site. As part of the license application process, FAA would require an additional environmental review under NEPA for any Vehicle Operator License.

FAA is the Federal agency with the responsibility to regulate commercial space launch activities. These regulations are codified at 14 CFR Parts 400–460. Under the Proposed Action, the County applied for a Launch Site Operator License (14 CFR Part 420) from FAA for the operation of Spaceport Camden. A

[5] Although Camden County is the applicant, the State of Georgia is participating.

Launch Site Operator License authorizes a license to operate a launch site in accordance with the conditions of the application and to offer its launch site to any launch operator for each launch point for the type and weight of launch vehicle identified in the license application. A Launch Site Operator License remains in effect for 5 years from the date of issuance and can be renewed by the licensee.

Launch operators proposing to launch from Spaceport Camden would be required to obtain an FAA Vehicle Operator License under 14 CFR Part 450. A Vehicle Operator License authorizes a licensee to conduct one or more launches using the same vehicle or family of vehicles. This license identifies, by name or mission, each launch authorized under the license. A licensee's authorization to launch terminates upon completion of all launches authorized by the license or the expiration date stated in the license, whichever comes first.

1.4.2 Other Licenses, Permits, and Approvals

Construction and operation of Spaceport Camden would require environmental permits and regulatory approvals for liquid discharges and airborne emissions from the facility, management of wastes, and storage of hazardous materials. Permits or approvals could also be required for withdrawal of groundwater, provision of drinking water, and management of sanitary wastes. FAA has identified the following environmental permits and approvals for Spaceport Camden construction and operation, but others may be required pending completion of analyses and resource agency consultations.

Air Emissions. Air emissions would be permitted by the Georgia Department of Natural Resources (GDNR). It is not anticipated that Spaceport Camden would be a major source requiring a Title V Permit.

Biological Resources. Consultation under Section 7 of the Endangered Species Act (ESA) for impacts to threatened and endangered species is required and has been completed with the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) for ESA-listed species, marine mammals, and essential fish habitat. FAA has received concurrence from the USFWS and NMFS on "no effect" and "may affect but not likely to adversely affect" determinations for several federally listed species under the ESA; FAA submitted the original USFWS consultation on October 31, 2017, based on the Proposed Action as described in the Draft EIS. On February 12, 2018, the USFWS provided concurrence that the Proposed Action is not likely to adversely affect federally listed species, provided that conservation measures identified in the consultation are implemented. In July 2020, FAA submitted revised consultation documentation reaffirming its determinations of "no effect" and "may affect but not likely to adversely affect" based on the modified Proposed Action in this Final EIS. The USFWS concurred again with this determination in September 2020 (see Appendix A, *Public Involvement/Agency Coordination and Consultation*). Consultation with NMFS was completed in October 2020, where the NMFS concurred on findings that the Proposed Action is not likely to adversely affect the NMFS ESA-listed species and/or designated critical habitat (see Appendix A, *Public Involvement/Agency Coordination and Consultation*). NMFS conservation recommendations and mitigation requirements are identified in Sections 4.2.1.2, *Biological Resources, Operation*, and 6.2, *Biological Resources*, of this EIS. As part of an Essential Fish Habitat (EFH) Assessment concluded in December 2020, FAA committed to respond appropriately and immediately should any launch failures occur that would potentially affect EFH and to consult with NMFS Southeast Region's Habitat Conservation Division (SER HCD) on impacts to EFH resulting from such events or from the responses to such events. Given this commitment from FAA, NMFS had no EFH conservation recommendations for launch failures and usage of emergency procedures. NMFS did provide some general recommendations for activities related to operation of the spaceport, which are identified in Sections 4.2.1.2 and 6.2 of this EIS. Correspondence is provided in Appendix A.

Coastal Resources. A Federal consistency certification is required for projects such as Spaceport Camden that are federally licensed when they are located in coastal areas. A Coastal Consistency Determination has been prepared in accordance with the Coastal Zone Management Act (CZMA) and was submitted to GDNR for review (see Appendix A). Per correspondence with GDNR, as provided in Appendix A, the County will continue to coordinate with GDNR with respect to the CZMA and associated Federal consistency certification throughout the facility development and operation process. The County, FAA, and GDNR have agreed to a phased concurrence process, wherein the County will provide GDNR with information necessary for GDNR to make a reasoned decision on the consistency of the proposed project (see 15 CFR §930.58(3)(c)) as the project moves through the development and operational phases. The County and FAA will provide GDNR with requested plans and documentation as they become available, and will coordinate development of operational plans that may affect coastal resources to ensure consistency with GDNR requirements. No in-water improvements or modifications to the Floyd Creek dock are planned at this time. However, use of this dock or any work on the dock, including maintenance, must be coordinated with the GDNR Coastal Resources Division and the U.S. Army Corps of Engineers (USACE) to obtain applicable permits/permissions (Official Code of Georgia Annotated [O.C.G.A.] 12-5-280, *Coastal Marshlands Protection Act*, and O.C.G.A. 50-16-61, *Administrative Procedures Act/Revocable License Program*), to include a USACE Section 404 and Section 10 permit, and Coastal Marshlands Protection Committee permit. Additionally, the dock is currently permitted for recreational use and the County would be required to coordinate permitting for other uses with GDNR. Recovery of any launch vehicle debris landing in tidally-influenced marsh or State waters out to 3 miles may require authorization from the GDNR Coastal Resources Division (O.C.G.A. 12-5-230, *Shore Protection Act*, and/or O.C.G.A. 12-5-280, *Coastal Marshlands Protection Act,* and/or O.C.G.A. 50-16-61, *Administrative Procedures Act/Revocable License Program*).

Historic and Cultural Resources. A Section 106 consultation with the Georgia State Historic Preservation Officer (SHPO) under the National Historic Preservation Act (NHPA) is required to identify and evaluate archaeological and architectural resources protected by the NHPA that could be affected by the construction or operation of Spaceport Camden. FAA initiated NHPA Section 106 consultation in 2017, and on April 15, 2021, the SHPO concurred with FAA's Finding of Effects and the area of potential effect (APE) (see Appendix A). FAA continues to work with the SHPO, Advisory Council on Historic Preservation (ACHP), NPS, Gullah/Geechee, National Trust on Historic Preservation, and Little Cumberland Island Homes Association on the Programmatic Agreement for effects to archaeological and aboveground historic resources (see Section 4.8, *Historical, Architectural, Archaeological, and Cultural Resources,* of this EIS for more details). Copies of all consultation correspondence through May 7, 2021, are provided in Appendix A, and consultation will be completed prior to the signing of any Record of Decision.

Wetlands. Section 404 of the Clean Water Act (CWA) and Section 10 (Rivers and Harbors Act) permits are issued by USACE for dredging or filling wetlands or other waters of the United States. Less than 1 acre of wetlands would be impacted by the proposed construction activities. Unless final design plans can further avoid wetland impacts, a Section 404 permit will be required prior to construction activities.

Wastewater Discharges. If there are any point source discharges from Spaceport Camden facilities, a National Pollutant Discharge Elimination System (NPDES) permit would be required. GDNR is authorized to administer this program.

Stormwater Discharges. During construction, a Storm Water Pollution Prevention Plan (SWPPP) and Sediment and Erosion Control Plan would be required in compliance with Georgia NPDES requirements and Georgia's Erosion and Sedimentation Act of 1975. Operational stormwater discharges would be permitted under NPDES 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 7 days before commencing to discharge.

Sanitary Waste. Several septic systems have been proposed for Spaceport Camden. Septic systems are regulated and permitted by the Georgia Department of Public Health and Camden County Department of Health.

Hazardous Materials and Waste. A hazardous waste generator operating permit from GDNR's Environmental Protection Division (EPD) would be required for operations at the site.

Security. The GDNR Coastal Resources Division requests notification in writing of all launch operations that require public notification, so that they may assist in alerting the affected public of upcoming closures. Operational activities involving closures may require a Marine Event Permit, in coordination with GDNR. Marine Event Permits must be applied for 30 to 60 days in advance, depending on the number of spectators anticipated, prior to each closure (O.C.G.A. 52-7-19, *Boat Safety Act*). Individual Security Plans that include motorized vehicular use or temporary structures or staging areas on the beach will require beach driving permits and/or Letters of Permission from the GDNR Coastal Resources Division (O.C.G.A. 12-5-230, *Shore Protection Act*). Individual Security Plans developed between the County and launch operator must be submitted to the GDNR Coastal Resources Division to determine if any additional plan-specific authorizations are required prior to implementation (O.C.G.A. 12-5-320, *Coastal Management Act*).

Spaceport Camden's Security Plans would require closures of navigable waterways, creeks and tributaries, and areas offshore that lie beyond the spaceport site boundary. These closures would affect the movement of persons and vessels around the spaceport site.

The County requested that the USCG determine the feasibility of establishing Limited Access Areas (LAAs) that the USCG would enforce during launch and rocket test activities to address the County's Security Plans. In response to the County's request, the USCG issued a composite proposed LAA for a variety of launch trajectory scenarios (hereinafter referred to as the "composite USCG LAA"), a Notice of Inquiry, and request for public comments in September 2018 (see Appendix A). A public meeting was held on September 27, 2018. The USCG and Camden County Letter of Agreement is found in Appendix A and the composite USCG LAA is depicted in Exhibit 2.1-10 in Chapter 2, *Proposed Action and Alternatives*.

Camden County and USCG will identify designated members of the public (including, but not limited to, residents, vacation house owners, permit-holding campers and ticketed guests, and NPS personnel) that the County and the USCG would allow to remain within a USCG managed LAA, provided that the launch operator has successfully demonstrated to FAA that the risk to those persons is compliant with FAA regulations. For the purposes of this EIS, those persons are described as "authorized persons." The term carries no legal obligation nor places any requirement on the part of members of the public. The decision to stay or leave the area during the launch would be theirs to make, and there would be no restrictions on their ability to access their property during a launch. All other members of the public not identified by the County or the USCG as "authorized persons" are described as "unauthorized persons" for the purposes of this EIS.

1.5 Public Involvement

FAA gathered input from the public during the scoping process, which is an early and open process for determining the range of issues to be addressed in the EIS. Section 1.5.1 describes the scoping process for this EIS. FAA has also provided the EIS to the public for review and comment. See Section 1.5.2 for a discussion on the Draft EIS that was made available for public review. FAA considers all comments on the EIS and responds to substantive comments in the Final EIS.

1.5.1 Scoping Process

Scoping provides an opportunity for the general public, government agencies, and interested groups to learn about the purpose and need, the Proposed Action, and alternatives for implementing the Proposed Action. The scoping process also provides an opportunity for the public to help define the scope of a Draft EIS, the alternatives, and the analyses by suggesting alternative approaches that meet the purpose and need and raising concerns and issues. During the public scoping comment period for this EIS, FAA requested input from government agencies, Native American tribes, organizations, interest groups, and the public on issues of concern and alternatives to be analyzed.

Scoping for this EIS began with the publication in the *Federal Register* of the Notice of Intent (NOI) to prepare an EIS, open a public scoping period, and hold a public scoping meeting in Camden County, Georgia, on November 6, 2015 (80 FR 68893). The NOI provided the date and time for the public scoping meeting and a summary of the Proposed Action; invited interested agencies, organizations, Native American tribes, and members of the public to submit comments; and formally initiated the public scoping comment period. FAA also notified, by postcard or e-mail, individuals; Federal, State, and local agencies; elected officials; and various groups that were likely to be interested in the Proposed Action and the scoping process. The NOI was also posted on FAA's website for this EIS: http://www.faa.gov/about/office_org/headquarters_offices/ast/environmental/nepa_docs/review/documents_progress/camden_spaceport. Appendix A contains materials and information from the scoping process. Specifically, Appendix A includes the *Scoping Summary Report* and associated appendices and the posters, fact sheets, FAA's presentation, and the transcript from the public scoping meeting.

The public scoping comment period was originally scheduled to close on January 4, 2016, but in response to public requests, it was extended to January 18, 2016. The extension was announced by issuing a notice of extension of the public scoping comment period in the *Federal Register* on January 11, 2016 (81 FR 1280), posting a notice on FAA's website for this EIS, and sending e-mail notifications to those on FAA's Spaceport Camden EIS mailing list.

The Brunswick News and the *Tribune & Georgian* are newspapers that provide service to the potentially affected communities in proximity to the proposed project. Table 1.5-1 identifies the advertisements announcing the public scoping meeting that were placed in these newspapers in the 2 weeks preceding the public scoping meeting. The advertisements summarized the Proposed Action; provided the time, date, and location of the public scoping meeting; and described the methods for submitting scoping comments.

Table 1.5-1. Scoping Meeting Notices—Publication Dates for Newspapers

Newspaper	Publication Date	Page Number
The Brunswick News	November 28, 2015	2A
	December 5, 2015	4A
Tribune & Georgian	November 26, 2015	5A
	December 3, 2015	6A

Although not an official part of the scoping process as defined by NEPA and FAA, the following additional outreach activities were conducted. In December 2015, FAA mailed letters to the leaders of the following Native American tribes, initiating formal government-to-government consultation: Chickasaw Nation, Choctaw Nation of Oklahoma, Muscogee (Creek) Nation, Poarch Band of Creek Indians, Seminole Nation of Oklahoma, Seminole Tribe of Florida, and Thlopthlocco Tribal Town. In January 2016, FAA mailed NHPA Section 106 consultation letters to the Georgia SHPO, the Tribal Historic Preservation Officers of the aforementioned tribes, and the Cherokee of Georgia Tribal Council, Georgia Tribe of Eastern Cherokee, and the Lower Muskogee Creek Tribe. FAA also e-mailed an NHPA Section 106 consultation letter to the Chair of the Gullah Geechee Commission.

1.5.1.1 Scoping Meetings

Two scoping meetings were held for the EIS, one for the public and one for agencies with an interest or involvement in the project.

Public Scoping Meeting

The public scoping meeting was held on Monday, December 7, 2015, from 5:00 p.m. to 8:00 p.m. at the Camden County Public Services Authority Recreation Center located at 1050 Wildcat Drive in Kingsland, Georgia, in Camden County. Attendees were welcomed at the entrance of the Recreation Center and were asked to fill out scoping meeting sign-in cards. Members of the public who wished to speak during the public comment portion indicated their intention to speak when they registered. The public scoping meeting began with an open-house poster session from 5:00 p.m. to 6:00 p.m., during which members of the public could speak to FAA representatives and view posters about the proposed project, the EIS, and the NEPA process. Posters and handouts provided information on the NEPA process and environmental impact categories (or resource areas); an overview of the Proposed Action, activities, and facilities; FAA licensing and permitting process; and the public involvement process.

Comment forms and pens were available during the poster session and during and after the formal meeting for attendees to fill out and submit comments. Comments could be submitted at the public scoping meeting, or the forms could be taken home and mailed to FAA after the meeting. A court reporter was present during the open house to record oral comments for those who did not wish to speak publicly at the meeting and to record the public comment session.

After the open house, FAA began the formal meeting with a brief presentation about the proposed project and the licensing and NEPA processes, followed by the public comment session. Speakers were called during the comment session in the order in which they signed up to speak. The transcript of the public comment session is included in Appendix A, *Public Involvement/Agency Coordination and Consultation*, and also available on FAA's *Spaceport Camden EIS* website, the link for which is provided in Section 1.5.1, *Scoping Process*.

A total of 460 individuals signed in at the public scoping meeting. Attendees included members of the public, representatives of Federal and State elected officials, city government agencies, community groups, and the media. There were 53 oral commenters at the public scoping meeting: 51 spoke during the comment session and 2 spoke privately to the court reporter.

Public Comments

Five methods were available to the public for providing comments:

- Submitting written comments at the public scoping meeting
- Providing oral comments during the public scoping meeting
- Providing oral comments privately to the court reporter during the open house preceding the comment portion of the public scoping meeting
- Submitting comments electronically to FAACamdenSpaceportEIS@Leidos.com
- Sending written comments by U.S. mail to Ms. Stacey M. Zee, FAA Environmental Specialist for the *Spaceport Camden EIS*

A total of 909 comment submissions were received. This total includes 770 comment submissions received during the time the public scoping comment period was officially open (November 6, 2015, to January 18, 2016). Of these 770 comment submissions, 355 comment submissions were provided as part of a campaign by the National Parks Conservation Association. Prior to the initiation of the public scoping

comment period, 125 comment submissions were received, 124 of which were from a campaign by the Wild Cumberland Organization. After the close of the public scoping comment period, another 14 comment submissions were received, 10 of which were additional National Parks Conservation Association campaign letters. Comment submissions are posted on FAA's *Spaceport Camden EIS* website, the link for which is provided in Section 1.5.1, *Scoping Process*. Table 1.5-2 identifies the number of comment submissions and the method by which they were received.

Table 1.5-2. Comment Submission Method Summary

Method of Submitting Comments[1]	Number of Comment Submissions Received
Written comments at scoping meeting	45
Oral comments at scoping meeting	53
Electronic (e-mail)[2]	770
U.S. mail	41
Total	**909**

Notes:
[1] Duplicate comment submissions provided via different methods were only counted once.
[2] A total of 125 comment submissions were received prior to the scoping comment period, and 14 comment submissions were received after the conclusion of the scoping comment period.

Concerns raised by commenters about the Proposed Action included the following:

- Disturbance of the natural habitat and visitor experience on Cumberland Island National Seashore
- Conflict between the Proposed Action and the wilderness designation of portions of the Cumberland Island National Seashore under the Wilderness Act
- Decreases in tourism and ecotourism, Cumberland Island visitation, and other local outdoor commerce
- Impacts on the public and threatened and endangered species from noise, vibration, chemical use and release, and lighting
- Potential for hazards to the public, land, and wildlife from accidents or failed launches
- Impacts on Naval Submarine Base (NSB) Kings Bay, especially from a failed launch or accident
- The effectiveness of emergency response and preparedness in the event of an accident, including the suitability of the existing road network and water evacuation routes
- A lack of specific information about the Proposed Action (trajectories, frequency, duration, and vehicle specifications)
- Safety issues with, and lack of precedent for, launches over populated areas and the failure rates of commercial rockets at other launch sites
- Impacts of evacuations and land and water closures (including closure of the Intracoastal Waterway) on local residents
- Lowered property values and increased insurance rates
- Overall reduction in local quality of life
- Financial liability of the County and its residents
- Impacts on cultural and historic sites from noise and vibration, including those listed on the NRHP
- Potential for vibrations to cause the release of residual hazardous materials from onsite soils

- Degradation of air quality and the potential for release of toxic fumes during launches
- Degradation or contamination of groundwater and surface waters
- Impacts on salt marshes, barrier islands, tidal areas, and other coastal resources
- De-confliction of both military and commercial airspace

Positive impacts of the Proposed Action cited by commenters included the following:

- Ideal setting of site (prior land use, location, isolation, natural buffers)
- Creation of new jobs/high-paying jobs
- Regional economic stimulus
- Increased tourism
- Increased educational opportunities and the retention of graduates with technical degrees

All comments received during the scoping period have been given equal consideration in the preparation of this EIS. The potential impacts from the Proposed Action and No Action Alternative on the environmental impact categories (i.e., resource areas) listed in Paragraph 4-1 of FAA Order 1050.1F are analyzed as part of this EIS. These environmental impact categories are:

- Air quality
- Biological resources (including fish, wildlife, and plants)
- Climate
- Coastal resources
- Department of Transportation Act, Section 4(f)
- Farmlands
- Hazardous materials, solid waste, and pollution prevention
- Historical, architectural, archaeological, and cultural resources
- Land use
- Natural resources and energy supply
- Noise and compatible land use
- Socioeconomics, environmental justice, and children's environmental health and safety risks
- Visual effects (including light emissions)
- Water resources (including wetlands, floodplains, surface waters, groundwater, and Wild and Scenic Rivers)

Additional resource areas recommended by commenters that are not listed in FAA Order 1050.1F, Paragraph 4-1 (e.g., airspace, geology and soils, health and safety, transportation) are analyzed and presented in appendices to this EIS.

Agency Scoping Meeting

The agency scoping meeting was held on December 8, 2015, from 9:30 a.m. to 12:00 p.m. at the Camden County Emergency Operations Center, located at 131 North Lee Street, Kingsland, Georgia. Representatives from NASA, NPS, NMFS, USACE, USFWS, USCG, U.S. Environmental Protection Agency (USEPA), U.S. Marine Corps, U.S. Navy, GDNR, Georgia Department of Community Affairs, Camden County Board of Commissioners, and Camden County Joint Development Authority participated either in person or by telephone.

The meeting began with FAA making the presentation it had given at the public scoping meeting during the previous evening. After the presentation, meeting participants introduced themselves and indicated their agency and interest in, or area of responsibility for, the proposed project. Introductions were followed by a discussion of issues and concerns. In general, agencies requested details about the proposed spaceport and launch activities; potential limited or restricted access areas, evacuation zones, and restrictions; potential effects on Cumberland Island National Seashore, wildlife, and habitats; and coordination and de-confliction with NSB Kings Bay and Marine Corps Air Station Beaufort. Attendees discussed agency consultation, coordination, and the roles and responsibilities of each of the agencies in attendance, including those required by Section 7 of the ESA, Department of Transportation Act Section 4(f), and Section 106 of the NHPA.

The meeting was followed by a tour of the proposed Spaceport Camden site. Agency representatives were able to view the site, comment on the potential for impacts on their respective areas of concern, and discuss any analyses or regulatory activities that might be required.

1.5.2 Public Involvement on the Draft EIS

In accordance with 40 CFR §§1506.6 and 1503.4, FAA must provide the public and interested agencies with an opportunity to review and comment on a Draft EIS and must formally respond to those public comments in the Final EIS. The Draft EIS review and comment period was initiated with the publication of the USEPA's Notice of Availability (NOA) in the *Federal Register* on March 16, 2018. In addition, FAA published a NOA in the *Federal Register* on March 16, 2018, indicating that the Draft EIS was available for review online at https://www.faa.gov/about/office_org/headquarters_offices/ast/environmental/nepa_docs/review/documents_progress/camden_spaceport/ and in hard copy format at the following local libraries:

- Camden County Public Library, 1410 Georgia Highway 40, Kingsland, Georgia 31548
- St. Marys Public Library, 100 Herb Bauer Drive, St. Marys, Georgia 31558
- Brunswick-Glynn County Library, 208 Gloucester Street, Brunswick, Georgia 31520
- St. Simons Island Public Library, 530A Beachview Drive, St. Simons Island, Georgia 31522

FAA sent notification of the publication of the Draft EIS to members of Congress; Federal, State, and local elected and appointed government officials and other agencies; Native American tribal officials; and libraries. FAA sent notification of the publication of the Draft EIS to media outlets; special interest groups; organizations; affected landowners; and interested members of the public who requested to be notified of the Draft EIS, as listed in Appendix A, *Public Involvement/Agency Coordination and Consultation*. FAA provided e-mail notification of the availability of the Draft EIS and the website location to everyone on the distribution list who had a valid e-mail address; those persons without valid e-mail addresses who provided a mailing address were notified via postcard. Notifications were also placed in local newspapers indicating the availability of the Draft EIS in the "Georgia" insert of the *Florida Times Union* (March 11 and April 8, 2018), the *Tribune & Georgian* (March 8 and April 5, 2018), and the *Brunswick News* (March 10 and April 7, 2018). The NOA, local newspaper advertisements, Draft EIS distribution letters, and the

website also provided notification of public hearings occurring to gather public input on the Draft EIS. The public hearings occurred on April 11 and 12, 2018, at the Camden County Public Services Authority Recreation Center located at 1050 Wildcat Drive in Kingsland, Georgia, in Camden County. Regional notification of the Draft EIS availability was also provided by placing NOAs on March 11, 2018, in the following newspapers: *The Island Packet* (Hilton Head, South Carolina); *Savannah Morning News* (Savannah, Georgia); main section of the *Florida Times-Union* (Jacksonville, Florida); and the *St. Augustine Record* (St. Augustine, Florida). Due to the scope of comments received during the scoping period, the NOA was published in two additional regional newspapers to capture a wider audience.

FAA requested that comments on the Draft EIS be substantive in nature. Generally, substantive comments are regarded as specific comments that: challenge the analysis, methodologies, or information in the Draft EIS as being factually inaccurate or analytically inadequate; identify impacts not analyzed; develop and evaluate reasonable alternatives or feasible mitigation measures not considered by FAA; offer specific information that may have a bearing on the decision, such as differences in interpretations of significance, scientific, or technical conclusions; or cause changes or revisions in the Proposed Action. Nonsubstantive comments, which do not require an FAA response, are generally considered those comments that: are nonspecific; express a conclusion or opinion about the Proposed Action; agree or disagree with the proposals; vote for or against the proposal itself or some aspect of it; state a position for or against a particular alternative; or otherwise state a personal preference or opinion.

The Draft EIS public comment period lasted for 90 days, from March 16, 2018, to June 14, 2018. Persons or agencies wishing to have their comments considered for the Final EIS were encouraged to provide their comments no later than June 14, 2018. During the comment period, FAA received over 15,500 comments, the large majority of which were nonsubstantive form letters sent by three different organizations expressing opinions regarding the Proposed Action and alternatives.

In accordance with 40 CFR §1503.4, FAA assessed and considered Draft EIS comments, both individually and collectively, to evaluate applicability of those comments given the modified scope of the Proposed Action. Comments were evaluated and addressed in the following manner:

- Comments were assessed to determine whether they identified fundamental or technical issues with the Draft EIS. Examples include technical issues with descriptions of the affected environment, perceived inadequacies with analyses, clarifications regarding the purpose and need, etc. FAA provided responses to these comments and revised discussions in this Final EIS, where applicable.
- Comments were also assessed to identify those specifically associated with the following topics: medium-large launch vehicles, returns, trajectories outside 100 degrees, or the Ocean-Landing Only Alternative. Examples include topic-specific safety discussions, impacts to resources, project-related details, etc. Such comments were evaluated to determine if the substance of the comment was still applicable under the modified scope. If still relevant, responses were provided as appropriate, and any associated changes were made to the document if necessary. For those comments identified as no longer applicable given the modifications to the Proposed Action, responses were provided to indicate that the comment is no longer applicable.

A more detailed discussion of the comment response process for the Draft EIS, as well as all substantive comments received and the associated FAA responses are provided in Appendix A.

Since the conclusion of the Draft EIS public commenting period, the County made the following modifications to the proposed spaceport as reflected in the modifications of its Spaceport Camden Launch Site Operator License Application amendment, submitted to FAA in January 2020:

- Change from medium-large launch vehicles to small launch vehicles; this is due to further feasibility analyses based on perceived market demand as well as, in part, public input.
- Removal of first-stage returns and ocean landings; this is because all current small launch vehicles are expendable.
- Change from an 83- to 115-degree trajectory range to a single 100-degree trajectory; addressing one trajectory is compliant with the requirements of 14 CFR §420.19.

Guidance contained in the CEQ Regulations Implementing the Procedural Provisions of the National Environmental Policy Act and FAA Order 1050.1F, Environmental Impacts: Policies and Procedures, requires the preparation of a supplemental EIS if the agency makes substantial modifications in the proposed action that are relevant to environmental concerns or there are significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts. See 40 CFR §1502.9(c)(1) and FAA Order 1050.1F, Section 9-3. FAA made its decision to prepare a Final EIS, rather than a supplemental or revised Draft EIS, in part based on its belief that the modifications to the Proposed Action associated with the County's amended application were not "substantial" in the context of presenting new or additional potential impacts beyond the scope already addressed in the Draft EIS.

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2 PROPOSED ACTION AND ALTERNATIVES

This Final EIS evaluates two alternatives: the Proposed Action and the No Action Alternative. Under the Proposed Action, FAA would issue a Launch Site Operator License (14 CFR Part 420) to the County that would allow the County to offer the commercial space launch site, Spaceport Camden, to commercial launch operators. Under the Proposed Action, the County would construct Spaceport Camden on the proposed site and operate it as a location for the integration, test, and launch of liquid-fueled, small, orbital, vertical-launch vehicles. The Proposed Action does not include recovery of the first stage[6] of the launch vehicle.

The Proposed Action is described in Section 2.1, *Proposed Action*. This EIS addresses issuance of a Launch Site Operator License to the County. Any commercial launch operator would be required to obtain a Vehicle Operator License (14 CFR Part 450) from FAA for operation of their vehicle(s) from Spaceport Camden. This EIS addresses FAA issuance of the Launch Site Operator License; FAA would require an additional environmental review under NEPA for any Vehicle Operator License.

Section 2.2, *No Action Alternative*, describes the No Action Alternative. Under the No Action Alternative, FAA would not issue a Launch Site Operator License to the County. Therefore, Spaceport Camden would not be constructed on the proposed launch site, and no activities requiring licensing or oversight by FAA would occur. The County could decide to purchase the site for other purposes not related to spaceport operation or not exercise its option to purchase the site.

Section 2.3, *Alternatives Considered but Not Carried Forward*, describes alternatives considered but not carried forward for detailed analysis. These alternatives include locations in Camden County other than the proposed site that were considered as candidate sites for Spaceport Camden and alternative locations on the proposed Spaceport Camden site for the placement of the Vertical Launch Facility. This section includes the criteria developed by the County to assess these launch sites and Vertical Launch Facility locations and a discussion of why these other alternatives were not carried forward for analysis.

2.1 Proposed Action

Under the Proposed Action, which is the Preferred Alternative, FAA would issue a Launch Site Operator License to the County. The Proposed Action is the County's Preferred Alternative because it satisfies the project's purpose and need. The license would allow the County to offer the commercial space launch site, Spaceport Camden, to commercial launch operators to conduct launches of liquid-fueled, small, orbital, vertical-launch vehicles. 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 city of Woodbine.

The proposed launch facility would be constructed within an existing 11,800-acre industrial site, comprising property currently owned by the Union Carbide Corporation and Bayer CropScience. Union Carbide Corporation owns approximately 4,000 acres and Bayer CropScience owns approximately 7,800 acres (see Exhibit 2.1-1). Within the context of this EIS, the terms "launch site," "spaceport," and "spaceport boundary" refer to the area outlined in blue on Exhibit 2.1-1, while "industrial site" refers to the current status of the entire property owned by Union Carbide Corporation and Bayer CropScience. The County has signed an option agreement[7] with the Union Carbide Corporation to purchase its portion of this industrial site (approximately 4,000 acres). The County plans to purchase the Bayer CropScience

[6] The "first stage" refers to the booster rocket(s) providing the initial powered ascent of the launch vehicle.
[7] 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.

property. If the County is unable to purchase the Bayer CropScience property, then the County would secure access to the site through a lease or easement.

Related existing 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 2.1.1, *Construction – Activities and Facility Descriptions*.

The County proposes to construct three of the four spaceport elements on what is currently Union Carbide Corporation property: the Vertical Launch Facility, Mission Preparation Area, and Launch Control Center Complex. These spaceport facilities would be constructed on approximately 100 noncontiguous acres of uplands (Exhibit 2.1-2 and Exhibit 2.1-3). One of the proposed facilities, the Alternate Control Center and Visitor Center, is located on what is currently Bayer CropScience property. Should the County neither purchase the property nor reach a lease agreement with Bayer CropScience, this facility would not be constructed, as it is not mission critical. To provide security and access control, each of the proposed facilities, and the western boundary of the spaceport site, would be fenced.

As is currently planned, the Union Carbide Corporation would retain title to the Resource Conservation and Recovery Act (RCRA) landfill and the buffer area around the landfill (Exhibit 2.1-2). In the unlikely event that Union Carbide Corporation determined it would to be unable to carry out its responsibilities for the RCRA landfill, the U.S. government would resolve that circumstance through the normal channels, such as bankruptcy proceedings and seeking a trustee to assume those responsibilities.

The County would acquire the remainder of the former Union Carbide Corporation industrial property, which would be carved-out from the RCRA landfill portion of the property prior to transfer to the County. This carved-out area acquired by the County would require a No Further Action signoff from GDNR EPD prior to acquisition by the County.

In addition, the County intends to take advantage of other potential measures to mitigate any potential liability under Federal and State law by conducting "all appropriate inquiries" pre-transfer and taking "reasonable steps" and "appropriate care" post-transfer in order to qualify for bona fide prospective purchaser status as defined under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The County also plans to purchase a pollution legal liability insurance policy.

As proposed, Spaceport Camden would accommodate up to 12 vertical launches per year. All vehicles would launch over the Intracoastal Waterway, Cumberland Island National Seashore, Little Cumberland Island, and the Atlantic Ocean. In support of launch operations, there would be up to 12 wet dress rehearsals and up to 12 static fire engine tests per year.[8] Operational activities are described in Section 2.1.2, *Representative Launch Vehicle and Operational Activities*.

The referenced launch trajectory identified in the Spaceport Camden Launch Site Operator License Application is 100 degrees from true north. This trajectory is depicted in Exhibit 2.1-4. This EIS uses the 100-degree trajectory for analysis. Only the 100-degree trajectory would be authorized under the Spaceport Camden Launch Site Operator License.

2.1.1 Construction – Activities and Facility Descriptions

This section describes the proposed Spaceport Camden facilities and construction activities under the Proposed Action. Facilities and associated infrastructure include a Vertical Launch Facility, Launch Control Center Complex, an Alternate Control Center and Visitor Center, and a Mission Preparation Area.

[8] Wet dress rehearsals are launch rehearsals that include loading of propellants but do not include ignition of the first-stage engines. Static fire engine tests are short (two- to seven-second) tests that include firing of the first-stage engines with the rocket held down. These are further detailed in Section 2.1.2.5, *Pre-Launch Activities*.

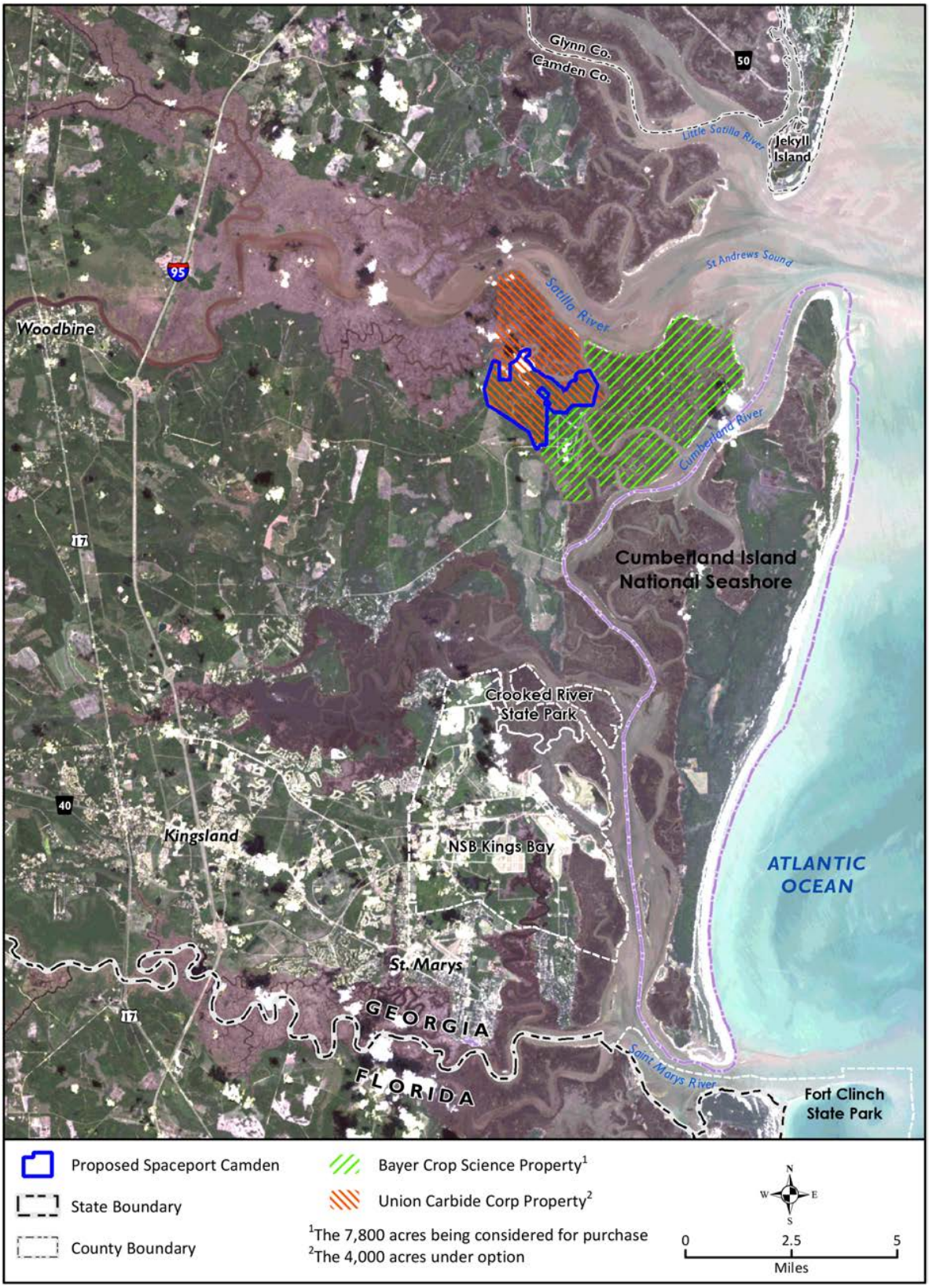
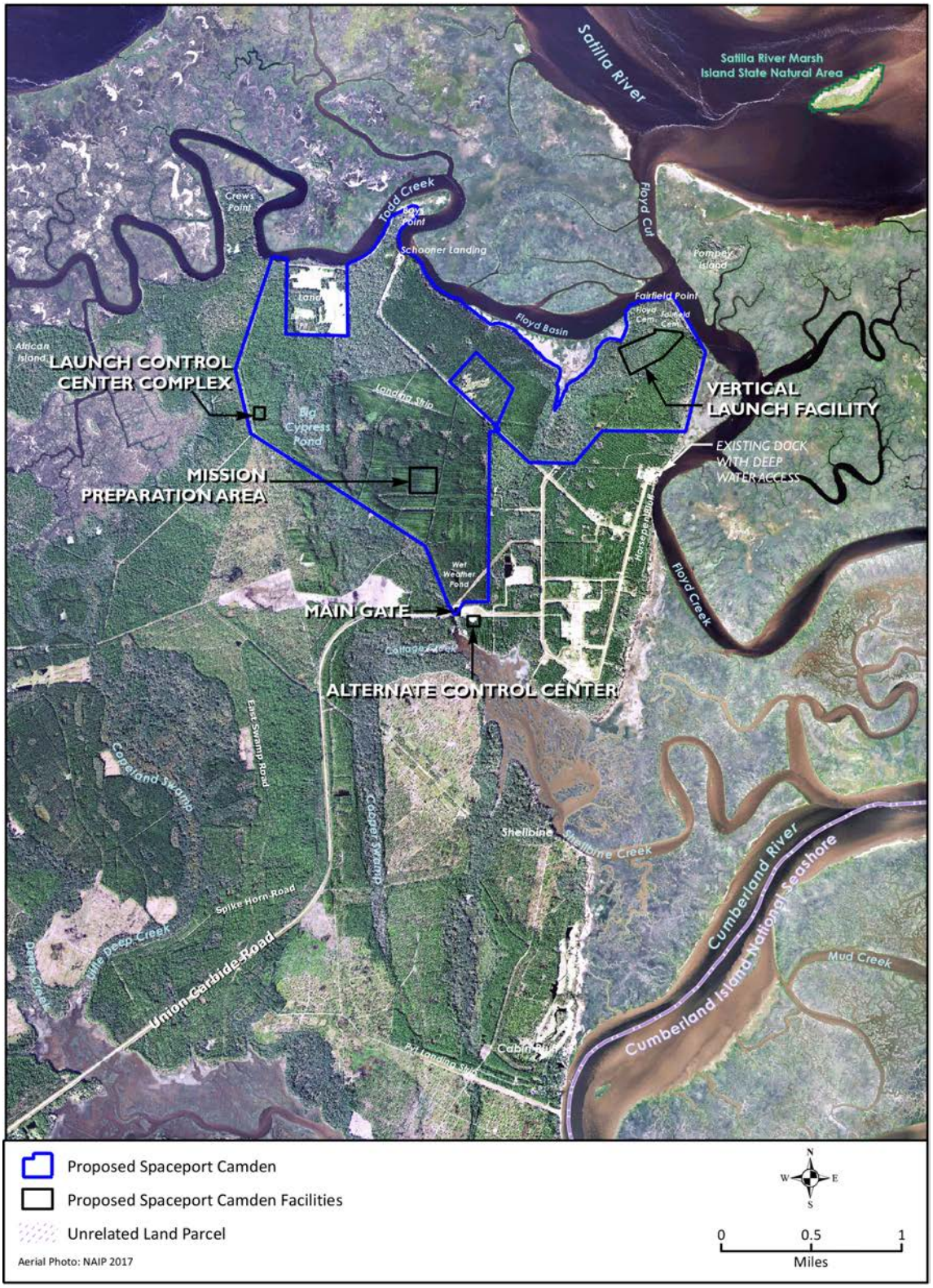


Exhibit 2.1-1. Proposed Spaceport Camden Regional Location



Note: The parcel of land identified in the exhibit as "Unrelated Land Parcel" is property owned and used by Bayer CropScience and is not included in the land Camden County is considering purchasing from Bayer CropScience.

Exhibit 2.1-2. Proposed Spaceport Camden Site Plan

Exhibit 2.1-3. Proposed Spaceport Camden Site Plan – Aerial View

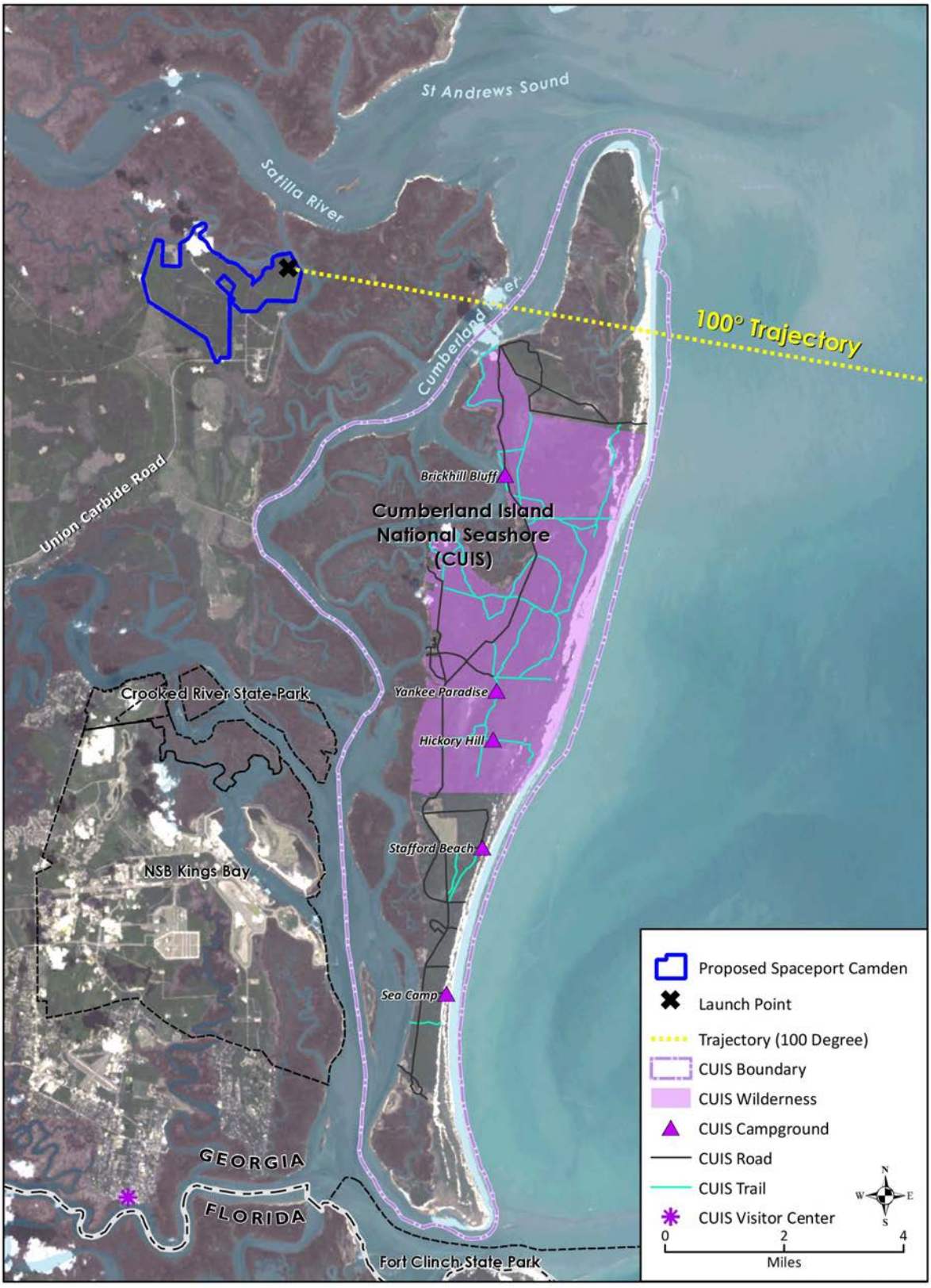


Exhibit 2.1-4. Spaceport Camden Reference Launch Trajectory (100 degrees)

The site layout described in the following sections represents the conceptual design for Spaceport Camden. Not all operators that may launch from Spaceport Camden would require the use of a Vertical Launch Facility, Launch Control Center Complex, Alternate Control Center and Visitor Center, and a Mission Preparation Area.

2.1.1.1 Launch Site Construction Activities

There are no existing buildings that could be converted to support launch site operations. Some existing infrastructure (i.e., roadways) is available on the Union Carbide Corporation property; this infrastructure would be used as appropriate and feasible. There are no water, electricity, or communication systems on the Union Carbide Corporation property; however, communications, power, electricity, and water are available on the adjoining Bayer CropScience property (in need of upgrade/repair), and there is an access road between the two properties. Accordingly, all the planned facilities and most of the onsite infrastructure proposed for Spaceport Camden would be new. Onsite infrastructure improvements would include improvements to existing internal roads, and construction of new roadways, new electrical, communications, and water distribution systems, and septic systems. No improvements to offsite infrastructure would be needed to support Spaceport Camden.

During construction, temporary laydown areas (i.e., staging areas for construction equipment and materials) for each facility would be encompassed within the fenced perimeter (see Exhibit 2.1-5 through Exhibit 2.1-8). Typically, these laydown areas would be located in spaces 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 additional laydown areas are needed, existing unused roadways may also be used. Construction of Spaceport Camden facilities and infrastructure would result in the clearing of approximately 122 acres.

All structures would be designed and constructed in accordance with building code requirements for Georgia and Camden County to accommodate hurricane protection. Table 2.1-1 shows the estimated construction timeframe for Spaceport Camden facilities.

Table 2.1-1. 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
Mission Preparation Area	9–10 months
Infrastructure[1]	6–7 months

Note:
[1] Includes water, sewer, communication systems, drainage, electric, and roads.

Construction of the facilities and infrastructure would occur simultaneously and last approximately 15 months, the length of time needed for construction of the Vertical Launch Facility. Construction activities would occur during daylight hours, 5 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, communications and roads). Launch site construction activities would not commence until after the NEPA process, including issuance of a Record of Decision, has been completed and required permits and approvals have been granted.

2.1.1.2 Vertical Launch Facility

Exhibit 2.1-5 includes an artist's rendering and schematic of the Vertical Launch Facility. The Vertical Launch Facility would be approximately 29 acres[9] in size and, as indicated in Exhibit 2.1-2, would be located in the northeastern portion of the Spaceport Camden site. Site preparation and construction of the Vertical Launch Facility is anticipated to take about 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 (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 250-foot-tall lightning towers 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 may use ordnance as part of the flight termination system (see Section 2.1.2.1, *Representative Launch Vehicle*) 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, which is a component of 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.

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. The two support buildings—containing 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, any building that houses machine shops or a warehouse would have a high bay. These support buildings would be approximately 45 feet tall.

[9] Facility areas include the area within the fenced perimeter (which encloses all of the facility structures) 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.

There is 25 ft of grass outside the perimeter fence and along retention ponds.

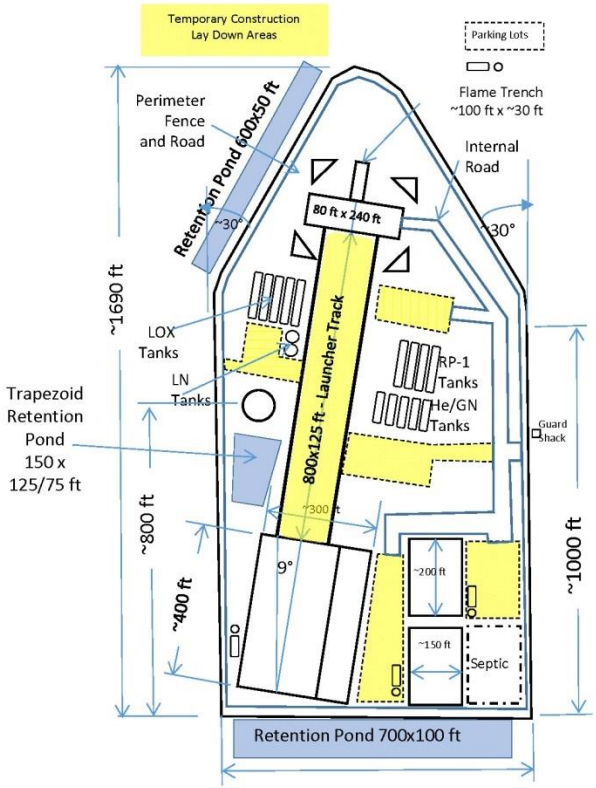


Exhibit 2.1-5. Vertical Launch Facility

A 250-foot-tall water tower would be constructed at the Vertical Launch Facility to feed a deluge water system, which would provide sound and vibration suppression during an actual launch. The deluge water would be injected into the rocket exhaust plume and flame trench and sprayed on the launch pad deck. During an actual launch, the water tower would discharge up to 250,000 gallons of water.

Other Vertical Launch Facility components would include associated roads, a parking lot, a perimeter road and fencing, gates, a guard shack, a diesel generator system (including fuel storage tanks),[10] a septic system, and area lighting. These features are described in Section 2.1.1.6, *Infrastructure*. As shown in Exhibit 2.1-5, three retention ponds for stormwater runoff control would be constructed at the Vertical Launch Facility. Each pond would be approximately 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.

2.1.1.3 Launch Control Center Complex

The Launch Control Center Complex would be constructed on approximately 2.4 acres (see Exhibit 2.1-6). As indicated on Exhibit 2.1-2, the Launch Control Center would be constructed on an uplands area in the extreme western portion of the Spaceport Camden site, approximately 2.3 miles from the launch pad at the Vertical Launch Facility and approximately 1 mile from the Mission Preparation Area.

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 satellite[11] and other related payload processing activities prior to integration onto launch vehicles. A first responder facility would be located within the Launch Control Center Complex at the Launch Control Center Building or the Payload Processing Building.

The Launch Control Center Complex would also include two small storage buildings for payload propellants (satellite and special fuels[12]) 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, approximately 2 feet in diameter and 40 feet long. Ordnance also may be stored at this facility for a short time before being installed on the vehicle 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 2.1.1.6, *Infrastructure*. Two retention ponds for stormwater runoff control would be constructed at the Launch Control Center Complex. Each pond would be approximately 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.

[10] There may be a total of up to seven diesel fuel storage tanks on the Spaceport Camden site, located at the Launch Control Center Complex, Vertical Launch Facility, and Alternate Control Center and Visitor Center.
[11] A satellite is the portion of the payload consisting of an object placed in orbit around the Earth.
[12] Satellite and special fuels include hydrazine and monomethylhydrazine (MMH) or unsymmetrical dimethyl hydrazine (UDMH) used with nitrogen tetroxide (NTO).

There is 25 ft of grass outside the perimeter fence and along retention ponds.

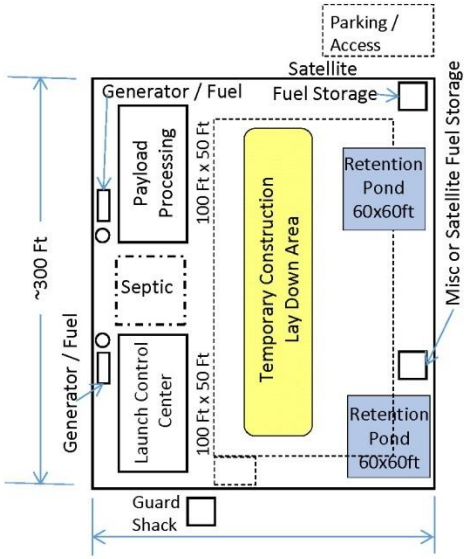


Exhibit 2.1-6. Launch Control Center Complex

Site preparation and construction of the Launch Control Center Complex is anticipated to take about 12 months.

2.1.1.4 Alternate Control Center and Visitor Center

Exhibit 2.1-7 shows an artist's rendering and proposed footprint for the Alternate Control Center and Visitor Center. 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 Camden site, as indicated in Exhibit 2.1-2, near the Spaceport Camden main entrance, on property that is currently owned by Bayer CropScience. The Alternate Control Center would mirror the Launch Control Center in facility construction. Although not required for launch operation, this Launch Control Center 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.

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 2.1.1.6, *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.

2.1.1.5 Mission Preparation Area

Exhibit 2.1-8 is an artist's rendering and schematic of the Mission Preparation Area. The Mission Preparation Area would be used for remote vehicle processing. It would occupy approximately 13 acres located in the center of the uplands portion of the Spaceport Camden site, as indicated in Exhibit 2.1-2. The Mission Preparation Area would primarily consist of a 400-foot by 400-foot concrete pad located roughly in the center of the area. The Mission Preparation Area would also have a building for operations and storage, as well as fuel and oxidizer ''offload'' tanks.

The Mission Preparation Area consists of a concrete pad that would be supported by 3-foot-diameter concrete piers driven into the ground. There would be 100-foot-wide concrete side wings for parking and storage of mobile offload propellant tanks and other support equipment such as mobile cranes or forklifts. The Mission Preparation Area would have a building for operations and storage (50 feet by 50 feet by 20 feet tall), with 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 Mission Preparation Area would be fenced for security, have a guard shack at the entrance, and have a septic system. These features are described in Section 2.1.1.6, *Infrastructure*. Two retention ponds for stormwater runoff control would be constructed at the Mission Preparation Area. Each would be approximately 8 feet deep and would have a combined surface area of 46,000 square feet and total retention volume of 370,000 cubic feet.

Site preparation and construction of the Mission Preparation Area is anticipated to take about 9 to 10 months.

There is 25 ft of grass outside the perimeter fence and along retention ponds.

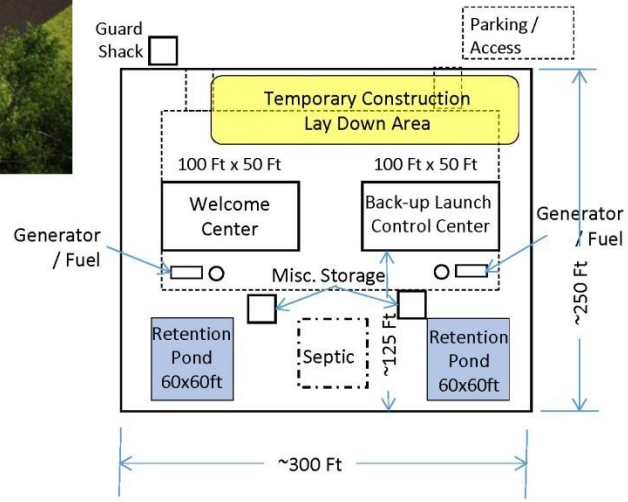


Exhibit 2.1-7. Alternate Control Center and Visitor Center

There is 25 ft of grass outside the perimeter fence and along retention ponds.

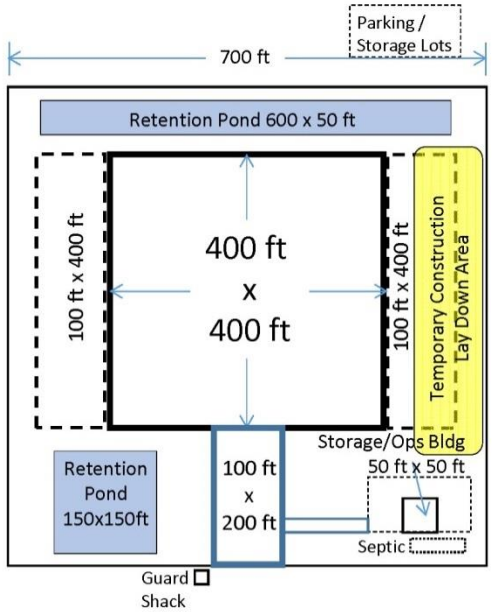


Exhibit 2.1-8. Mission Preparation Area

2.1.1.6 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. The County has stated that new infrastructure and improvements would be limited to onsite improvements or, in the case of improved roadways, within the industrial property. The County does not anticipate improvements or expansions required for Harrietts Bluff Road/Union Carbide Road outside the proposed spaceport site, which would provide access to the site. (Portions of Union Carbide Road within the boundary of the proposed spaceport site would require improvement as described below.) Additionally, the County does not anticipate required expansions or improvements to the utilities that bring electricity and communications to the external boundary of the industrial property, although expansions and improvements may be required within the boundary of the spaceport site to provide utilities to various facilities.

Expansion and improvement of the internal roadway system (i.e., within the spaceport site boundary) would be required for construction activities and to accommodate the new facilities and activities. Exhibit 2.1-9 shows the proposed roadway modifications, including modifications to roads on the Union Carbide Corporation property and on the Bayer CropScience property. Most of the launch site roadwork would involve 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 oversized 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 Mission Preparation Area, 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 2.1-9, one of the road upgrades is an upgrade to a heavier road to the existing dock. The dock area, which is part of Bayer CropScience property and would be included in the purchase option, could be used in support of future site operations at Spaceport Camden. Infrastructure exists at the dock; however, it is currently in an unserviceable state. The County has no plans at this time to use or make any modifications to the dock itself. The County recognizes that use of this dock or any work on the dock, including maintenance, must be coordinated with the GDNR Coastal Resources Division and USACE to obtain applicable permits/permissions (O.C.G.A. 12-5-280, *Coastal Marshlands Protection Act*, and O.C.G.A. 50-16-61, *Administrative Procedures Act/Revocable License Program*), which would require additional environmental review. Coordination with both the GDNR Coastal Resources Division and USACE would determine permitting and surveying needs.

There is no electrical power, communications fiber, sewer/septic or water available within the property currently owned by Union Carbide Corporation. The Bayer CropScience property includes electrical and communications lines as well as two deep water wells; however, these utilities do not extend onto the property currently owned by Union Carbide Corporation. Electric power, communications, and water are available at the main gate building for the industrial site, which is located on property currently owned by Bayer CropScience (see Exhibit 2.1-2). Power, communications, and water would be provided to proposed Spaceport Camden facilities by extending the existing services available at the main gate.

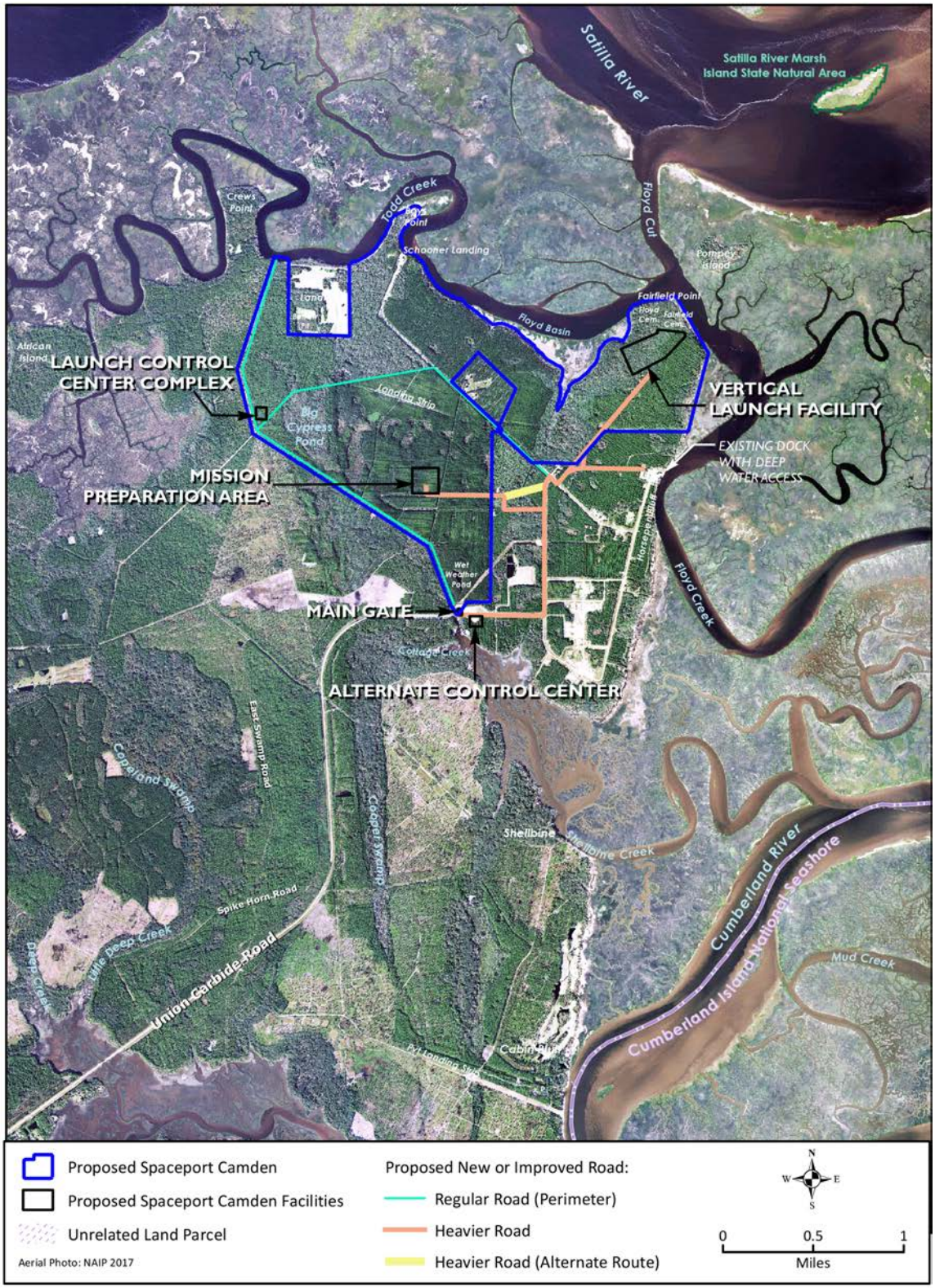


Exhibit 2.1-9. Proposed Launch Site Roads Improvements

The proposed electrical power distribution system would consist of an extension of the existing aerial distribution system to areas near the proposed spaceport facilities. This would involve installing approximately 3 miles of aboveground lines (mounted on wooden poles) located along launch site roadways. The system would then transition to underground primary cables, which would extend to multiple pad-mounted transformers located near each building and load center. Power requirements during launch site operation are estimated at a nominal power demand of 6,400 kilovolt amps (kVA) during operation, with a maximum demand of approximately 7,500 kVA. Power requirements during construction would be much less, nominally a little over 500 kVA.

There are two existing deep wells on the property currently owned by Bayer CropScience 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 proposed 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.) Union Carbide Corporation is currently working with the County to modify certain institutional controls currently in place for the property, including modification of the Environmental Covenant prohibiting the use of groundwater. The County plans to modify the Environmental Covenant to allow use of groundwater from the deeper aquifer. The County anticipates resolution to this issue prior to the beginning of operations at the proposed Spaceport Camden site. Groundwater from the surficial aquifer will remain restricted for any use.

Septic systems would be constructed at each of the four facilities to manage sanitary sewage. Commercial grade onsite sewage disposal (septic) systems would be used 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 Mission Preparation Area, 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, and possibly video surveillance, would be installed around each of the four individual facilities and along the western border of the Spaceport Camden site.[13] A main gate with controlled access would be installed near the Alternate Control Center and Visitor Center. The County has proposed that its 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 FAA AC 150/5370-10 (as amended). The security fencing would consist of a chain-link fabric installed to a height of 8 feet (2.5 meters) and topped with a three-strand barbed wire overhang. Fence posts could 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. Appropriate endangered and/or protected species (e.g., tortoises and snakes) pass-throughs in/under the fence would be installed pursuant to USFWS and GDNR recommended mitigation measures (see Appendix A). Some examples of designs to support wildlife movement at a boundary fence include leaving small gaps at the base of the fence, installing small culverts that burrow beneath fencing, using gauged wire to support passage along the base of the fence, and installing the fence with a 4 to 6 inch gap between it and the ground to allow wildlife passage.

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

Each of the facilities would have controlled access and guard shacks at the entrance. All the guard shacks for the four individual internal facilities (Vertical Launch Facility, Launch Control Center Complex, Mission Preparation Area, 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.

The County has stated that its lighting systems would be designed and operated using best practices for wildlife, navigation, safety, and security. Area lighting would be provided for the four facilities but is not anticipated for the entire site 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 (LED) lighting.

Typical (non-launch weekday) operations would dictate that external lighting would be turned on at about 9:00 p.m., and 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 safety/security needs and the potential for three-shift operations at all four facilities.

2.1.1.7 Structure Summary

The previous sections provided information about the features of each of the four facilities and the infrastructure proposed for Spaceport Camden. Table 2.1-2 provides a summary of the permanent structures that would be located at each of the Spaceport Camden facilities, their sizes, and type of construction. The size identified for each facility includes the area within a fenced perimeter plus a 25-foot cleared grassy area outside of the perimeter. Table 2.1-3 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 2.1-4 provides the proposed facility final construction 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, the County has stated that areas temporarily affected by construction (laydown areas) would all be within the fenced perimeter of the facilities. For the construction of these structures, the County has stated that all excavated material (an estimated 126,000 cubic yards) would be reused onsite, primarily as backfill. Within the Mission Preparation Area and Vertical Launch Facility, all pads, parking lots, and roads would be concrete, and all other paved areas would be asphalt.

2.1.2 Representative Launch Vehicle and Operational Activities

Operations would consist of up to 12 launches[14] per year. Up to 12 static fire engine tests and up to 12 wet dress rehearsals may also be conducted per year. One of the 12 launches could be conducted at night. The azimuth of the reference trajectory in the Spaceport Camden Launch Site Operator License Application is 100 degrees from true north. Consequently, the analysis in this EIS evaluates launches to the east along the 100-degree azimuth (approximately east southeast), over the Intracoastal Waterway, Cumberland Island National Seashore and/or Little Cumberland Island, and the Atlantic Ocean. The first stage of the launch vehicle would drop 200 to 300 miles offshore into the Atlantic Ocean and not be recovered.[15]

[14] *Launch* is defined as an attempt to place a launch vehicle or reentry vehicle and any payload from Earth in a suborbital trajectory, in Earth orbit in outer space, or otherwise in outer space. Launch operations consist of the launch and pre- and post-flight ground operations, beginning with the arrival of the launch vehicle and payload/satellite at Spaceport Camden and continuing until all activities are completed.

[15] As part of the license application process, FAA would require an additional environmental review under NEPA for any Launch Vehicle Operator License.

Table 2.1-2. Proposed Action Permanent Vertical Structures

Facility	Structure	Height (feet)	Footprint (feet)[a]	Construction
Launch Control Complex (facility size: 300 ft x 250 ft)	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
Alternate Control Center and Visitor Center (facility size: 300 ft x 250 ft)	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
Mission Preparation Area (facility size: 700 ft x 700 ft)	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 ft x 800 ft[c])	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[a] (four)	250	60 x 60 x 85	Metal frame
	Chemical storage tanks[b]			Prefabricated metal
	Liquid oxygen	14	150 x 135	
	Rocket Propellant-1	12	135 x 135	
	Helium/nitrogen	10	80 x 160	

Notes: ft = foot.

[a] Footprint dimensions are for the concrete pads for these structures.

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

[c] 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.

Table 2.1-3. Proposed Action Facility Summary

Facility	Total Acreage[1] (square feet/acres)	Occupants (normal/surge)	Construction Duration (months)
Launch Control Center Complex	105,000/2.4	25/100	12
Alternate Control Center and Visitor Center	105,000/2.4	10/50 | 15/150 (visitors)	12
Mission Preparation Area	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

Note:
[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 2.1-4. Spaceport Facilities Component Footprints

Vertical Launch Facility Components	Component Footprint (square feet)
Vehicle Integration Building	120,000
Office building	30,000
Warehouse/storage/ shop building	30,000
Water tower	0
Guard shack	100
Launch pad	19,200
Launcher track	100,000
Flame trench	3,000
Lightning tower pads (four)	7,200
Parking lots (five)	132,000
Chemical storage tank pads	
Liquid oxygen	20,300
Rocket Propellant-1	18,200
Helium/nitrogen	12,800
Interior roads	56,800
Facility perimeter road	48,900
Retention ponds (two)	100,000
Total footprint[d] (Structures/Pavement)	598,000[b]
Launch Site Roads[e]	**Component Footprint (square feet)**
Launch site perimeter road (west side of site)	150,000
Interior regular roads	312,000
Interior heavy use roads	462,000

Launch Control Center Components	Component Footprint (square feet)
Launch Control Center Building	5,000
Payload Processing Building	5,000
Guard shack	100
Storage buildings (two)	800
Parking area	22,500[a]
Access drive	600
Retention ponds (two)	7,200
Total footprint (structures/pavement)	33,900[b]
Alternate Control Center and Visitor Center Components	**Component Footprint (square feet)**
Alternate Control Center Building	5,000
Visitor Center	5,000
Guard shack	100
Storage buildings (two)	800
Parking area	22,500[a]
Access drive (two)	1,200
Retention ponds (two)	7,200
Total footprint (structures/pavement)	34,500[b]
Mission Preparation Area Components	**Component Footprint (square feet)**
Storage/operations building	2,500
Multiuse pad	160,000
Side wings (two)	80,000
Access road	20,000

Table 2.1-4. Spaceport Facilities Component Footprints (Continued)

Launch Site Roads[e]	Component Footprint (square feet)
Total road footprint	924,000

Mission Preparation Area Components	Component Footprint (square feet)
Parking lot	9,500[c]
Retention ponds (two)	31,500
Total footprint (structures/pavement)	272,000[b]

Notes:
[a] Paved area of parking lot encompasses the two larger buildings. Paved area excludes area associated with the buildings.
[b] Total does not include retention pond area.
[c] Paved area of parking lot encompasses the storage/operations building. Paved area excludes area associated with the building.
[d] 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.
[e] The perimeter road would be one lane. All others would be 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).

This section describes a representative small launch vehicle and typical operational activities.

Minimal vehicle assembly and processing would be expected to occur at the launch site because the launch vehicles that would launch from Spaceport Camden would launch within a few days to several weeks after the arrival of the payload. Fabrication of the major components of the launch vehicle would occur at other facilities run by the vehicle operator. Launch vehicles would be delivered to the launch site in preassembled segments (e.g., first stage, second stage), and integration of these vehicle segments would occur at Spaceport Camden.

The County anticipates that permanent staffing at the launch site under the Proposed Action would be approximately 77 full-time employees, with 27 of the employees being Camden County employees and 50 of the employees being launch operator employees. Depending on the launch operator and type of launch, onsite activities supporting a launch would be expected to begin up to 4 weeks before launch day. About 2 weeks before launch and during launch operations, it is anticipated that the number of staff would increase to approximately 50 to 100 Camden County employees and 150 to 200 launch operator employees. The additional Camden County employees are expected to be from the local work force; however, the launch operator employees would most likely be permanent launch operator employees temporarily assigned to Spaceport Camden. These additional employees would be needed to support the additional activities associated with payload processing, launch vehicle preparation, payload and launch vehicle integration, and launch support activities during launch preparation.

2.1.2.1 Representative Launch Vehicle

Spaceport Camden would be available to a range of launch operators, each of which offers various launch vehicles. While these vehicles would be small 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 for launch from Spaceport Camden, a representative launch vehicle is used in this EIS to evaluate the potential environmental impacts of proposed operations.[16]

[16] As part of the license application process, FAA would require an additional environmental review under NEPA for any Launch Vehicle Operator License.

The design features described for the launch vehicle described in the following paragraphs were selected as representative for a small launch vehicle. While these are not the only parameters that determine environmental impacts, the size of the vehicle, the types of propellants used by the launch vehicle, propellant capacity (total amount of propellant carried on the vehicle), and thrust are important parameters in the analysis of environmental impacts.

The representative small launch vehicle used for this analysis is a two-stage, liquid-fueled (liquid oxygen and RP-1) launch vehicle with approximately 18,500 pound-feet of thrust at lift-off, carrying a small (100- to 300-pound) payload/satellite to low Earth orbit. The representative launch vehicle is considered to be similar in design and performance to a RocketLab Electron launch vehicle, which Camden County identified as a representative launch vehicle for purposes of hazard analysis in the Launch Site Operator License application. The representative launch vehicle is anticipated to carry approximately 1,000 gallons of liquid oxygen and 750 gallons of RP-1. The representative launch vehicle used for this analysis is anticipated to be between 40 to 60 feet tall.

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 limit the risk to the public from a malfunctioning vehicle or its debris in accordance with FAA regulations.

Launch Vehicle Transport and Assembly

The first and second stages would typically arrive separately by oversized truck 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 vehicle checks, information on the vehicle status would typically be shared via radio frequency channels.

Ground transportation support for the delivery of the launch vehicle and payload would be minimal. This ground transportation support would consist of a truck to deliver a crane and four or five delivery trucks for delivery of the first stage, second stage, the interstage (a structure located between the first stage and second stage that houses the first stage release and stage separation systems), and any miscellaneous items. The payload would be delivered separately from the delivery of the launch vehicle. During transport of these launch vehicle components, the truck carrying the components would be accompanied by one or two escort vehicles.

2.1.2.2 Propellant, Gas, Fuel, Oil, and Solvent Storage

As discussed in Section 2.1.1.2, *Vertical Launch Facility*, liquid oxygen and RP-1 would be stored onsite to fuel launch vehicles. As much as 350,000 gallons of liquid oxygen and 200,000 gallons of RP-1 would be stored in tanks in dedicated propellant storage areas at the Vertical Launch Facility.

Payload fuels, such as unsymmetrical dimethyl hydrazine (UDMH), monomethylhydrazine (MMH), and nitrogen tetroxide (NTO), would be stored on a single-mission basis. In total, up to 5,500 pounds of UDMH, MMH, and NTO could be stored at the Launch Control Center Complex.[17] A typical storage tank for these types of propellants would hold 50 gallons, though some may also hold up to 250 gallons per

[17] The ratio of the required fuels is payload specific. Typically, this amount is equivalent to less than 600 gallons of payload fuels.

container in some cases. These propellants would be stored in aboveground storage tanks in the approximate 20-foot by 20-foot fuels storage area in the payload processing area of the Launch Control Center Complex. In addition, up to 2,000 gallons of hydrazine, used as a satellite propellant, could be stored at the fuel storage area of the Launch Control Center Complex.

Helium and nitrogen would be used as pressurants for the propellant tanks during flight. They may also be used as a purge gas during fueling operations and at engine start. Helium and nitrogen would be obtained from commercial sources, delivered by tanker truck, and stored in aboveground, high-pressure storage tanks. Approximately 10,000 to 15,000 gallons of helium and 25,000 to 50,000 gallons of nitrogen would typically be stored at the Vertical Launch Facility. An additional 1,000 cubic feet of helium and 3,000 cubic feet of nitrogen would be stored at the Launch Control Center Complex.

Launch operators would arrange for the delivery of propellants and other necessary fluids and gases (e.g., the associated helium and nitrogen) needed for each launch. A total of approximately six to eight trucks would make monthly deliveries of propellant, helium, and nitrogen, as needed.

Approximately 100 gallons of isopropyl alcohol would be needed for each launch operation for additional cleaning operations, and approximately 20 gallons would be required for various cleaning operations during preparation activities. Solvent flushes would be performed during operation of the launch vehicle programs, requiring storage of limited quantities of various solvents in the shop areas. Less than 300 gallons of heavy gear oil and hydraulic oil, less than 5 gallons of cutting oil, and limited supplies of adhesives would be stored in the shop area in the Vehicle Integration Building or at the launch pad for general use in the maintenance of ground equipment. Welding equipment would be maintained onsite for occasional use. An oxygen/acetylene or other torch with its associated gases (carbon dioxide and argon) may also be used on a limited basis. Welding gases and supplies would be stored in 10 K-bottles (cylindrical tanks roughly 10 inches in diameter and 5 feet long each). Approximately 35,000 gallons of generator fuel (diesel or gasoline) would be stored at the launch site for backup generator usage.

Table 2.1-5 provides a representative list of these materials proposed to be stored onsite. When no quantity is listed, only minimal amounts would be stored.

2.1.2.3 Representative Launch

Launch operations begin with the onsite delivery of the launch vehicle to the Vehicle Integration Building at the Vertical Launch Facility and the payload to the Payload Processing Building at the Launch Control Center Complex. Payload processing and launch vehicle checkout and assembly would occur concurrently. When ready for integration, the payload would be brought to the Vehicle Integration Building to be mated to the launch vehicle. Prelaunch tests (including dry and wet rehearsals and static engine tests) would be performed in the days leading up to the launch (see Section 2.1.2.5, *Pre-Launch Activities*).

A typical trajectory starts with a nearly vertical climb for 45 to 75 seconds and then slowly tips horizontally, continuing to gain altitude until it achieves orbit. Based on launch and trajectory modeling information as included in the Launch Site Operator License Application for Spaceport Camden, when the rocket approaches Cumberland Island or Little Cumberland Island, it should be between 70,000 and 100,000 feet above the island and take between 6 to 10 seconds to cross the island. Most of the initial vertical ascent (between 45 to 75 seconds depending on the rocket and trajectory) would take place almost directly over the launch pad and/or within the boundary of the Spaceport Camden site.

Table 2.1-5. Material Storage

Material	Quantity Stored Onsite
Launch Vehicle Propellants/Pressurants	
RP-1	200,000 gallons
Liquid oxygen	350,000 gallons
Helium	10,000 to 15,000 gallons at Vertical Launch Facility 1,000 cubic feet at Launch Control Center Complex
Nitrogen	25,000 to 50,000 gallons at Vertical Launch Facility 3,000 cubic feet at Launch Control Center Complex
Payload fuel (UDMH, MMH, NTO)	5,500 pounds (600 gallons[a])
Hydrazine	2,000 gallons
Chemicals, Solvents, Lubricants	
Ammonia	[b]
Chlorine bleach	[b]
Degreaser	[b]
Grease	[b]
Isopropyl alcohol	[b]
Machining lubricants	Less than 300 gallons
Gasoline	[b]
Diesel fuel	35,000 gallons[c]
Welding gases (carbon dioxide and argon)	[b]

Notes: MMH = monomethylhydrazine; NTO = nitrogen tetroxide; RP-1 = rocket propellant 1; UDMH = unsymmetrical dimethyl hydrazine.

[a] Volume stored is dependent upon ratio of propellants stored. Quantity is based on typical ratio of propellants needed for payload.

[b] Minimal quantities of this chemical would be stored onsite.

[c] At the Vertical Launch Facility, Launch Control Center Complex, and Alternate Control Center and Visitor Center, up to seven diesel fuel storage tanks may be used.

2.1.2.4 Payload and Payload Processing

Launches from Spaceport Camden would be expected to have payloads like satellites and experiments. At this time, no human passengers or nuclear payloads are anticipated or proposed for Spaceport Camden launches. Most payloads are expected to be commercial; however, payloads could also be from the Federal government or have a Federal contribution to a commercial payload. Primary commercial payload processing would be expected to occur at the Payload Processing Building in the Launch Control Center Complex. Typically, the payload would be delivered to the Payload Processing Building by the launch operator or a payload manufacturer up to 4 weeks before the scheduled launch.

Primary payload processing would include the following activities:

- **Payload checkout.** A visual checkout and functional inspection of the payload to ensure that no damage has occurred during transit to the launch site or storage and that the payload is functioning nominally.
- **Payload/satellite propellant loading.** Payloads (including satellites) are shipped without propellants. Propellants identified in the following paragraphs would be added to the payload/satellite at the Payload Processing Building.

- **Payload encapsulation.** Placing the payload within the launch vehicle's payload fairing. The payload fairing provides protection from atmospheric impacts to the payload during launch and improves the aerodynamics of the launch vehicle.

Most payloads would include some additional propellants onboard, either for orbit maintenance or orbital insertion. Payload propellants may include fuels such as UDMH, MMH, and NTO, as well as pressurized gases, including helium and nitrogen or solid propellants. Quantities would vary but could be as much as 1,000 pounds for combined weight of MMH and NTO for the representative launch vehicle. The MMH/NTO propellant weight for a representative capsule is approximately 600 pounds. Total payload weight (dry weight plus propellant weights) could be up to 4,400 pounds for the representative launch vehicle. Payloads would typically be fueled in the Payload Processing Building at the Launch Control Center Complex or at the Vertical Launch Facility. Any residual propellants would be returned to the Payload Processing Building storage facility.

At the launch site, UDMH, MMH, and NTO would be stored in a fuels storage area in the Launch Control Center Complex. Helium and nitrogen gases would be required at both the Vertical Launch Facility and Launch Control Center Complex. A small amount of ordnance, such as small explosive bolts and onboard batteries, would also typically be used and stored in the Payload Processing Building in the Launch Control Center Complex. This facility would be certified to meet National Fire Protection Association requirements for electrical systems and equipment and any Federal, State, or local laws and regulations concerning the storage of hazardous materials.

Spaceport Camden would have procedures, equipment, launch site staff, and local first responders trained in emergency response for materials and activities at the launch site. Launch operators would also be required to develop a Hazardous Materials Emergency Response Plan and establish an emergency response team for any hazardous or toxic propellants and materials. Spills would be contained and cleaned up in accordance with the procedures identified in the Hazardous Materials Emergency Response Plan.

After completion of any necessary primary payload processing, the payload would be delivered to the Vehicle Integration Building. The payload would then be attached to the fully assembled launch vehicle, which would then be loaded on the transporter-erector. The Vehicle Integration Building and immediate vicinity would be used for unloading, storage, and any necessary final payload processing. Approved safety procedures, to accommodate both nonhazardous and hazardous payload processing, such as ordnance installation and loading of liquid propellants onto the second stage, would be in place. The Vehicle Integration Building would be certified to meet National Fire Protection Association requirements for electrical systems and equipment, including crane consoles.

2.1.2.5 Pre-Launch Activities

Pursuant to the Spaceport Camden Launch Site Operator License Application, the following pre-launch activities are described. Such activities would begin with coordination efforts to provide governmental agencies and media outlets with notification of test and launch operation activities and to establish USCG LAAs in the vicinity of Spaceport Camden.

- The **Overflight Exclusion Zone** (**OEZ**) is a safety area defined in 14 CFR §420.5 as "a portion of the flight corridor which must remain clear of the public during the flight of a launch vehicle." 14 CFR §§420.23(a)(2) and (3) define how the OEZ is determined using flight safety analysis methodologies, which include inputs such as the representative launch vehicle and standard assumptions such as meteorological conditions, propellant, and payload. Typically, the OEZ will be roughly rectangular/oblong along the flight trajectory ground track with the wider end of the shape behind the launch pad and the narrowing of the shape as the flight trajectory extends away from the launch pad. The OEZ would be expected to include the land and water immediately

adjacent to the Vertical Launch Facility. For the representative launch vehicle, the OEZ does not extend onto Cumberland Island or Little Cumberland Island. The OEZ is a strict "no-go" area for launch. The OEZ for pre-launch testing operations/activities (specifically, cold flow tests and static fire tests) corresponds to the explosive siting criteria and is an approximate 4,021-foot radius from the launch location; this does not extend beyond the marshlands bordering the northeastern portion of the site location. Area access control points would be established around the OEZ to control entry. The OEZ is depicted in Exhibit 2.1-10.

- The **USCG Limited Access Area (LAA)**, which is not an FAA requirement, is an area, both on the land and water, that lies beyond the OEZ where Camden County proposes to monitor and control public access in accordance with the Comprehensive Launch Plan pursuant to 33 CFR §§165.5 and 165.20. The USCG LAA may have persons present or be available for transit with the permission of the Captain of the Port pursuant to 33 CFR §165.20. The USCG issued a composite proposed LAA for a variety of launch trajectory scenarios, a notice of inquiry, and request for public comments in September 2018 (see Appendix A). Each launch would have an individually defined USCG LAA, depending on the specific type of vehicle, the trajectory, and the mission. The composite USCG LAA, as depicted in this EIS, encompasses an area that accounts for operations of the medium-large launch vehicles and trajectory range previously assessed in the Draft EIS. The USCG and Camden County Letter of Agreement is in Appendix A, and the composite USCG LAA is depicted in Exhibit 2.1-10. Individual launch USCG LAAs associated specifically with the 100-degree trajectory and the small launch vehicle would probably be smaller and depend on several factors unique to each event, such as actual trajectory and payload. The rulemaking would codify the USCG LAA. Soft access control checkpoints would be established at certain points on both land and water throughout the USCG LAA in order to control and monitor access. The county and state law enforcement, in combination with other county marine assets under USCG LAA authority, would monitor access control points on navigable waters, while the Camden County Sheriff's Office, in combination with state law enforcement, would monitor access control checkpoints on land.

OEZs and USCG LAAs in the vicinity of the launch site would be necessary for wet dress rehearsals, static fire engine tests, and launches. The size of an individual OEZ or USCG LAA would vary by type of operation and is therefore not graphically represented. For example, the OEZ for a static fire test is a simple ring whose diameter is determined by explosive siting criteria. The OEZ and USCG LAAs also have different operational characteristics. For example, the OEZ has a "no admittance" policy.

Members of the general public would experience temporary controls on public access in the USCG LAA. Authorized persons identified by the USCG and Camden County (see Section 1.4.2, *Other Licenses, Permits, and Approvals*) would have the same rights of access on Little Cumberland Island and Cumberland Island as they currently experience. As described in detail below, public notification would be provided prior to the establishment of USCG LAAs and OEZs for mission rehearsals, static fire engine tests, and launch operations. A Security Plan, developed by the County in cooperation with the launch operator, would outline the process for controlling public access to the USCG LAAs during test and launch operations, in accordance with 14 CFR Parts 450 and 420. Marshlands and tidal areas that may fall within the OEZ or USCG LAA would remain open for public use and enjoyment outside of times in which portions may be closed during pre-launch and/or launch related closures.

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. These rehearsals would allow for team training and coordination of activities between the mission-specific launch operator crew and other operations personnel. 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 loading[18]) 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 the activities associated with a wet dress rehearsal, with the additional action of igniting the first stage engines. The deluge water system is also tested during a static fire engine test. Conservatively, all 250,000 gallons of water stored in the water tower could be sprayed into the engine exhaust plume during a test, although typically less than 100,000 gallons would be used. During a static fire engine test, the launch vehicle engines would typically be ignited for approximately 2 seconds but could be ignited for up to 7 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.

Public Notification of Test and Launch Operations

Typically, for a commercial launch of a small launch vehicle and its primary payload(s), a launch manifest can be developed as far as a year out. An estimated launch window for a particular mission is established as far out as practicable 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 USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*) establishment is typically identified at least 1 to 3 months in advance and would be made available to government agency personnel (including police, fire, and rescue personnel) and the general public for planning purposes. The County will work to provide as much advance notice as possible and expects that a minimum notice of 30 days generally will be provided. However, providing a 30-day notice may not always be possible due to launch delays or more immediate launch needs.

Public notification would be disseminated via multiple channels, including dynamic messaging signs, marine band radio broadcast to mariners, social media announcements, and County-maintained websites. Notifications would include the intended date, time, and location of USCG LAA activation, the expected dimensions for the USCG LAAs, durations, and backup closure dates and times. The County and/or the launch operator would be responsible for posting written notices of the date, time, and the proposed USCG LAAs at several locations, including public boat ramps frequented by recreational and commercial fishermen, as well as in local newspapers. The County would be responsible for ensuring these notices are physically posted. Notices would also be sent out via email and posted to the USCG Marine Safety Unit Savannah Homeport web page.

The County would coordinate with Glynn County, GDNR, law enforcement agencies, the USCG, the U.S. Navy at NSB Kings Bay, the Marine Corps Air Station Beaufort, the appropriate regional Air Route Traffic Control Center (Jacksonville Tower), and local commercial/general aviation airports. Notices to Mariners (NOTMARs) and Notices to Airmen would also be disseminated. The County and the launch operator would also notify the City of Brunswick, the NPS, Crooked River State Park, and other appropriate agencies of the test or launch operation and associated establishment of USCG LAAs.

[18] Propellant loading includes the launch vehicle main engine fuel (RP-1) and oxidizer, (liquid oxygen), and any other fuels used by a payload (such as hydrazine).

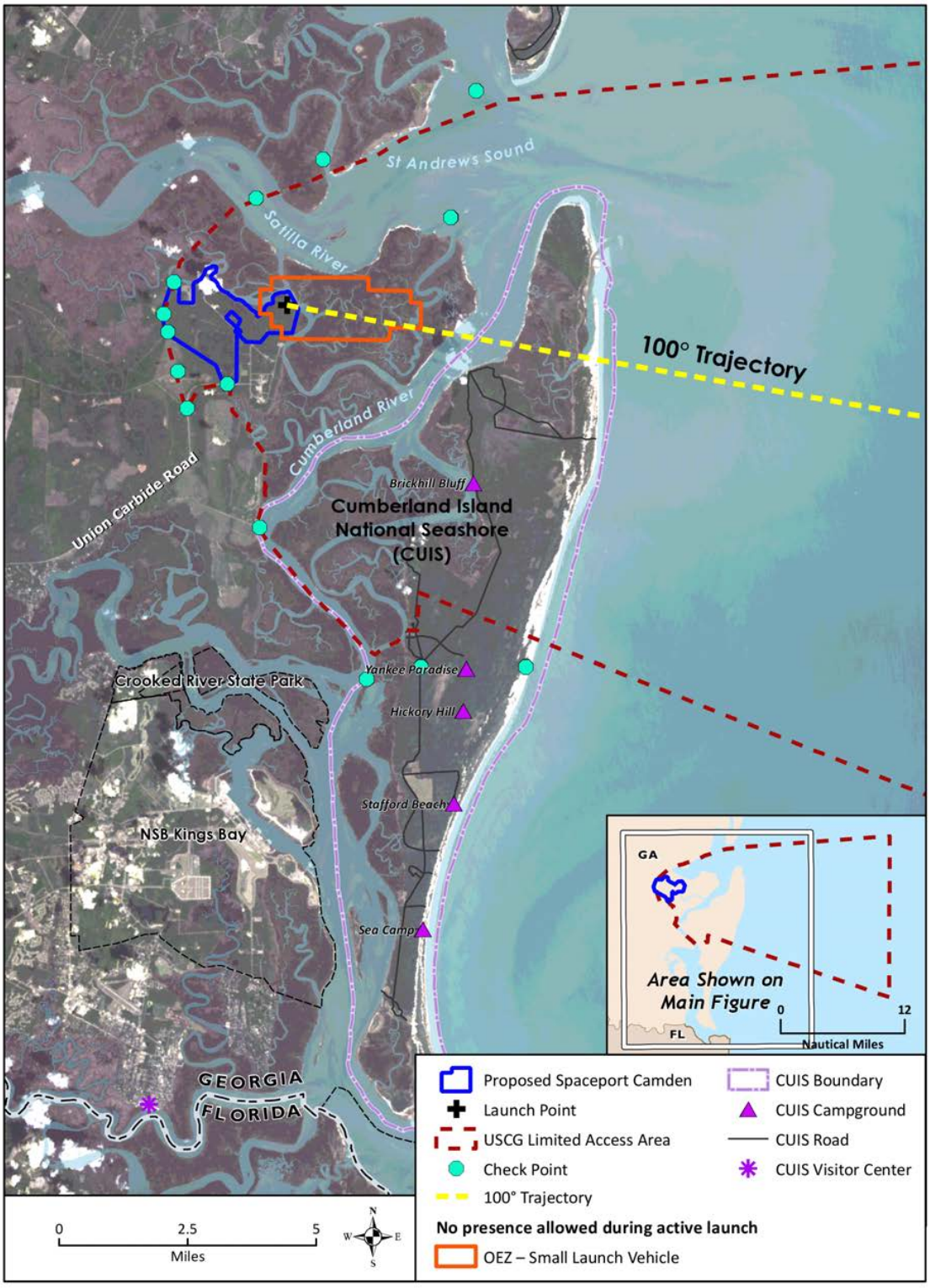


Exhibit 2.1-10. Overflight Exclusion Zone and Composite Launch USCG Limited Access Areas (100-degree Trajectory)

The actual date for anticipated activity (to include USCG LAA establishment) would be re-confirmed about 2 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, government agency personnel and the public would be notified of any cancellation or changes in the target date of the activity and any associated USCG LAA establishment. In an atypical scenario for a small launch vehicle 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 1 month or less, but this would be very unusual. The GDNR Coastal Resources Division recommends avoiding or minimizing launch operations that require limited access on weekends, holidays, and during organized fishing tournaments in the vicinity, as well as posting limited access dates/times at all public access points within 10 miles of proposed USCG LAAs (described in Section 2.1.2.5, *Pre-Launch Activities*), including public boat ramps, 30 days in advance (O.C.G.A. 12-5-320, *Coastal Management Act*). Camden County intends to coordinate with the GDNR Coastal Resources Division to implement these requests.

USCG Limited Access Areas (LAAs)

As part of the licensing process, the County and the launch operator would jointly develop a Comprehensive Launch Plan that defines the process for controlling access within the USCG LAAs. The Comprehensive Launch Plan would include safety and security personnel for each launch operation activity and roadblocks and other land and water security access control checkpoints to control and monitor public access around the launch site and within USCG LAAs. An agreement with the USCG is required for each launch license, and specific resource needs will be assessed at the time of individual launch license application. Camden County and the USCG will identify authorized persons for access within the LAA (see Section 1.4.2, *Other Licenses, Permits, and Approvals*).

The Camden County Emergency Management Agency centrally coordinates all special events/incidents that are large in scale with multiple agencies/organizations involved that could impact public safety, including those where multiple jurisdictions are involved, through use of the Federal Emergency Management Agency (FEMA) National Incident Management System (NIMS) doctrine (FEMA, 2017a). NIMS provides a common, nationwide framework that enables the whole community to work together to manage all threats and hazards. NIMS applies to all incidents, regardless of cause, size, location, or complexity. The Comprehensive Launch Plan would use common practices already in place across all local and regional first responders and government agencies to manage incidents. The Spaceport Camden Comprehensive Launch Plan would describe the procedures for establishing land-based access limitations and USCG LAAs where public access would be controlled and/or monitored during test and launch operations. Land-based access limitations and restrictions would be implemented by the County and local law enforcement, while water-based access limitations and restrictions would be implemented by the USCG.

Mainland land-based access limitations and restrictions would be expected to include areas around the access points to the launch site at the end of Harrietts Bluff Road (also referred to as Union Carbide Road). On Cumberland Island National Seashore and Little Cumberland Island, current residents and their guests, ticketed park visitors, government personnel, and other Spaceport Camden–designated persons would have the same rights of access within the USCG LAA as they currently experience. Beach driving for security sweeps would require a state authorization under O.C.G.A. 12-5-230 et seq., *Shore Protection Act*, prior to commencing. (Management requirements and best management practices (BMPs) for beach driving under this authorization are listed in Chapter 6, *Mitigation*.)

The water-based portion of the USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*) would be expected to include the waterways surrounding the launch site and some of the waterways surrounding Cumberland Island and Little Cumberland Island extending along the trajectory and out to sea. The

water-based portion of the LAA would be enforced by the USCG and their designated authorities. On a case-by-case basis and subject to operation-specific considerations, the Captain of the Port and/or their designated authority could allow vessel travel through the USCG LAA. Any LAA would only extend 12 nautical miles off shore, as that is the limit of USCG authority.

Exhibit 2.1-10 shows the composite USCG LAA for a launch based on the 100-degree reference trajectory. Each launch would have an individually defined USCG LAA, depending on the specific type of vehicle, the trajectory, and the mission. The composite USCG LAA, as depicted for representative launch activities, encompasses an area that accounts for the operations of the medium-large launch vehicle previously assessed in the Draft EIS. However, individual launch USCG LAAs associated specifically with the 100-degree trajectory and small launch vehicle addressed in this Final EIS would be smaller and depend on several factors unique to each event, such as actual trajectory. Control of marshland for hazardous operations shall be pursuant to agreements with the USCG for the implementation of an appropriate LAA in accordance with 33 CFR §165.20 and the Letter of Agreement found in Appendix A.

The County (as the launch site operator) and/or the launch operator would coordinate with the following entities (and possibly others) to develop and implement the Comprehensive Launch Plan: Camden County, Glynn County, and Georgia state law enforcement agencies; the cities of Brunswick, St. Marys, Woodbine and Kingsland; the NPS; U.S. Navy/Marines; FAA; Crooked River State Park; Jekyll Island State Park; the Georgia Department of Transportation; USFWS/NMFS; GDNR; and the USCG.

Advanced planning work sessions with all stakeholders would occur to ensure that every organization's role and responsibilities are defined and understood and that a detailed (minute-by-minute) launch checklist (count down and contingency plan) would be created. There may be dry runs of the detailed launch checklist before the first few launches to make sure everyone is clear on how the process would flow, and the detailed launch checklist would be updated as needed to account for lessons learned. Appropriate cost recovery mechanisms would be put in place as needed for those government agencies that are a part of the process. Provisions for ensuring access to the USCG LAA for authorized persons (see Section 1.4.2, *Other Licenses, Permits, and Approvals*). Should those persons wish to depart the area on Cumberland Island or Little Cumberland Island before a launch, Spaceport Camden personnel would facilitate transportation for those individuals to and from their houses or camp sites on the day of the launch.

During test and launch operations, the County proposes to control and monitor access to the USCG LAA for members of the public. These pre-defined access control checkpoints would be stationed at approximately the locations as indicated in Exhibit 2.1-10 near the launch site to ensure that "unauthorized persons" (see Section 1.4.2, *Other Licenses, Permits, and Approvals*) remain off the launch site. Under the direction of the Camden County Incident Commander, the Camden County Sheriff's Office would be responsible for setting up and enforcing these access control checkpoints. Only approved government, Camden County, launch operator, and emergency personnel, and others with appropriate credentials would be allowed on the launch site during test or launch operations. Current residents and their guests, ticketed park visitors, government personnel, and other Spaceport Camden-designated persons would have the same rights of access as they currently experience on areas of Little Cumberland Island and Cumberland Island located within the USCG LAA (outside the OEZ).

It is Spaceport Camden's intent to establish a two-factor log-in web-based registration system, much like major public events that impact local neighborhoods, where Cumberland Island and Little Cumberland Island property owners would register their family and/or guests for access to limited access areas during a USCG LAA associated with launch operations. Owners and guests would be electronically registered and verified at established access control points using State-issued identification card against an active online

registration list. At established access control points, assigned security personnel, acting under the delegated authority of the USCG, would control access and would follow posted orders based on elements of the USCG LAA directive and/or USCG area commander orders. All USCG LAA enforcement personnel would maintain an up-to-date master list of "authorized persons" for reference (see Section 1.4.2, *Other Licenses, Permits, and Approvals*). Where issues arise outside of established posted orders, access control personnel would be required to communicate with the on-scene commander, or designee, for resolution. Beach sweeps on Little Cumberland Island would be restricted to areas below the high tide, which are navigable waters.

As shown in Exhibit 2.1-10 for the trajectory considered for this EIS, the waterway access control checkpoints could be located along the Satilla River/St. Andrews Sound area, the Atlantic Ocean, and the Cumberland River. Under USCG delegation of authority, Camden County Sheriff's Office, supported by Range Safety Boats, would be used to secure the river, streams, and ocean access control checkpoints. Additional support would be provided through Range Safety Aircraft as assigned. If needed, additional land security access control checkpoints could be implemented on Cumberland Island near Brickhill Bluff or Plum Orchard and on the Atlantic beach to ensure appropriate population monitoring.

The proposed USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*) has been developed in coordination with multiple Federal, State, and local government stakeholders, including NPS, USCG, and GDNR. Refinement of these USCG LAAs would continue in consultation with the launch operator and the Federal, State, and local government stakeholders to ensure minimal impact to activities and operations in Cumberland Island National Seashore and the Satilla River/St. Andrews Sound area. The range of potential USCG LAAs proposed by the USCG for Spaceport Camden operations would not require closures to either the Sea Camp or Dungeness docks at Cumberland Island National Seashore.

The duration of the USCG LAA during a typical launch is anticipated to be up to 3.5 hours; however, access controls could be in place for up to 12 hours on an atypical launch day. The atypical 12-hour duration allows for potential aborts and contingencies

During the periods of public access limitations, monitoring would be conducted by vehicles (car/truck) along existing roads, 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 personnel, the launch operator, and/or law enforcement would monitor the area to the east of the access control checkpoints to ensure that the area would remain clear. Except in case of an emergency, Camden County personnel and/or the launch operator would not conduct ground sweeps. Only if video surveillance is insufficient would other monitoring methods be used, such as the following:

- Unmanned aerial surveillance (no more than two unmanned vehicles at the same time), with unmanned vehicles abiding by FAA requirements under a Certificate of Authorization, outside of restricted airspace to include NSB Kings Bay and the Cumberland Island National Seashore (and generally not overflying the wilderness area)
- Manned aerial surveillance (one fixed-wing aircraft with flight time less than 30 minutes at an altitude of less than 1,000 feet)
- USCG or designated vessel

Table 2.1-6 lists actions that would be conducted to ensure the security of the USCG LAA and OEZ prior to an actual launch. The same actions and activities would occur for other test and launch operations requiring access controls (i.e., wet dress rehearsal and static fire engine test), but the start time, area size, and durations would be different because these other launch operations are not expected to last as long or impact as large an area as an actual launch. Exhibit 2.1-10 notes initially proposed check points.

The Comprehensive Launch Plan would also include a process for clearing offshore areas. This process would include coordinating with the USCG and issuing a NOTMAR. As noted above, advance notice of waterway closures would be posted at public docks to inform recreational and commercial fishermen. Notices would also be sent out via email and posted to the USCG Marine Safety Unit Savannah Homeport web page. The USCG or delegated authority could conduct a boat patrol to sweep the offshore area; sweeps would continue until the launch operator is ready to load propellant to the vehicle (approximately 3 hours prior to launch). If necessary, a final sweep of the water-based portion of the USCG LAA by manned fixed-wing aircraft or unmanned aerial vehicle could be implemented at this time to ensure the areas are clear.

Table 2.1-6. Representative Security Activities on Day of Launch

Action	Purpose	Start Time	End Time
Establish check points and take down check points	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 access control checkpoints	Restrict public access to OEZ and limit access within the USCG LAA.	T – 3 hours	T + 5 to 30 minutes
USCG/other waterborne law enforcement on station	USCG and/or other local waterborne law enforcement sweep areas and restrict (OEZ)/limit (LAA) 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 access control checkpoints for activity, review video one last time.	T – 1 hour	T – 40 minutes
Close airspace	In accordance with agreed procedure, FAA Air Traffic Control closes appropriate commercial airspace. Airspace closures potentially affecting Special Use Airspace would be coordinated with the appropriate using agency (e.g., U.S. Navy at Naval Submarine Base Kings Bay, Marine Corps Air Station Beaufort).	T – 15 minutes	T + 5 to 30 minutes
Estimated Total Limited Access Time per Launch within USCG LAA (typical launch day)		Up to 3.5 hours	
Estimated Total Limited Access Time per year within USCG LAA (12 launches per year and typical launch day)		Up to 42 hours	
Estimated Total Closure Time per Static Fire Engine Test or Wet Dress Rehearsal within OEZ (only those areas within a 4,021-foot radius of the launch pad)		Up to 3 hours	
Estimated Total Closure Time per year for Static Fire Engine Test and Wet Dress Rehearsal within OEZ (12 operations each and only those areas within a 4,021-foot radius of the launch pad)		Up to 72 hours	
Estimated Total Access Limitation Time (USCG LAA) and Closure Time (OEZ) per Year (12 launches / 12 static fire engine tests and 12 wet dress rehearsals)		Up to: 42 hours (USCG LAA) / 114 hours (OEZ)	

Notes: ATV = all-terrain vehicle; NPS = National Park Service; OEZ = Overflight Exclusion Zone; UAV = unmanned aerial vehicle; USCG = U.S. Coast Guard.

[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).

After the launch operation is completed or postponed, the County and/or the launch operator would notify law enforcement, allowing them to reopen the USCG LAA and OEZ. In the event that the launch would be postponed, the USCG LAA and OEZ would be reestablished for the rescheduled launch.

2.1.2.6 Launch Day Activities

Within the 24 hours before a launch, the launch vehicle on the transporter erector would be moved to the launch pad from the Vehicle Integration Building and connected to the launch stand. A wheeled vehicle such as a small tug or other road equipment would be used to pull the launch vehicle and transporter erector to the launch pad, where the launch vehicle would be erected and final system checks completed. Launch vehicles may be erected and de-erected several times prior to launch. Approximately 3 hours before engine ignition, the vehicle would be loaded with propellant. Just before engine ignition, the transporter erector would be retracted from the vehicle. The transporter erector would be moved into the Vehicle Integration Building after the launch.

As described above, one water tower would be constructed at the Vertical Launch Facility as a part of a deluge water system for sound and vibration suppression during an actual launch. The deluge water would be injected into the engine exhaust plume and flame trench and sprayed on the launch pad deck. Between 100,000 to 250,000 gallons of water from the tower would be required during a launch. Much of this water would be vaporized, as depicted in Exhibit 2.1-11; the remainder drains to the water retention pond(s).

Source: (NASASpaceflight.com, 2018)

Exhibit 2.1-11. Vapor Cloud from the Launch of a Small Launch Vehicle

A Letter of Agreement between the USCG and GDNR outlines jurisdictional responsibilities over the navigable waterways. The USCG has jurisdiction over the waterways and can manage vessels under the Safety Waterway Act. GDNR can restrict fishing activities but cannot close waters to boats traveling through the water. Camden County obtained a Letter of Agreement with the USCG to provide notification of launches to boaters through the issuance of NOTMARs as well as surveillance and access control to the LAA defined in Camden County's license application and this EIS. GDNR, the USCG, and FAA have confirmed the existence of this agreement and the shared understanding of Camden County's proposed approach to the undertaking of launch activities at the proposed Spaceport Camden as follows.

In advance of the planned launch operation, the USCG would issue a NOTMAR at the request of Camden County, in accordance with the terms of their agreement. On the day of the planned launch operation, USCG vessels would patrol waterways in the LAA. Due to resource limitations, Camden County and the USCG would negotiate the level of support available. Once the LAA is established on the day of the

planned operation, the USCG has the authority to prevent boaters from entering the LAA. The USCG also has the authority to escort any boaters present in the LAA outside the LAA once it becomes active. FAA regulations would require the launch operator to hold the launch until the OEZ (see Section 2.1.2.5, *Pre-Launch Activities*) is clear or cancel the launch if that area cannot be cleared in the available time. If a member of the public is already present in the OEZ but not aboard a vessel, as in the case of a wading fisherman or swimmer, the USCG would coordinate with the Camden County sheriff's office to have that individual removed. If the sheriff is unable to remove the individual from the OEZ, FAA regulations would require the launch operator to hold the launch until that area is clear or cancel the launch if that area cannot be cleared in the available time.

2.1.2.7 Launch Failures

Launch failures are possible. A "failure" describes a situation where the vehicle does not perform as intended. The different types of failures include *pad failure* (occurs before the launch, generally a catastrophic destruction of the launcher and/or its payload); *launch failure* (occurs when the launcher fails to place its payload[s] into Earth orbit); *orbital failure* (occurs when the payload[s] fails to reach proper orbit); *mission failure* (occurs when the mission was not accomplished) (e.g., a probe that crashes on or passes by its intended target); and *end-of-mission failure* (occurs when, generally, the payload is not recovered as intended) (NASA, 2020). In the context of this EIS, the term "launch failure" includes both pad failures and failures in flight but not orbital failures or mission failures, as those types of failures do not affect public and health and safety. 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. Vehicle debris from the explosion would be expected to be confined to the immediate area around the launch site.

Lightning, wind, and other weather factors are assessed for risk to the rocket and payload during launch operations. Inclement weather (rain, ice, snow, lightning, or the presence of static electrical buildup prior to lightning) would cause the launch to be postponed. Consequently, rockets are not launched when there is lightning in the vicinity of a launch pad, considering the presence of sensitive electronics/fuel and an increased probability of a lightning strike during launch. Additionally, rockets are not launched in the presence of strong, low- and high-altitude winds that cause high aerodynamic loads, with or without other weather effects (rain, lightning, etc.). Therefore, a launch failure would not occur in inclement weather or high winds because a launch would be postponed due to such conditions.

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 and its instantaneous impact point crosses an impact limit line established as a geographic safety threshold. This system is employed to ensure that any debris from the destruction of the vehicle would not increase the risk to the public above the limits established in 14 CFR Part 450. Most propellants (typically liquid oxygen and RP-1) are expected to be dispersed or consumed during the destruction of the vehicle. Dispersed propellant usually evaporates before contact with the ground (similarly to jet fuel released in an aviation emergency operation). The County would require operators to employ flight safety limits that ensure any debris or surviving components impact within the spaceport site boundary, the OEZ, or the USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*). 14 CFR Part 420 requires the launch site operator license applicant to demonstrate that the risk to the public from any debris impacts occurring outside the OEZ, expressed in terms of expected casualty, does not exceed 1×10^{-4}. Should the applicant not meet the criteria, FAA will not grant a launch site operator license. 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.

Any launch vehicle operator proposing to launch from the spaceport must include in their license application rigorous public safety analyses that account for the launch vehicle and its reliability statistics, the associated fuel types, payload, and individual trajectory. To receive a license from FAA, launch vehicle operators must demonstrate compliance with public safety risk limits as defined in 14 CFR §450.101, which limit the risk from launch to an individual to 1×10^{-6} per mission (a one-in-a-million chance) and the expected number of casualties from all hazards (debris, toxic releases, and blast overpressure) from a launch to 1×10^{-4} (a less than 1-in-10,000 chance) during any launch. Over the past 25 years, there have been no fatalities or serious injuries to the public (i.e., persons not involved in launch activities) from licensed or permitted commercial space launch operations (FAA, n.d.).

As stated previously, a typical trajectory starts with a nearly vertical climb for 45 to 75 seconds, and then slowly tips horizontally, continuing to gain altitude until it achieves orbit. Based on launch and trajectory modeling information as included in the Launch Site Operator License Application for Spaceport Camden, the instantaneous impact point (IIP) clears the island from west to east in about 5 to 7 seconds of dwell time. The IIP is the projected landing spot of the rocket should thrust be terminated at that instant. For the 100-degree trajectory, around 60 seconds into mostly vertical flight, the IIP starts to cross the western edge of Cumberland Island, taking about 5 to 7 seconds to reach the Atlantic Ocean (the "IIP dwell time"). The rocket passes directly above Cumberland Island at an altitude of approximately 72,000 feet and departs 6 to 10 seconds later at about 97,000 feet. During this physical crossing, if an incident were to occur, the debris would fall forward along the trajectory and beyond the island.

The launch vehicle proposed for this action would be liquid-fueled, small launch vehicles. The representative launch vehicle is considered to be similar in design and performance to a RocketLab Electron launch vehicle. Information regarding failure rates for the representative Electron is limited. For the purposes of analysis for this EIS, Camden County has assumed that a launch failure will eventually occur. However, the County believes that the probability of a failure occurring that would have the potential to adversely affect the environment or public health and safety is a significantly lower percentage of the overall failure rate. Potential environmental impacts associated with launch failures are discussed in Chapter 4, as appropriate.

Emergency Response

Spaceport Camden would have procedures, equipment, launch site staff, and local first responders trained in emergency response for materials and activities at the launch site. Launch operators would also be required to develop a Hazardous Materials Emergency Response Plan and establish an emergency response team for any hazardous or toxic propellants and materials. Spills would be contained and cleaned up in accordance with the procedures identified in the Hazardous Materials Emergency Response Plan. Emergency response services in Camden County include the Camden County Sheriff's Office, Kingsland Police Department, St. Marys Police Department, Georgia State Patrol, Camden County Fire Rescue Department, Kingsland Fire Rescue, St. Marys Fire Department, Georgia Forestry Commission, and Camden County Emergency Management Agency. The closest emergency response services to the proposed spaceport site include the Camden County Sheriff's Office located 10.6 miles from the site and the Camden County Fire Rescue Station #16 located 5.3 miles from the site. The Southeast Georgia Health Systems Hospital's Camden Campus is approximately 12 miles southwest of the proposed spaceport site.

Firefighting contingencies are launch specific and are coordinated as part of the comprehensive launch planning process. As part of the Spaceport Camden Launch Site Operator License Application, the County submitted a Fire Mitigation Plan that was developed in accordance with the FEMA National Incident Management System (i.e., NIMS), Third Edition, dated October 2017 (FEMA, 2017a). As stated in the Fire Mitigation Plan, the Camden County Fire Rescue Department and law enforcement will utilize marine landing craft that will ensure uninterrupted ingress/egress to Little Cumberland Island, day and night in support of all first responders, to include the Georgia Forestry Commission. Additional investments in

restoring the existing water buffalo (i.e., a type of portable water tank) to an operational status (completed in July 2020) and adding a new water buffalo, with all-terrain vehicle deployment capability for use by the Georgia Forestry Commission, or the Camden County Fire Rescue Department, emergency medical services, and/or law enforcement would ensure a timely response onto Little Cumberland Island in support of all-hazards threats, e.g., fire, medical, evacuation, search and rescue.

2.2 No Action Alternative

Under the No Action Alternative, FAA would not issue a Launch Site Operator License to the Camden County Board of Commissioners. No activities related to constructing or operating a commercial spaceport would occur at the site. The County would not exercise its option to purchase the site, and the site would continue to be owned by the private landowner in accordance with its current industrial zoning. The site, currently under private ownership with no public access, is not being used. Under this No Action Alternative, it is assumed that the site would continue to be unused. Therefore, for this EIS, FAA will consider impacts associated with the assumption that no further development or change in the use of the site would occur.

2.3 Alternatives Considered but Not Carried Forward

Several possible locations within Camden County were preliminarily evaluated as candidates for the Spaceport Camden site. Because the Proposed Action is a County initiative, only locations within Camden County were considered. In addition to evaluating other locations to site a spaceport, alternative locations on the proposed site for the location of the Vertical Launch Facility were considered before selecting the proposed location. This section describes the launch site selection criteria used to assess the viability of these alternate locations for both the spaceport site and the Vertical Launch Facility location within the launch site and discusses the ability of each site and location to meet the selection criteria.

2.3.1 Offsite Alternatives

In addition to the site selected for the Proposed Action, four potential locations within Camden County were considered for the location of Spaceport Camden. Each of these locations was assessed against siting criteria that are important for safety, environmental, logistical, and economic reasons. The siting is influenced by many factors, including FAA regulations contained in 14 CFR Parts 400–499 and their appendices, the topography of the location, and the condition of the land under consideration. The following paragraphs discuss the siting criteria and the siting options considered.

2.3.1.1 Launch Site Selection Criteria

The siting criteria for the location of a spaceport in Camden County have evolved over the course of several years. Initially, Camden County officials received high-level launch site requirements for launch operations through direct inquiries to Camden County by companies such as SpaceX and Blue Origin, as well as input from the Georgia Department of Economic Development. Camden County representatives identified potential sites based on their location in Camden County. The criteria included relatively low population density near the sites, proximity to ocean trajectories (for vertical launch), utility access, other available infrastructure (e.g., roads), and the size of a site. In response to interest shown by commercial space companies, additional high-level requirements were identified, including larger buffer areas where a vertical launch could be safely performed in accordance with 14 CFR Parts 450 and 420 requirements and site access requirements.

The siting criteria for the location of a spaceport in Camden County evolved to include eight primary criteria and two secondary criteria that could be applied to five potential sites identified by county officials. Failure of a site to meet any one of the primary criteria was sufficient to eliminate the site from further consideration as a spaceport site. The narrative below provides a discussion of how the selected proposed site meets each of the criteria.

Primary Criteria

- The site must be located in Camden County, Georgia.
    - The selected site meets this criteria because it is located in Camden County.
- The site must be zoned or have the potential to be either zoned or otherwise permitted for use as a launch complex.
    - Because of past industrial use and its current state, the selected site has the potential to be zoned or otherwise permitted for use as a launch complex.
- The site must be large enough (approximately 100 acres of usable upland with sufficient on-site or adjacent buffer[19] area) to accommodate one vertical launch pad; the necessary facilities and infrastructure to support the launch of liquid-fueled, small, orbital, vertical-launch vehicles; a mission preparation area; a control center/payload integration facility; an alternate control center, visitor center, visitor viewing area for up to 1,000 visitors; and necessary parking for up to 250 cars. Additionally, the site must be large enough to accommodate future internal growth and expansion.
    - The selected site meets this criteria because it is more than 11,000 acres, has more than 100 acres of usable upland, and has enough acreage to support necessary facilities and infrastructure needed for a spaceport. The adjacent land area does not include private property and can be access-controlled by the USCG and local authorities to meet 14 CFR Part 420 OEZ requirements (see Exhibit 2.1-10). (The licensee must demonstrate the ability to control public access pursuant to 14 CFR §420.53.)
- The site must have the clear potential to satisfy FAA regulations, 14 CFR Part 420.
- The site must be located in an area with either existing or reasonable potential access for required launch infrastructure, to include utilities and community services such as fire, medical, and law enforcement.
    - The selected site meets this criteria. Emergency response services in Camden County include the Camden County Sheriff's Office, the Kingsland Police Department, the St. Marys Police Department, the Georgia State Patrol, Camden County Fire Rescue Department, Kingsland Fire Rescue, St. Marys Fire Department, Georgia Forestry Commission, Camden County Animal Control, and Camden County Search and Rescue. The closest emergency response services to the proposed spaceport site include the Camden County Sheriff's Office located 10.6 miles from the site and the Camden County Fire Rescue Station #16 located 5.3 miles from the site. The Southeast Georgia Health Systems Hospital's Camden Campus is approximately 12 miles southwest of the proposed spaceport site.

[19] Buffer, in this context, refers to an area that would serve to shield, cushion, screen, and/or guard against unauthorized access to the site as well as serve as a protected space between the developed portion of the site and the local waterways.

- The site must be accessible from an existing or feasibly constructed road of sufficient capacity to safely and efficiently accommodate the delivery of large items such as launch vehicle stages, fuel tanker trucks, and the delivery of equipment.
    - The selected site meets this criteria. Interstate 95 (I-95) traverses north-south approximately 9 miles to the west of the proposed spaceport, and U.S. Route 17 (Ocean Highway) parallels I-95 for 1 to 2 miles to the west for much of Camden County. Access to the site would be provided by way of Harrietts Bluff Road, which transitions into Union Carbide Road approximately 5.5 miles southwest of the gated entry to the selected site.
- The site must be located in an area that would result in infrequent or minimal chances of the Federal government's priority use of airspace that could necessitate the rescheduling of previously planned launches.
    - The selected site meets this criteria. There are no known Federal priority airspace conflicts, and with the U.S. Navy as a coordinating agency, FAA and the Department of Defense would coordinate airspace actions during launch periods.
- The site's natural features (e.g., topography, soil type, presence of floodplains and/or wetlands) and risk exposure(s) (e.g., ability to satisfy FAA regulations, 14 CFR Part 420) must not unduly complicate the construction or operation of the launch complex.
    - The selected site meets this criteria. The site's natural features would not unduly complicate the construction or operation of the launch complex. Sensitive areas (e.g., wetlands and/or floodplains, contaminated areas, etc.) can be avoided via site design and would not be expected to result in substantive overall complications associated with construction or operation.

Secondary Criteria

- The site provides the potential for alternative means of delivering large items needed for long-term launch site operations.
    - The selected site meets this criteria. While not proposed at this time, an existing deep-water access dock is available as an alternative means for delivering large items. Should the dock be proposed for use in the future, additional analysis under NEPA (as well as appropriate coordination and permitting with USACE) would be required.
- The site acquisition and development costs must be affordable for the County, cost competitive in relation to other potential sites, and have an anticipated timeline pursuant to the commercial need envisioned by the project (i.e., reasonably developable within approximately 24 months after approval of a Vehicle Operator License application).
    - The selected site meets this criteria. Acquisition and development costs are affordable for the County and are cost competitive in relation to the other potential sites evaluated (see Section 2.3.1.2, *Evaluation of Sites in Camden County, Georgia*). Additionally, the site can be reasonably developed within approximately 24 months after approval of a Vehicle Operator License application.

2.3.1.2 Evaluation of Sites in Camden County, Georgia

The four sites identified by the County, in addition to the proposed Spaceport Camden site, and evaluated as part of this EIS are the West Site/Undeveloped (Ceylon) site, the Durango/Gilman Mill site in St. Marys, a Little Cumberland Island site, and a Cumberland Island site. These sites are shown in Exhibit 2.3-1. The County was unable to identify any other potential viable sites in Camden County that could meet the identified screening criteria.

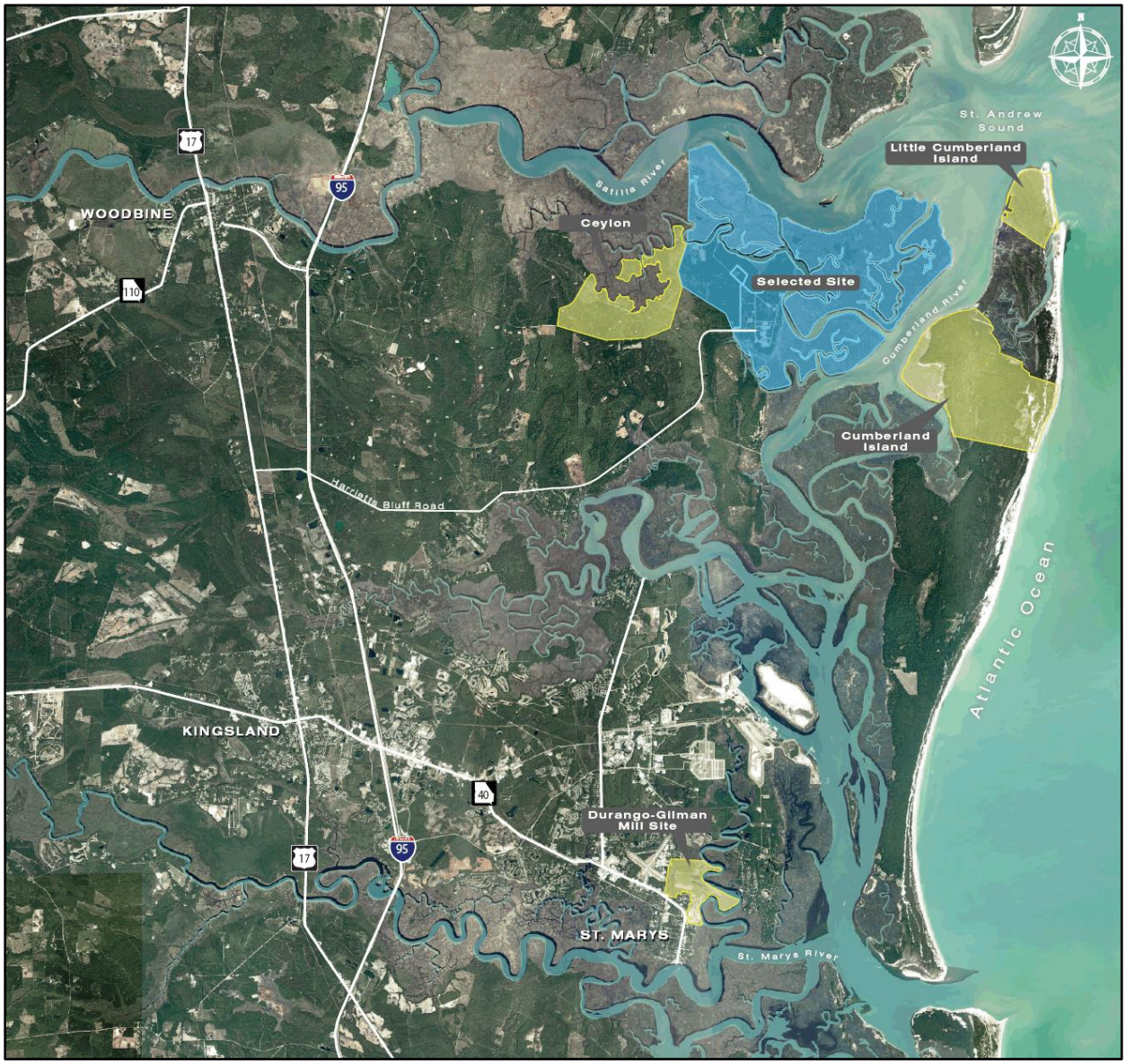


Exhibit 2.3-1. Spaceport Camden Alternate Sites

West Site/Undeveloped (Ceylon)

The subject property is a large tract east of I-95, south of the Satilla River, on the west-edge of the Union Carbide site, previously owned by SLF IV-GA Big Pasture, LLC. The site is approximately 4,305 acres of undeveloped land north of the general unincorporated area of Camden County called "Floyds Neck." (Harrietts Bluff is a small community on Crooked River in the southeastern part of Floyds Neck). Approximately 3,157 acres is woodland and the remaining acreage is marshland. The subject property

was primarily an undeveloped site and is zoned as a planned unit development that is referred to by the former developer as "Ceylon." The specific Camden County land reference number is 129-001. The site includes African Island, which is surrounded on three sides by Todd Creek and on the north side by the Satilla River and marshland.

The Draft EIS analysis was performed when the site was privately owned, and the analysis indicated that the site does have greater than 100 acres of usable upland for siting of the various facilities but the nature of the site does not allow the siting of the required facilities to adequately support the launch of liquid-fueled, small, orbital launch vehicles, while also safely accommodating other required facilities. Assuming a launch pad location on African Island, the necessary separation distance to other manned facilities would not be met. Therefore, this criterion was not met by the West Site/Ceylon location.

Since publication of the Draft EIS, this parcel was sold and is now a GDNR Wildlife Management Area. Therefore, it is not practical or feasible for the Ceylon site to be zoned for an onsite launch complex due to the nature of its designation as a conservation land trust. In accordance with the reasonableness standard of 40 CFR §1502.14, the Ceylon site does not meet this requirement.

Durango Gilman Mill Site in St. Marys

The property is within the city limits of St. Marys, Georgia, adjacent to NSB Kings Bay. The site consists of more than 700 acres and is an abandoned former Durango-Gilman paper mill site (the site was established by the Gilman Paper Company then later operated by the Durango Paper Company).

It is not practical or feasible for the Durango-Gilman mill site in St. Marys to be zoned for an onsite launch site complex due to its location in and around the densely populated town center and NSB Kings Bay. Further, since publication of the Draft EIS, the site has been identified for mixed-use development. In accordance with the reasonableness standard of 40 CFR §1502.14, the Durango-Gilman mill site in St. Marys does not meet this requirement.

Little Cumberland Island

Little Cumberland Island is located at the northern tip of Cumberland Island and is a 2,400-acre tract separated from Cumberland Island by Christmas and Brockington Creeks. Though within the legislated boundary of Cumberland Island National Seashore, Little Cumberland Island is privately owned and not open to the public. Little Cumberland Island has 1,600 acres of uplands, with approximately 2.5 miles of sand beach. There are 100 two-acre lots where development is allowed, but according to county records, only 44 lots have been built on. Within the original legislation establishing Cumberland Island National Seashore (Public Law 92-536, 23 October 1972, as amended), Little Cumberland Island is considered within the boundary of the park; however, the island will remain under private ownership and must be maintained "in a manner consistent with the purposes for which the seashore is established … and the lands are used and occupied in accordance therewith." Otherwise, it is subject to acquisition by the NPS.

The Little Cumberland Island site does not have a reasonable or common sense chance of being zoned for an onsite launch site complex due to the nature of its designation as a trust that is compliant with the formation of the congressionally mandated Cumberland Island National Seashore and the wilderness area that is within the national seashore's boundary. Such rezoning would require an act of Congress and presidential signature to overturn. In accordance with the reasonableness standard of 40 CFR §1502.14, the Little Cumberland Island site does not meet this requirement.

Cumberland Island

Cumberland Island is approximately 17.5 miles long with an area of 36,415 acres. Cumberland Island National Seashore and the wilderness area within its boundaries are under the control and management of the NPS. The potential launch site location would be the less-populated area in the north of the island (see Exhibit 2.3-1). On February 28, 2005, NASA declassified records indicating that a portion of Cumberland Island was considered as an alternative launch site for the Apollo program.

There are privately owned houses on the southern, western, and northern portions of the island. In 1972, landholders started to transfer most of their Cumberland Island holdings to the Federal government to be designated as a national seashore. Some former land owners transferred their property to the NPS, but retained rights of use and occupancy during their lifetime. Eventually, most of the property will revert to the NPS and become part of the national seashore; however, some properties on the south end of the island remain in fee simple ownership, with no reversion agreements with the NPS.

The United States Congress designated the Cumberland Island Wilderness Area in 1982, and it now has a total of 9,886 acres of designated wilderness and 10,500 acres of potential wilderness. Designated wilderness is the highest level of conservation protection for Federal lands. Only Congress may designate wilderness or change the status of wilderness areas. Wilderness areas are designated within existing Federal public land. Congress has directed four Federal land management agencies—U.S. Forest Service, Bureau of Land Management (BLM), the USFWS, and NPS—to manage wilderness areas so as to preserve and, where possible, to restore their wilderness character.

The Cumberland Island site does not have a reasonable or common sense chance of being zoned for an onsite launch site complex due to the nature of its designation as a congressionally mandated national seashore and wilderness area that would require an act of Congress and presidential signature to overturn. In accordance with the reasonableness standard of 40 CFR §1502.14, the Cumberland Island site does not meet this requirement.

Based upon the limitations identified, all these sites were eliminated from further consideration as alternatives.

2.3.2 Alternate Onsite Locations for the Vertical Launch Facility

Three potential locations on the Spaceport Camden site were considered for the location of the Vertical Launch Facility. Each location was assessed against siting criteria. Siting is influenced by many factors, including FAA regulations contained in 14 CFR Parts 400–499 and their appendices, the topography of the location, and the condition of the land under consideration. The following paragraphs discuss the siting criteria and the siting options considered.

2.3.2.1 Onsite Alternatives Siting Criteria

The siting criteria for the location of the Vertical Launch Facility on the Union Carbide Corporation property included two primary criteria and one additional secondary criterion. Failure of a location to meet either of the primary criteria was sufficient to eliminate the location from further consideration as a Vertical Launch Facility location.

Primary Criteria

- The facility location must, at a minimum, meet the launch site boundary requirements in 14 CFR §420.21 Table 2–2 for at least small, orbital, expendable launch vehicle.
- The facility location's natural features (e.g., topography, soil type, presence of floodplains and/or wetlands) and risk exposure(s) (e.g., ability to satisfy FAA regulations, 14 CFR Part 420) must not unduly complicate the construction or operation of the launch complex.

Secondary Criteria

- The preferred launch complex will be as far north, away from NSB Kings Bay, as possible, while meeting the other evaluation criteria.

2.3.2.2 Evaluation of Onsite Vertical Launch Facility Locations

Two potential locations were considered in addition to the proposed location (identified as Fairfield North) for the Vertical Launch Facility: Silo and Fairfield South. These alternative facility locations within the launch site are shown on Exhibit 2.3-2.

Silo

The Silo site is located along the road leading to the old Thiokol rocket engine test location on the north end of the property. The site is the northernmost location considered for the Vertical Launch Facility at the launch site and is the farthest away from NSB Kings Bay. The Silo site does not meet the 14 CFR §420.21 launch site boundary requirements, as it is too close to the west property edge and the 7,300-foot offset distance significantly overlaps the location for the Launch Control Center Complex, which is a required operational component for a launch. (The Mission Preparation Area as well as the Alternate Control Center and Visitor Center would also be inside the 7,300-foot offset distance but are not required facilities for a launch.) Therefore, the Silo site does not meet the required criteria.

Fairfield South Site

Fairfield South is the southern location in the Fairfield Point area of the property near Floyd Creek and the existing deep water dock. Fairfield North and Fairfield South locations are very similar, and both would be approximately 2 miles from the main gate. The distance to the western edge of the property on the north side is more than 2.35 miles for both Fairfield locations. Fairfield North is farther away from NSB Kings Bay, by about 700 to 800 feet, than the Fairfield South location. Fairfield South also borders or is close to a large suspected prehistoric site. The proximity of the suspected prehistoric site to the Fairfield South site would not unduly complicate the construction or operation of the launch complex. Therefore, the Fairfield South location does meet both primary criteria as an alternative location for the Vertical Launch Facility.

While initially identified as an alternative location for the Vertical Launch Facility, the Fairfield South location was subsequently determined to be essentially the same as the Fairfield North location. The relocation of the launch pad by a couple of hundred yards would not be expected to result in differences in the potential environmental impacts associated with the two locations. The Fairfield South location has been incorporated into the Fairfield North location as a part of the Proposed Action. Should subsequent investigation of the Fairfield North site uncover information that would indicate siting the facility there could result in impacts avoidable by moving the launch pad location, relocation of the Vertical Launch Facility to the Fairfield South location would be considered as part of the Proposed Action.

2.3.3 Alternatives Proposed During Scoping

As indicated in Chapter 1, *Introduction*, the scoping process provides an opportunity for the public to help define the scope of the EIS, including the alternatives to be considered. During the scoping period, several topics were identified by government agencies and the public that were evaluated for their potential to be considered alternatives to the Proposed Action. These topics can be broadly grouped into five categories:

- Limitations to flight activities, particularly limitations to flight trajectories
- Restrictions associated with closure and safety areas
- Modifications to the location of facilities within Spaceport Camden
- Alternative locations for the spaceport
- Alternative uses for the site identified as the location of the spaceport in the Proposed Action.

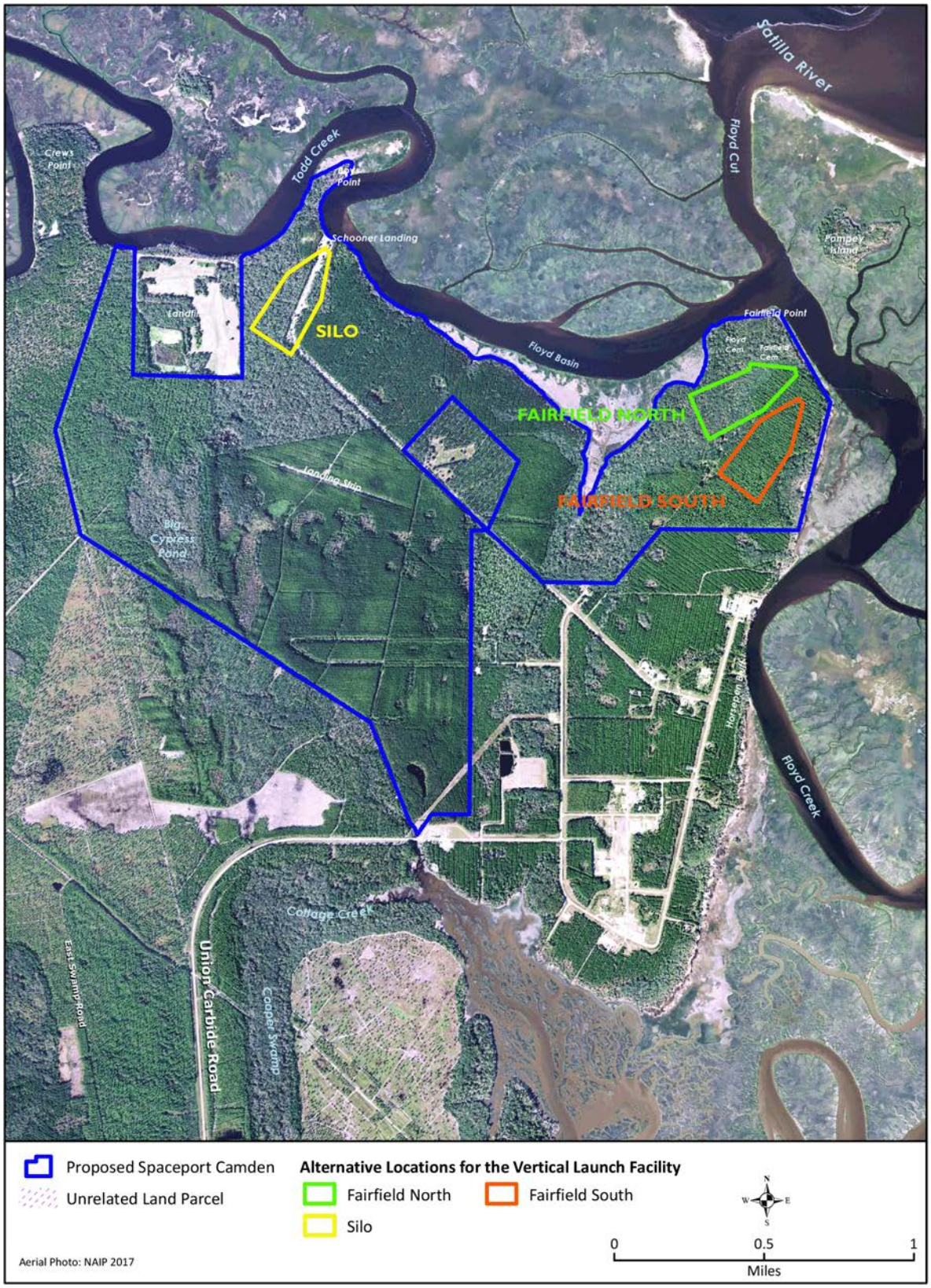


Exhibit 2.3-2. Alternative Locations for the Vertical Launch Facility Within the Spaceport Camden Site

Table 2.3-1 identifies these topics and provides an assessment regarding which of these topics are considered as alternatives to the Proposed Action in this EIS.

Table 2.3-1. Topics Identified During Public Scoping Evaluated as Possible Alternatives

Alternative	Description	Disposition
Proposed By Agencies During Scoping		
Limit Activities in Right Whale Calving Areas During Calving Season	The National Marine Fisheries Service (NMFS) suggested that first stage landings and spaceport-related vessel traffic be prohibited during calving season and within the calving area for the northern right whale.	Seasonal prohibitions and avoidance measures could be considered as mitigations if the analysis indicates the potential for adverse impacts to the northern right whale or northern right whale habitat. However, such mitigations would apply to all vessel traffic in the affected areas, not just Spaceport Camden vessel traffic. Federal mitigations (speed restrictions) are already in place for mitigation of vessel traffic in the affected area and will be followed by Spaceport Camden. Therefore, this suggestion will be considered as a potential mitigation measure rather than a separate alternative in this Environmental Impact Statement (EIS). Additionally, there are no landings being considered as part of the Proposed Action in this EIS.
Limit Flight Trajectories	The U.S. Navy suggested that proposed flight trajectory limitations be considered.	The Proposed Action in this EIS considers a trajectory of 100 degrees from true north, reduced from the 83- to 115-degree range specified in the original proposal.
Modified Site Configuration	The U.S. Fish and Wildlife Service (USFWS) suggested that facilities be located to avoid and accommodate species and habitat of special concern. Specific suggestions included: "During project planning facilities with the highest potential for leaks or releases should be sited away from the most environmentally sensitive areas on and near the project site, such as protected species habitats and tidal marsh environments. Forested uplands should serve as buffers between the facilities and the sensitive habitats. For example, the site has documented occurrences of the federally threatened eastern indigo snake. The snake is a commensal species of the gopher tortoise, a Federal candidate species. The site should be surveyed to identify gopher tortoise habitat so that it may be avoided in siting the facilities of the project. Currently the Launch Control Center and Payload Processing Building are adjacent to or	Alternative locations have been screened to some extent to avoid sensitive areas for onsite locations of the Vertical Launch Facility; additional buffer has been provided should the need arise to move locations. There are no plans to conduct species surveys at this time because construction activities may occur several years from the publication of this EIS. However, FAA has reviewed the site and, in consultation with the USFWS and other agencies, considered what species may be found in the area and evaluated reasonably foreseeable impacts to those species. As a result, considerations as part of consultation would include pre-construction site-specific surveys to identify sensitive species prior to land disturbance and address accordingly (e.g., move facility footprints or move gopher tortoises). The need to move other facilities may be determined by the impacts analysis of the Proposed Action, and the ability to move facilities may be impacted by siting criteria or adverse impact potentials. For instance, moving the Vertical Launch Facility further to the southwest by 1.25 miles would result in movement of the noise profiles further southwest, which would then result in further potential for noise impacts to Little Cumberland Island and a larger closure area closer to shore.

Table 2.3-1. Topics Identified During Public Scoping Evaluated as Possible Alternatives (Continued)

Alternative	Description	Disposition
	sited on possible gopher tortoise habitat. As another example, the launch facility is currently proposed close to the brackish tidal marsh and an active eagle nest on Pompey Island. We recommend moving it inland to the southeast at least 1.25 miles to create a much wider forested buffer to protect the marsh. This would also serve to lessen any potential impacts to the active eagle nest and the pelican nesting colony. Also, connectivity between habitats utilized by species of concern should be considered. The indigo snake moves between upland gopher tortoise burrows in cold weather months and wetlands in warm months. Impediments to these type movements should be avoided. If avoidance is not possible, they should be minimized or as a last resort they should be mitigated for."	However, any substantive changes to the Proposed Action in the future outside the scope of analysis within this EIS and associated consultations would require additional NEPA analysis and re-initiation of consultation.
Launch Trajectory Limitations	The U.S. Marine Corps suggested that launch trajectory limitations should be developed to include the recovery pattern/path with specifics of first stage recovery plan and impact area provided.	The Proposed Action in this EIS considers a trajectory of 100 degrees from true north, reduced from the 83- to 115-degree range specified in the original proposal. Additionally, there are no landings planned for small launch vehicles.
Proposed by Individuals During Scoping		
Ocean Only Trajectories	Limit the range of trajectories to include only those trajectories that pass over the Atlantic Ocean and do not travel over land.	The Proposed Action in this EIS considers a trajectory of 100 degrees from true north, reduced from the 83- to 115-degree range specified in the original proposal.
Reduce Hazard Area Size	It was suggested that the size of the hazard area should be limited, so that the radius of the hazard area is no more than 1.5 miles from the launch pad and so that neither the hazard area nor the closure area intersects with upland area on the property now owned by The Nature Conservancy.	The size of the USCG LAA does not impact Cabin Bluff.
Modified Site Configuration	It was suggested that the site configuration be modified to ensure that neither the hazard area nor the closure area intersects with upland area on the property now owned by The Nature Conservancy.	Changes to the site configuration could be considered as a mitigation if the analysis indicates the potential for adverse impacts to the upland areas on the property now owned by The Nature Conservancy. This suggestion seems best suited as a potential mitigation measure rather than a separate alternative. Plans do not have USCG LAA impacting Cabin Bluff upland property.

Table 2.3-1. Topics Identified During Public Scoping Evaluated as Possible Alternatives (Continued)

Alternative	Description	Disposition
Develop Climate Change Research Center	It was suggested that an alternative land use be to develop the National Center for Climate Change Studies and Research in Camden County to serve as an innovative, technological think-tank of companies developing products to improve our earth.	The suggested use for the property does not meet the purpose and need as defined for this EIS. The County has indicated it would not purchase the property should the spaceport not come to fruition.
Other Uses of Property by County	It was asked what other land uses or alternative plans would be considered for these tracts owned now by Dow Chemical and Bayer CropScience should the County go forward with purchase and the spaceport not come to fruition.	Alternative plans for the property do not meet the purpose and need as defined for this EIS. The County has indicated it would not purchase the property should the spaceport not come to fruition.
Develop Technological Park	It was suggested that the natural resources and energy supply of this land could be better used to develop a technological park whose businesses would study, develop, research, and manufacture products applied to climate change, pollution clean-up and containment methods, renewable energy sources, innovative solutions and products, even related to space exploration, in a more sustainable, environmentally and financially sound manner.	The suggested use for the property does not meet the purpose and need as defined for this EIS. The County has indicated it would not purchase the property should the spaceport not come to fruition.
Other Locations in the State of Georgia	It was suggested that if State funding was anticipated, other locations within the State of Georgia should be considered.	This alternative was reviewed against the siting criteria identified in Section 2.3.1.1, *Launch Site Selection Criteria*. Those sites in other Georgia locations do not meet the criteria for the site to be located in Camden County, Georgia.
4,305-acre Parcel 129 001, SLF IV-GA Big Pasture LLC	It was suggested that the property located immediately west and adjacent to the site be considered.	The County previously identified this property as a possible alternative to the proposed site. The site is identified as the West Site/Undeveloped (Ceylon) in Section 2.3.1.2, *Evaluation of Sites in Camden County, Georgia*.
7,914-acre Parcel 156 001, Mead Timber Company & MWV-Cabin Bluff LLC	It was suggested that the property located immediately south of the site be considered.	This alternative was reviewed against the siting criteria identified in Section 2.3.1.1. The property does meet some criteria; however, the County may have difficulty acquiring this property. It is an active commercial property; the Lodge at Cabin Bluff is located there. This site is also closer to Naval Submarine Base (NSB) Kings Bay.
1,144-acre Parcel 143 001, Davis M Love III Family Ltd Partnership	It was suggested that the property located immediately southwest of the site be considered.	This alternative was reviewed against the siting criteria identified in Section 2.3.1.1. Because of the size and shape of the property, it does not have the clear potential to satisfy FAA regulations, 14 CFR Parts 450 or 420.

Table 2.3-1. Topics Identified During Public Scoping Evaluated as Possible Alternatives (Continued)

Alternative	Description	Disposition
400-acre Parcel 129 001a, MWV Cabin Bluff LLC	It was suggested that the property located immediately west of the site be considered.	This alternative was reviewed against the siting criteria identified in Section 2.3.1.1. This site is not large enough to provide sufficient usable uplands and adjacent property to act as a buffer.
2,110-acre Parcel 088 002, McCarthy Trustees	It was suggested that the property located along Interstate 95 (I-95) in northern Camden County be considered.	This alternative was reviewed against the siting criteria identified in Section 2.3.1.1. Because of the size and shape of the property, it does not have the clear potential to satisfy FAA regulations, 14 CFR Parts 420 or 450.
4,854-acre Parcel 112 001, Seven States Timberlands LLC	It was suggested that the property located along I-95 in northern Camden County be considered.	This alternative was reviewed against the siting criteria identified in Section 2.3.1.1. Because of the size and shape of the property, it does not have the clear potential to satisfy FAA regulations, 14 CFR Parts 420 or 450.
1,179- acre Parcel 025 003, Tarboro Land & Timber LP	It was suggested that the property in western Camden County be considered.	This alternative was reviewed against the siting criteria identified in Section 2.3.1.1. Because of the size and shape of the property, it does not have the clear potential to satisfy FAA regulations, 14 CFR Parts 420 or 450.
Use of Property by Developers	It was suggested that consideration be given to impacts from residential development should the spaceport not be approved and constructed.	Alternative plans for the property do not meet the purpose and need as defined for this EIS. The County has indicated it would not purchase the property should the spaceport not be approved.
Launch Over Other Inhabited Islands	It was suggested that if it were determined to be acceptable to launch over an inhabited, environmentally sensitive barrier island, that launch trajectories that cross over other inhabited, but less environmentally sensitive barrier islands or inland areas should be considered as well.	The Proposed Action in this EIS considers a trajectory of 100 degrees from true north, reduced from the 83- to 115-degree range specified in the original proposal.
Trajectory Windows	It was suggested that several trajectory windows should be considered to include Jekyll Island, NSB Kings Bay, Little Cumberland and Cumberland Island.	The Proposed Action in this EIS considers a trajectory of 100 degrees from true north, reduced from the 83- to 115-degree range specified in the original proposal.
Inland Launch Sites	It was suggested that if there were "little to no risk to persons or property under the flight path of an ascending commercial rocket, the EIS must consider alternative launch site properties, further inland, which could serve to launch commercial rockets over inhabited areas, but which don't include nearby unique environmental and cultural features, such as exist on coastal landscapes and barrier islands."	Alternative sites, including some further inland, suggested in other public comments have been assessed against siting criteria (see previous site assessment discussions).

Table 2.3-1. Topics Identified During Public Scoping Evaluated as Possible Alternatives (Continued)

Alternative	Description	Disposition
Minimize Impact to Species	It was suggested that an alternative be considered that minimizes impact to northern right whale critical habitat as well as nesting birds and sea turtles, to include prohibition on launches during certain seasons, lighting controls, and other measures to minimize impacts on wildlife.	Prohibiting launches during certain seasons, controlling lighting, and other measures could be considered as mitigations if the analysis indicates the potential for adverse impacts to the northern right whale, its respective habitat, or to other species. Therefore, this recommendation would be treated as a mitigation technique, not as a new alternative for consideration.
Restrict Launch Trajectories	It was suggested that launch or landing trajectories and exclusion zones avoid certain populated areas, such as all points west of the launch site; points north such as Dover Bluff, Hazzards Neck, all land in Glynn County, including Jekyll Island and St. Simons Island, and all land in South Carolina and North Carolina; points south, such as St. Marys, NSB Kings Bay, the southern half of Cumberland Island, and all land in Florida; and even certain points east, such as Little Cumberland Island.	The Proposed Action in this EIS considers a trajectory of 100 degrees from true north, reduced from the 83- to 115-degree range specified in the original proposal. Additionally, there are no landings being considered as part of the Proposed Action in this EIS.
Canaveral National Seashore	It was suggested that Canaveral National Seashore is available and should be used rather than Cumberland Island.	This alternative was reviewed against the siting criteria identified in Section 2.3.1.1. This alternative site does not meet the criteria for the site to be located in Camden County, Georgia.
Kennedy Space Center	It was suggested that Kennedy Space Center already has launch pads and should be used instead of Spaceport Camden.	This alternative was reviewed against the siting criteria identified in Section 2.3.1.1. This alternative site does not meet the criteria for the site to be located in Camden County, Georgia.
Wallops Flight Facility	It was suggested that Wallops Flight Facility should be used instead of Spaceport Camden.	This alternative was reviewed against the siting criteria identified in Section 2.3.1.1. This alternative site does not meet the criteria for the site to be located in Camden County, Georgia.

3 AFFECTED ENVIRONMENT

This chapter provides background information on each of the resources potentially affected by the Proposed Action and No Action Alternative. It identifies each resource area; defines the resource-related region of influence (ROI) for the Proposed Action, which is applicable to both alternatives unless noted otherwise; identifies the applicable regulatory requirements (Federal, State, and local) for each resource; and provides a description of the existing conditions for each resource.

3.1 Air Quality

3.1.1 Definition and Description

Air quality in a given location is defined by the concentration of various pollutants in the atmosphere. A region's air quality is influenced by many factors, including the type and amount of pollutants emitted into the atmosphere, the size and topography of the air basin, and the prevailing meteorological conditions. The Earth's atmosphere consists of four main layers: the troposphere, stratosphere, mesosphere, and ionosphere. For the purposes of this EIS, the discussion of air quality is defined as at or below 3,000 feet above ground level (AGL), which USEPA accepts as the nominal height of the atmosphere mixing layer in assessing contributions of emissions to ground-level ambient air quality under the Clean Air Act (CAA) (USEPA, 1992). Although launch vehicle emissions from operations at or above 3,000 feet AGL would occur, these emissions would not result in appreciable ground-level concentrations.

3.1.2 Regulatory Setting

The following laws, executive orders, agency regulations, and other guidance apply to the Proposed Action.

Clean Air Act, National Ambient Air Quality Standards

The baseline standards for pollutant concentrations are the National Ambient Air Quality Standards (NAAQS) and State air quality standards established under the CAA and its amendments (40 CFR Part 50). These standards represent the maximum allowable atmospheric concentration that may occur and still protect public health and welfare. The NAAQS provide both short- and long-term standards for the following criteria pollutants: carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter equal to or less than 10 and 2.5 microns (PM_{10} and $PM_{2.5}$, respectively), ozone, and lead. The State of Georgia has adopted the Federal NAAQS standards for all pollutants (Georgia Administrative Code 391-3).

Under the CAA, it is the responsibility of the individual states to achieve and maintain the NAAQS. To accomplish this, states use the USEPA-required State Implementation Plan (SIP). Areas that are and have historically been in compliance with the NAAQS are designated as "attainment" areas. Areas that violate a federal air quality standard are designated as "nonattainment" areas. Areas that have transitioned from nonattainment to attainment are designated as maintenance areas and must meet standards of maintenance plans to ensure continued attainment. If an area is designated as "nonattainment" (designated areas), states must develop an SIP that details the path to attain and maintain the NAAQS. An SIP identifies goals, strategies, schedules, and enforcement actions designed to reduce the level of pollutants in the air and bring the state into compliance with the NAAQS (Table 3.1-1). Georgia has implemented SIPs for the 2008 ozone, 2010 $PM_{2.5}$, 2008 lead, 2008 nitrogen dioxide, and 2010 sulfur dioxide standards.

All areas of the United States are designated as having air quality better than or worse than the NAAQS (attainment or nonattainment, respectively) (Table 3.1-1). Areas where there are insufficient air quality data for USEPA to form a basis for attainment status are unclassifiable. Thus, such areas are treated as attainment areas until proven otherwise. "Maintenance areas" are those that were previously classified as nonattainment but where air pollution concentrations have been successfully reduced to levels below the standard. Maintenance areas are subject to special maintenance plans to ensure compliance with the NAAQS.

Table 3.1-1. Summary of National Ambient Air Quality Standards

Criteria Pollutant	Averaging Time	Federal Primary NAAQS	Federal Secondary NAAQS
Carbon monoxide	8-hour	9 ppm	No standard
	1-hour	35 ppm	No standard
Lead	Rolling 3-month average	0.15 µg/m^3 [(a)]	0.15 µg/m³
Nitrogen dioxide	Annual	53 ppb[(b)]	53 ppb
	1-hour	100 ppb	No standard[c]
PM_{10}	24-hour	150 µg/m^3	150 µg/m³
$PM_{2.5}$	Annual	12 µg/m³	15 µg/m³
	24-hour	35 µg/m³	35 µg/m³
Ozone	8-hour	0.070 ppm[(c)]	0.070 ppm
Sulfur dioxide	Annual	No standard	No standard
	24-hour[a]	No standard	No standard
	3-hour	No standard	0.50 ppm[(d)]
	1-hour	75 ppb[(d)]	No standard

Notes: µg/m³ = micrograms per cubic meter; CFR = Code of Federal Regulations; NAAQS = National Ambient Air Quality Standards; $PM_{10/2.5}$ = particulate matter equal to or less than 10 or 2.5 microns; ppb = parts per billion; ppm = parts per million; USEPA = U.S. Environmental Protection Agency.

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

[b] The level of the annual nitrogen dioxide standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.

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

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

Source: (USEPA, 2016)

Hazardous air pollutants (HAPs) are chemicals that are known or suspected of causing cancer or other serious health effects. Unlike the criteria pollutants, HAPs currently do not have national ambient standards. Some volatile organic compounds (VOCs) are classified as HAPs. VOCs are also ozone precursors and include any organic compound involved in atmospheric photochemical reactions, except those designated by a USEPA administrator as having negligible photochemical reactivity. HAPs are not covered by the NAAQS but may present a threat of adverse human health or environmental effects under certain conditions.

HAPs emitted from mobile sources are called Mobile Source Air Toxics (MSATs) and include acetaldehyde, acrolein, benzene, 1,3-butadiene, diesel particulate matter, formaldehyde, naphthalene, and polycyclic organic matter. These compounds are emitted from highway vehicles and non-road equipment and are known or suspected to cause serious health and environmental effects. In 2001, USEPA issued its first MSAT Rule, which identified 21 compounds as being HAPs that required regulation. In February 2007, USEPA issued a second MSAT Rule, which generally supported the findings in the first rule and provided additional recommendations of compounds having the greatest impact on health. The rule also identified several engine emission certification standards that must be implemented.

As mentioned above, unlike the criteria pollutants, there are no NAAQS for HAPs. The primary control methodologies instituted by Federal regulation for MSATs involve technological improvements for reducing their content in fuel and altering engine operating characteristics to reduce the volume of pollutants generated during combustion. MSATs would be the primary HAPs emitted by mobile sources during construction and operations. The equipment used during construction would likely vary in age and have a range of pollution reduction effectiveness. Construction equipment, however, would be operated intermittently over a large area and would produce negligible ambient HAPs in a localized area. Operational equipment, including vehicles driven by commuters, is anticipated to be primarily newer equipment (post-2010 model year) that generate lower emissions and would also produce negligible ambient HAPs. There are no MSATs generated by the combustion of liquid oxygen, nitrogen, or helium. While some quantity of MSATs could be produced through combustion of RP-1 (based on comparison to studies of similar kerosene-based jet fuels), no studies are currently available that directly assess the emission of MSATs based on RP-1 combustion in association with rocket launches. Therefore, MSAT emissions are not considered further in this analysis.

General Conformity

The USEPA General Conformity Rule applies to Federal actions occurring in nonattainment or maintenance areas when the total direct and indirect emissions of nonattainment pollutants (or their precursors) exceed specified thresholds called *de minimis* thresholds. A conformity applicability analysis is the first step of a conformity evaluation and assesses whether a Federal action must be supported by a conformity determination. This is typically done by quantifying applicable direct and indirect emissions that are projected to result due to implementation of the Federal action. If the results of the applicability analysis indicate that the total emissions would not exceed the *de minimis* emissions thresholds, then the conformity evaluation process is completed. If *de minimis* thresholds would be exceeded, the agency is required to complete a conformity determination in which the action must be shown to conform with the applicable SIP(s).

New Source Review (Preconstruction Permit)

New major stationary sources and major modifications at existing major stationary sources are required by the CAA to obtain an air pollution permit before commencing construction. This permitting process for major stationary sources is called New Source Review and is required whether the major source or major modification is planned for nonattainment areas or attainment and unclassifiable areas. In general, permits for sources in attainment areas and for other pollutants regulated under the major source program are referred to as Prevention of Significant Deterioration (PSD) permits, while permits for major sources emitting nonattainment pollutants and located in nonattainment areas are referred to as nonattainment new source review permits. In addition, a proposed project may have to meet the requirements of nonattainment new source review for the pollutants for which the area is designated as nonattainment and PSD for the pollutants for which the area is designated as attainment. Additional PSD permitting thresholds apply to increases in stationary source greenhouse gas (GHG) emissions. PSD

permitting can also apply to a new major stationary source (or any net emissions increase associated with a modification to an existing major stationary source) that is constructed within 6.2 miles of a Class I area and that would increase the 24-hour average concentration of any regulated pollutant in the Class I area by 1 microgram per cubic meter or more. Class I federal lands include areas such as national parks, national wilderness areas, and national monuments. These areas are granted special air quality protections under Section 162(a) of the federal Clean Air Act (USEPA, 2020). The Proposed Action does not include any major stationary sources, so the PSD requirements would not apply.

Title V (Operating Permit)

The Title V Operating Permit Program consolidates all CAA requirements applicable to the operation of a source, including requirements from the SIP, preconstruction permits, and the air toxics program. It applies to stationary sources of air pollution that exceed the major stationary source emission thresholds, as well as other non-major sources specified in a particular regulation. The program includes a requirement for payment of permit fees to finance the operating permit program whether implemented by USEPA or a State or local regulator. Installations subject to Title V permitting shall comply with the requirements of the Title V Operating Permit Program, which are detailed in 40 CFR Part 70 and all specific requirements contained in their individual permits. The proposed Spaceport Camden is not likely to be considered a major source of criteria pollutants or HAPs, and Title V permitting would not be required.

Greenhouse Gases

GHGs are gas emissions that trap heat in the atmosphere. These emissions occur from natural processes and human activities. Scientific evidence indicates that increasing global temperature due to an increase in GHG emissions is associated with climate change. Further discussion of GHG emissions is provided in Section 3.3, *Climate*.

3.1.3 Existing Conditions

Spaceport Camden would be located in Camden County, Georgia. Camden County is located within the Jacksonville (Florida) – Brunswick (Georgia) Interstate Air Quality Control Region, which includes 25 counties in Florida and 14 in Georgia (defined in 40 CFR §81.91). The air quality analysis focuses on the local environs surrounding the proposed vertical launch area and control center, which are located in Camden County. According to USEPA, Camden County is in attainment for all criteria pollutants (USEPA, 2017a), and a conformity determination would not be required. The proposed project area is located entirely in Camden County; however, because it is the designated Federal regulatory region for air quality under the CAA, the Jacksonville-Brunswick Interstate Air Quality Control Region is the ROI used for the air quality analysis for both construction and end-state operations.

Existing conditions in, or materially impacting, Camden County that were or may be important to assessing the relative impact of the spaceport project on its surroundings include: regular tug traffic along the Intracoastal Waterway, operations at NSB Kings B ay, the two paper mills (WestRock and Rayonier) on the border of Camden County in Fernandina Beach, and the recently ceased pesticide production operations of Bayer CropScience on the proposed spaceport site.

Although air is well mixed throughout the atmosphere, the atmosphere itself is not physically uniform but has significant variations in temperature and pressure with altitude, which define a number of atmospheric layers. These include the troposphere (surface to 6 miles), stratosphere (6 to 31 miles), mesosphere (31 to 50 miles), and thermosphere (50 to 217 miles). The boundaries between these four layers are defined by abrupt changes in temperature. These boundaries are the tropopause, stratopause, and mesopause. In the troposphere and mesosphere, temperature generally falls with increasing altitude,

while in the stratosphere and thermosphere, temperature rises with increasing altitude. Only emissions occurring below 3,000 feet AGL in the troposphere are generally considered to have the potential to directly affect human health and regional air quality; therefore, these are the only criteria pollutant emissions evaluated in this EIS. However, GHG emissions have the potential to indirectly affect human health through depletion of the ozone layer and increased levels of the sun's ultraviolet radiation reaching the Earth's surface. Thus, total GHG emissions are considered.

For impact analysis in Chapter 4, *Environmental Consequences*, emissions that would be generated from spaceport operations were compared with Camden County and the Air Quality Control Region emissions obtained from USEPA's 2017 National Emissions Inventory (NEI) (USEPA, 2020a). NEI data are the latest available; these are presented in Table 3.1-2. The county data include emissions amounts from point sources, area sources, and mobile sources. *Point sources* are stationary sources that can be identified by name and location. *Area sources* are point sources from which emissions are too low to track individually, such as a home or small office building, or a diffuse stationary source, such as wildfires or agricultural tilling. *Mobile sources* are any kind of moving vehicle or equipment such as vehicles with gasoline or diesel engines, airplanes, or ships. Two types of mobile sources are considered: on-road and nonroad. On-road sources consist of vehicles such as cars, light trucks, heavy trucks, buses, engines, and motorcycles. Nonroad sources are aircraft, locomotives, diesel and gasoline boats and ships, personal watercraft, lawn and garden equipment, agricultural and construction equipment, and recreational vehicles (USEPA, 2017b).

Table 3.1-2. Camden County and Regional Air Emissions Inventory (2017)

Location	Carbon Monoxide	Nitrogen Oxides	PM_{10}	$PM_{2.5}$	Sulfur Dioxide	VOCs
	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)	(tpy)
Camden County	18,775	2,339	1,316	590	33	22,809
Jacksonville-Brunswick Interstate Air Quality Control Region	795,035	95,460	123,081	56,892	16,549	790,167

Notes: PM_{10} and $PM_{2.5}$ = particulate matter equal to or less than 10 or 2.5 microns; tpy = tons per year; VOC = volatile organic compound.
Source: (USEPA, 2020a)

3.2 Biological Resources

3.2.1 Definition and Description

Biological resources comprise the plant and animal species, habitats, and ecological relationships of the land, water, and Atlantic coastal areas within the construction and operational ROI. The operational ROI for biological resources extends out for a radius of approximately 10 miles around the Spaceport Camden site to account for potential noise and visual effects from launches and includes the OEZ and portions of the USCG LAA boundaries (described in Section 2.1.2.5, *Pre-Launch Activities*). The construction ROI for biological resources consists of the proposed Spaceport Camden site, which is much smaller than the operational ROI. Plant associations are referred to generally as "vegetation," and animal species are referred to generally as "fish" or "wildlife." *Habitat* can be defined as the resources and conditions present in an area that support a plant or animal. Particular consideration is given to sensitive species and habitats. Sensitive species include those protected by Federal or State law (see Section 3.2.2, *Regulatory Setting*). Sensitive habitats consist of essential fish habitat (EFH), wetlands, floodplains, and other sensitive areas as identified during previous site surveys and scoping meetings.

3.2.2 Regulatory Setting

The following laws, executive orders, agency regulations, and other guidance apply to the Proposed Action.

Endangered Species Act

The ESA (16 U.S.C. §1531–1543) applies to Federal actions in two separate respects. First, the ESA requires that Federal agencies, in consultation with the responsible wildlife agency (i.e., NMFS, USFWS), ensure that proposed actions are not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of a critical habitat (16 U.S.C. §1536 [a][2]). Regulations implementing the ESA expand the consultation requirement to include those actions that "may affect" a listed species or critical habitat.

Second, if an agency's proposed action is likely to adversely affect, or take, a listed species, then the agency must obtain an incidental take statement from the responsible regulatory agency (i.e., NMFS, USFWS). The ESA defines the term *take* to mean "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt any such conduct" (16 U.S.C. §1532[19]). The regulatory definitions of *harm* and *harass* are relevant to FAA's determination as to whether the Proposed Action would result in adverse effects on listed species:

> Harm is defined by regulation as "an act which actually kills or injures" fish or wildlife (50 CFR §222.102).
>
> Harass is defined by regulation to mean an "intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding or sheltering" (50 CFR §17.3).

Marine Mammal Protection Act

The Marine Mammal Protection Act (MMPA) established, with limited exceptions, a moratorium on the "taking" of marine mammals in waters or on lands under U.S. jurisdiction. The act further regulates "takes" of marine mammals in the high seas by vessels or persons under U.S. jurisdiction. The term *take*, as defined in Section 3 (16 U.S.C. §1362) of the MMPA, means "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal." *Harassment* was further defined in the 1994 amendments to the MMPA, which provided for two levels of harassment: Level A (injury) and Level B (behavioral harassment):

> Injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild (Level A harassment) or
>
> Disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including but not limited to migration, surfacing, nursing, breeding, feeding, or sheltering, to a point where such behavioral patterns are abandoned or significantly altered (Level B harassment) (16 U.S.C. §1362 [18][B][i],[ii]).

Section 101(a)(5) of the MMPA directs the Secretary of Commerce to allow, upon request, the incidental, but not intentional, taking of marine mammals by U.S. citizens who engage in a specified activity (exclusive of commercial fishing) within a specified geographic region. These incidental takes may be allowed if the NMFS determines the taking will have a negligible impact on the species or stock and the taking will not have an immitigable adverse impact on the availability of such species or stock for taking for subsistence uses.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act (MBTA) was enacted to ensure the protection of shared migratory bird resources. The MBTA prohibits the intentional take, possession, import, export, transport, selling, purchase, barter, or offering for sale, purchase, or barter, any migratory bird or its egg, part, or nest, except as authorized under a valid permit. Current regulations authorize permits for the intentional taking of migratory birds for activities such as scientific research, education, and depredation control. However, these regulations do not expressly authorize the incidental taking of migratory birds resulting from actions where the take was not the intent of the action. The MBTA protects a total of 1,026 bird species. Assessment of a project's effects on migratory birds places an emphasis on "species of concern" as defined by EO 13186, *Responsibilities of Federal Agencies to Protect Migratory Birds*. This EO directs Federal agencies to take action to further implement the MBTA. In accordance with this EO, FAA signed a Memorandum of Agreement with the USFWS and other Federal agencies in December 2002 to address aircraft-wildlife strikes. Through this Memorandum of Agreement, the agencies established procedures to coordinate their missions to more effectively mitigate against existing and future environmental conditions that contribute to wildlife strikes with aircraft.

Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (16 U.S.C. §668–668d) prohibits the taking or possession of and commerce in bald and golden eagles. It also protects bald and golden eagles from the unauthorized capture, purchase, or transportation of the birds, their nests, or their eggs.

Magnuson-Stevens Fishery Conservation and Management Act

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. §§1801 et seq.) was enacted to conserve and restore the nation's fisheries and requires that NMFS and regional fishery councils describe and identify EFH for all species that are federally managed. EFH is defined as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. Under the act, Federal agencies must consult with NMFS regarding any activity or proposed activity that is authorized, funded, or undertaken by the agency that may adversely affect EFH.

Executive Order 13112, Invasive Species

EO 13112, *Invasive Species*, states that no Federal agency shall authorize, fund, or carry out actions that it believes are likely to cause or promote the introduction or spread of invasive nonnative species in the United States or elsewhere.

Council on Environmental Quality Guidance on Incorporating Biodiversity Considerations

In accordance with 40 CFR §§1507.2(e), 1508.8(b), and 1508.27, the guidance on incorporating biodiversity considerations into environmental impact analysis under NEPA directs Federal agencies to consider the effects of Federal actions on biodiversity to the extent that is possible to both anticipate and evaluate those effects. The guidance outlines the general principles and discusses the importance of context—that is, examining the direct, indirect, and cumulative impacts of a specific project in the regional or ecosystem context.

Memorandum of Understanding to Foster Ecosystem Approach

The memorandum of understanding emphasizes consideration of all relevant and identifiable ecological and economic consequences, both long term and short term; coordination among Federal agencies; partnership; communication with the public; efficient and cost-effective implementation; use of best available science; improved data and information management; and responsiveness to changing circumstances. The memorandum of understanding was signed by the CEQ, all U.S. departments, USEPA, and the Office of Science and Technology Policy.

3.2.3 Existing Conditions

For the purposes of this EIS, the ROI for biological resources includes those areas that would be impacted by construction activities (construction ROI) and operational activities (operational ROI) as described for the Proposed Action. Within this EIS, biological resources are divided into four major categories: terrestrial vegetation and habitats, terrestrial animals (to include feral horses on Cumberland Island), marine vegetation and habitats, and marine animals. Special status species and environmentally sensitive or critical habitat potentially present within the ROI are discussed in their respective categories. For the purposes of this EIS, special status species are defined as those species listed as threatened or endangered under the ESA, species proposed for listing, candidate species for listing under the ESA, State-listed species, and species afforded Federal protection under the MMPA, Bald and Golden Eagle Protection Act, and the MBTA. Environmentally sensitive habitat includes EFH. Critical habitat includes federally designated critical habitat under the ESA. Background information sources for the existing site includes, but is not limited to, the following:

- Results of previous onsite characterization studies
- Information on Federal and State protected species, as listed in the NOI, EIS scoping response letters from the general public, USFWS, NMFS, the NPS, and GDNR
- USFWS Information for Planning and Consultation (IPaC)
- NatureServe – Terrestrial Ecological Classifications, Alliances and Associations of Camden, Glynn, and McIntosh Counties, Georgia
- Wetland survey results

Descriptions of terrestrial and marine habitats and species associated with the ROI area are described in the following sections.

3.2.3.1 Terrestrial Vegetation and Habitats

Several types of terrestrial habitats occur within the construction ROI (Exhibit 3.2-1). There are no ESA-listed plant species in the construction ROI, although the federally endangered hairy rattle weed (*Baptismal arachnifera*) does occur north of the Satilla River. These habitats are grouped into ecological associations based on soil characteristics and the mix of plant and animal species present in the area. Construction activities and daily operations of Spaceport Camden described under the Proposed Action would primarily occur in upland ecological associations. Other associations within the operational ROI affected by the launch or static fire tests would include nearby waterways and Cumberland Island. Terrestrial vegetation of particular interest found within the construction and operational ROI is listed in Table 3.2-1. Descriptions for the community types found at the Spaceport Camden site were summarized from the *Alliances and Associations of Camden, Glynn, and McIntosh Counties, GA* (NatureServe, 2009).

Southeastern Coastal Plain Interdunal Wetland

This fresh marsh community occurs in open flatwoods and stream head environments and in narrow to broad interdune depressions. These areas contain standing water most years, but water levels are reduced during severe droughts. Interdunal wetlands are dominated by Jamaica swamp sawgrass (*Cladium mariscus* ssp. *jamaicense)* and often have substantial shrub cover, which is maintained by fire.

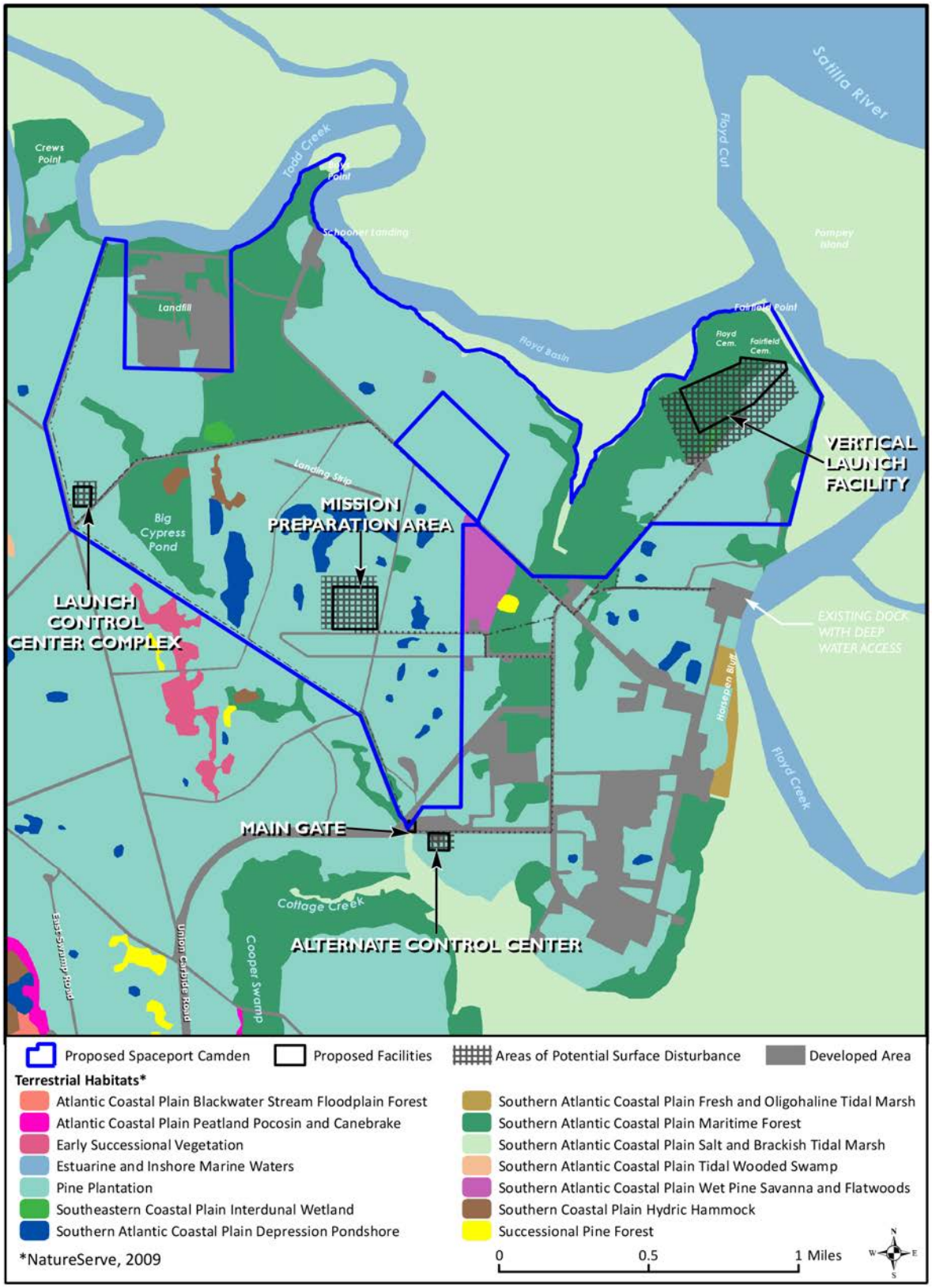


Exhibit 3.2-1. Terrestrial Habitats Present Within the Construction Region of Influence
Source: (NatureServe, 2009)

Table 3.2-1. Summary List of Terrestrial Vegetation Within the Construction ROI

Scientific Name	Common Name	Status	
		State	Federal
Plants			
Acacia farnesiana	Sweet acacia	-	-
Aeschynomene viscidula	Sticky joint-vetch	-	-
Agalinis filifolia	Seminole purple foxglove	-	-
Agalinis maritima var. *grandiflora*	Saltmarsh purple foxglove	-	-
Andropogon brachystachyus	Shortspike bluestem	-	-
Aristida beyrichiana	Beyrich threeawn	-	-
Asimina pygmea	Dwarf pawpaw	-	-
Asplenium heteroresiliens	Morzenti's spleenwort	T	-
Calopogon multiflorus	Many-flowered grass-pink	-	-
Carex chapmanii	Chapman's sedge	-	-
Carex dasycarpa	Velvet sedge	R	-
Carex decomposita	Cypress-knee sedge	-	-
Carex gholsonii	Gholson's sedge	-	-
Carex godfreyi	Godfrey's sedge	-	-
Carpinus caroliniana ssp. *caroliniana*	American hornbeam	-	-
Cephalanthus occidentalis	Buttonbush	-	-
Cladium mariscus ssp. *jamaicense*	Jamaica swamp sawgrass	-	-
Coreopsis integrifolia	Ciliate-leaf tickseed	T	-
Cornus foemina	Stiff dogwood	-	-
Ctenium floridanum	Florida orange-grass	-	-
Dalea carnea	Pink-tassels	-	-
Diospyros virginiana	Common persimmon	-	-
Eleocharis albida	White spikerush	-	-
Eleocharis montana	Nodose spikerush	-	-
Eleocharis montevidensis	Spikerush	-	-
Elyonurus tripsacoides	Pan-american balsamscale	-	-
Epidendrum magnoliae	Greenfly orchid	U	-
Forestiera godfreyi	Godfrey's wild privet	E	-
Forestiera segregata	Florida wild privet	R	-
Fuirena scirpoidea	Southern umbrella-sedge	-	-
Gaylussacia dumosa var. *dumosa*	Dwarf huckleberry	-	-
Gaylussacia tomentosa	Blue huckleberry	-	-
Helianthus agrestis	Southeastern sunflower	-	-
Ilex amelanchier	Serviceberry holly	-	-
Ilex glabra	Gallberry	-	-
Iris tridentata	Savanna iris	-	-
Itea virginica	Virginia sweetspire	-	-
Juniperus virginiana var. *silicicola*	Southern red cedar	-	-
Justicia angusta	Narrowleaf water-willow	-	-
Leitneria floridana	Corkwood	T	-
Liatris tenuifolia var. *quadriflora*	Florida narrowleaf blazing star	-	-
Litsea aestivalis	Pond spice	R	-
Lycium carolinianum	Carolina wolfberry	-	-
Lyonia ferruginea	Rusty staggerbush	-	-

Table 3.2-1. Summary List of Terrestrial Vegetation Within the Construction ROI (Continued)

Scientific Name	Common Name	Status	
		State	Federal
Lyonia fruticosa	Coastal plain staggerbush	-	-
Lyonia lucida	Fetterbush	-	-
Magnolia virginiana	Sweetbay magnolia	-	-
Mikania cordifolia	Heartleaf climbing hempweed	-	-
Morella cerifera	Wax myrtle	-	-
Muscadinia rotundifolia var. *munsoniana*	Munson grape	-	-
Neptunia pubescens var. *pubescens*	Tropical neptunia	-	-
Nyssa biflora	Swamp tupelo	-	-
Orbexilum virgatum	Slender leather-root	-	-
Osmanthus americanus var. *americanus*	Devilwood	-	-
Palafoxia integrifolia	Palafoxia	-	-
Persea borbonia	Red bay	-	-
Persea palustris	Swamp bay	-	-
Persicaria arifolia	Halberd-leaf tear-thumb	-	-
Phlebodium aureum	Goldfoot fern	-	-
Physostegia leptophylla	Narrowleaf obedient plant	-	-
Pinus elliottii	Slash pine	-	-
Pinus palustris	Longleaf pine	-	-
Pinus taeda	Loblolly pine	-	-
Plantago sparsiflora	Pineland plantain	-	-
Platanthera chapmanii	Chapman's fringed orchid	-	-
Polygonum glaucum	Sea-beach knotweed	-	-
Pteroglossaspis ecristata	Wild coco	T	-
Pycnanthemum floridanum	Florida mountain-mint	-	-
Quercus austrina	Bluff white oak	-	-
Quercus chapmanii	Chapman oak	-	-
Quercus geminata	Sand live oak	-	-
Quercus laurifolia	Laurel oak	-	-
Quercus minima	Dwarf live oak	-	-
Quercus similis	Swamp post oak	-	-
Quercus virginiana	Southern live oak	-	-
Rhexia nuttallii	Nuttall meadowbeauty	-	-
Rhynchospora harperi	Harper's beaksedge	-	-
Sabal palmetto	Cabbage palmetto	-	-
Sageretia minutiflora	Climbing buckthorn	T	-
Sapindus marginatus	Soapberry	R	-
Sarracenia minor var. *minor*	Hooded pitcherplant	U	-
Scirpus lineatus	Drooping bulrush	-	-
Serenoa repens	Saw palmetto	-	-
Spiranthes eatonii	Eaton's ladies-tresses	-	-
Sporobolus curtissii	Curtis' dropseed	-	-
Thalia dealbata	Powdery alligator-flag	-	-
Thalia geniculata	Bent alligator-flag	-	-
Tillandsia bartramii	Bartram's airplant	-	-
Tillandsia fasciculata	Quill-leaf airplant	-	-
Tillandsia recurvata	Ball-moss	-	-

Table 3.2-1. Summary List of Terrestrial Vegetation Within the Construction ROI (Continued)

Scientific Name	Common Name	Status	
		State	Federal
Tridens carolinianus	Carolina redtop	-	-
Triphora trianthophora	Three-birds orchid	-	-
Ulmus americana	American elm	-	-
Vaccinium myrsinites	Shiny blueberry	-	-
Vicia minutiflora	Pygmy-flower vetch	-	-
Vigna luteola	Wild yellow cowpea	-	-
Vitis palmata	Riverbank grape	-	-
Vittaria lineata	Shoestring fern (sporophyte)	-	-
Zamia floridana var. *umbrosa*	Florida coontie	-	-

Notes: E = endangered; R = rare; T = threatened; U = unusual.

Southern Atlantic Coastal Plain Maritime Forest

The maritime forest is a xeric maritime hammock found on deep, sandy soils with an overstory dominated by sand live oak (*Quercus geminata*). Shrubs typically include saw palmetto (*Serenoa repens*), redbay (*Persea borbonia*), rusty staggerbush (*Lyonia ferruginea*), devilwood (*Osmanthus americanus* var. *americanus*), coastal plain staggerbush (*Lyonia fruticosa*), and wax myrtle (*Morella cerifera*).

Southern Atlantic Coastal Plain Wet Pine Savanna and Flatwoods

This community has a sparse overstory of longleaf pine (*Pinus palustris*) and occurs on sandy, mesic to moderately dry soils with low pH. Curtis' dropseed (*Sporobolus curtissii*) and Beyrich threeawn (*Aristida beyrichiana)* are common, and the shrub layer is often dense with saw palmetto*,* shiny blueberry (*Vaccinium myrsinites*), dwarf huckleberry (*Gaylussacia dumosa* var. *dumosa*), blue huckleberry (*Gaylussacia tomentosa*), dwarf live oak (*Quercus minima*)*,* gallberry (*Ilex glabra*), and fetterbush (*Lyonia lucida*).

Southern Atlantic Coastal Plain Depression Pondshore

Found in peaty or acidic, mucky, semi permanently wet depression, this community is dominated by swamp tupelo (*Nyssa biflora*). Scattered shrubs may include species such as Virginia sweetspire (*Itea virginica*) and buttonbush (*Cephalanthus occidentalis*).

Southern Coastal Plain Hydric Hammock

These hammocks usually form in areas where deep groundwater seeps from limestone outcrops. The canopy typically includes cabbage palmetto (*Sabal palmetto*), laurel oak (*Quercus laurifolia*), southern live oak (*Quercus virginiana*), sweetbay magnolia (*Magnolia virginiana*), and American elm (*Ulmus americana*). Understory species may include species such as stiff dogwood (*Cornus foemina*), American hornbeam (*Carpinus caroliniana* ssp. *caroliniana*), common persimmon (*Diospyros virginiana*), sweetbay magnolia (*Magnolia virginiana*), swamp bay (*Persea palustris*), and swamp tupelo (*Nyssa biflora*).

Southern Atlantic Coastal Plain Salt and Brackish Tidal Marsh

This ecological system encompasses the brackish to saline intertidal marshes. The expanse of salt marshes between Georgia's barrier islands and the mainland comprises about one-third of all salt marsh habitat on the U.S. Atlantic coast (Schneider & Keyes, 2015). Salt marshes are dominated by medium to extensive expanses of cordgrass (*Spartina alterniflora*). Salt marshes are flooded approximately twice daily by lunar tides. Regular tidal flooding occurs over most of the system, with irregular flooding in unusually high tides occurring in brackish marshes found in the upper zones. The water is salty over most of the expanse of salt marsh systems, grading to brackish waters further upland. Brackish marshes occur upstream along

tidal creeks about 25 to 35 kilometers from the ocean (by river distance), dominated by black needlerush (*Juncus roemerianus*) and other rush species. The upland brackish community is infrequently flooded and may support inclusions of shrublands, forests, or woodlands. Brackish shrublands are dominated by bushy seaside tansy (*Borrichia frutescens*) or eastern baccharis, groundsel bush, and sea myrtle (*Baccharis halimifolia*). Brackish woodlands are dominated by southern red cedar (*Juniperus virginiana* var. *silicicola*) in the canopy, which may range from 10 to 80 percent closure.

Pine Plantation

Pine plantations at Spaceport Camden are primarily loblolly pine (*Pinus taeda*), but there are also some slash pine (*Pinus elliottii*) plantations (CH2M Hill, 2015). These mono-specific stands have been converted from the native vegetative types, which would have included oak hammock, mixed hardwood forest, and native pine flatwoods, characterized by an open canopy of longleaf pine and slash pine and diverse grasses and forbs. Understory diversity is very low due to the dense row planting. Emergent and scrub shrub wetlands are scattered within the pine plantation.

Barrier Island

Cumberland Island falls under the barrier island ecological association, and its entire terrestrial area is classified as coastal upland community. This community is associated with sand beaches, beach dunes, coastal grassland, coastal interdunal swales, and scrub communities. There are 22 different biological associations on Cumberland Island, including various upland forests.

Invasive Nonnative Plant Species

Invasive nonnative plant species have been documented at multiple locations within the Spaceport Camden site (CH2M Hill, 2015). These species have the potential to outcompete and overtake native plant communities, degrade threatened and endangered species habitat, and alter natural processes such as the hydrology of wetlands. Chinese privet (*Ligustrum sinense*) and Chinese tallow (*Triadica sebifera*) have been identified on the site (CH2M Hill, 2015).

3.2.3.2 Terrestrial Animals

A rich diversity of game and nongame animals is found within the construction and operational ROIs, including special status species, due to the variety of habitats that occur. The various ecological associations provide habitat for birds, reptiles, amphibians, fish, and mammals. Table 3.2-2 provides a list of terrestrial species that may be found within the construction and operational ROIs. The lists are representative of species that could occur but are not considered comprehensive. Sea turtles, which nest within the operational ROI on Cumberland Island National Seashore, are included in the table below for terrestrial species and discussed in Section 3.2.3.4, *Marine Animals*.

Table 3.2-2. Representative List of Terrestrial Animals Within the Construction and Operational Regions of Influence

Scientific Name	Common Name	Status	
		State	Federal
Amphibians and Reptiles			
Lithobates capito	Gopher frog	R	-
Notophthalmus perstriatus	Striped newt	-	-
Pseudobranchus striatus	Broad-striped dwarf siren	-	-
Caretta caretta	Loggerhead sea turtle	E	T
Chelonia mydas	Green sea turtle	T	T
Clemmys guttata	Spotted turtle	U	-

Table 3.2-2. Representative List of Terrestrial Animals Within the Construction and Operational Regions of Influence (Continued)

Scientific Name	Common Name	Status	
		State	Federal
Crotalus adamanteus	Eastern diamond-backed rattlesnake	-	-
Dermochelys coriacea	Leatherback sea turtle	E	E
Drymarchon couperi	Eastern indigo snake	T	T
Farancia erytrogramma erytrogramma	Common rainbow snake	-	-
Gopherus polyphemus	Gopher tortoise	T	C
Lepidochelys kempii	Kemp's ridley sea turtle	E	E
Malaclemys terrapin	Diamondback terrapin	-	-
Micrurus fulvius fulvius	Eastern coral snake	-	-
Nerodia floridana	Florida green water snake	-	-
Pituophis melanoleucus mugitus	Florida pine snake	-	-
Pseudemys nelsoni	Florida redbelly turtle	-	-
Regina alleni	Striped crayfish snake	-	-
Rhadinaea flavilata	Pine woods snake	-	-
Birds			
Ammodramus maritimus	Seaside sparrow	-	BCC
Ammodramus maritimus macgillivraii	Macgillivray's seaside sparrow	-	-
Calidris canutus rufa	Red knot	T	T
Charadrius melodus	Piping plover	T	T
Charadrius wilsonia	Wilson's plover	T	BCC
Elanoides forficatus	Swallow-tailed kite	R	BCC
Haematopus palliatus	American oystercatcher	R	BCC
Haliaeetus leucocephalus	Bald eagle	T	BCC
Himantopus mexicanus	Black-necked stilt	-	-
Laterallus jamaicensis jamaicensis	Eastern black rail	-	T
Mycteria americana	Wood stork	E	T
Nyctanassa violacea	Yellow-crowned night-heron	-	-
Nycticorax nycticorax	Black-crowned night-heron	-	-
Passerina ciris	Painted bunting	-	BCC
Pelecanus occidentalis	Brown pelican	-	-
Picoides borealis	Red-cockaded woodpecker	E	E
Plegadis falcinellus	Glossy ibis	-	-
Sternula antillarum	Least tern	R	BCC
Mammals			
Corynorhinus rafinesquii	Rafinesque's big-eared bat	R	-
Geomys pinetis	Southeastern pocket gopher	T	
Equus ferus	Feral horse	-	-
Lasiurus intermedius	Northern yellow bat	-	-
Neofiber alleni	Round-tailed muskrat	T	
Odocoileus virginianus	White-tailed deer	-	-
Perimyotis subflavus	Tri-colored bat	-	-
Sciurus niger shermani	Sherman's fox squirrel	-	-

Notes: BCC = birds of conservation concern; C = candidate species; E = endangered; R = rare; T = threatened; U = unusual.
Source: (GDNR, 2014; USFWS IPaC, 2016; USFWS IPaC, 2020)

Terrestrial Special Status Animal Species

As shown in Table 3.2-2, Exhibit 3.2-2, and Exhibit 3.2-3, the following ESA-listed species, candidate species for listing under the ESA, species protected by the Bald and Golden Eagle Protection Act, and State-listed species may be present within the ROI (full descriptions of these species are provided in Appendix D, *Biological Resources*):

- Eastern indigo snake (*Drymarchon corais couperi*) – Federally threatened, the indigo snake is primarily found in sandhills habitat, but during warmer months it may also be found in stream bottoms, swamps, and flatwoods. The indigo snake has been found within the construction ROI in the sandy portions that extend south from Todd Creek to the abandoned airstrip (Exhibit 3.2-2) and may be found throughout the site, both in wetlands and uplands, particularly in areas with gopher tortoise burrows (CH2M Hill, 2015). The indigo snake uses gopher tortoise burrows during the cold weather months and forages in wetlands during warm weather months.
- Gopher tortoise (*Gopherus polyphemus*) – A Federal candidate species in the eastern portion of its range (east of the Mobile and Tombigbee Rivers), 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 are found within the construction ROI in the open sandy areas between Todd Creek and the airstrip, and on the peninsula near the Floyd Family Cemetery (Exhibit 3.2-2). The pine plantation areas may have also historically supported a large gopher tortoise population before the dense plantings shaded out suitable forage plants (CH2M Hill, 2015).
- Gopher frog (*Lithobates capito*) – A State-listed rare species, the gopher frog is restricted to longleaf pine ecosystems and typically occurs in sandy and well-drained longleaf pine, saw palmetto, and wiregrass sandhills. Except when breeding, gopher frogs are predominantly terrestrial and occupy the burrows of other animals, including gopher tortoises. They breed in isolated, depressional, ephemeral (seasonally dry) wetlands, in the fall, winter, and early spring (Stevenson et al., 2018). A small area of known gopher breeding habitat occurs within the construction ROI (Exhibit 3.2-2).
- Red-cockaded woodpecker (*Picoides borealis*) – Federally listed as endangered, this small woodpecker requires large expanses of mature, open pine forest, particularly longleaf, slash, or loblolly pine. Currently there is no suitable nesting habitat within the construction ROI for red-cockaded woodpeckers, as most of the upland areas are in young plantation pine (CH2M Hill, 2015), and GDNR records[20] did not indicate any red-cockaded woodpeckers within 3 miles of the site (Yellin, 2014).
- Wood storks (*Mycteria americana*) – Federally threatened birds that nest in large colonies, primarily in cypress or mangrove swamps, where they often nest in the upper branches of large trees. Wood stork colonies occur outside of the construction ROI, but within the operational ROI 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 4 miles east/southeast of the site at Cumberland Island (Exhibit 3.2-3 and Exhibit 3.2-4) (GDNR, 2020a). Historically, they have been seen foraging at the borrow pit near the landfill, in the wet weather pond near the southern boundary of the spaceport site, and along shallows and mudflats along Todd Creek (CH2M Hill, 2015), but wood storks may vary the areas they use for foraging and roosting based on environmental conditions.

[20] The GDNR 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.

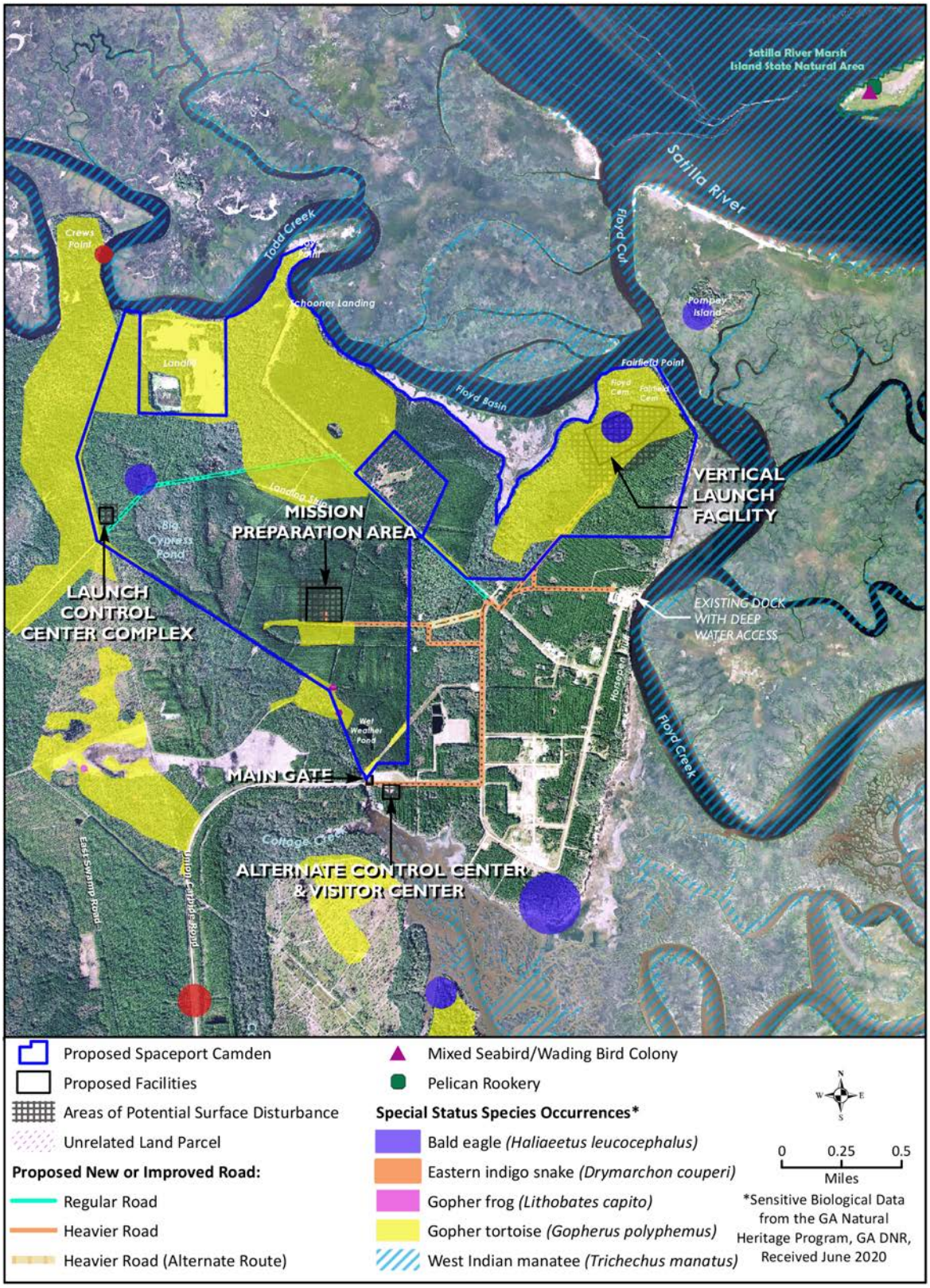


Exhibit 3.2-2. Known Occurrences of Special Status Animal Species Within the Construction ROI

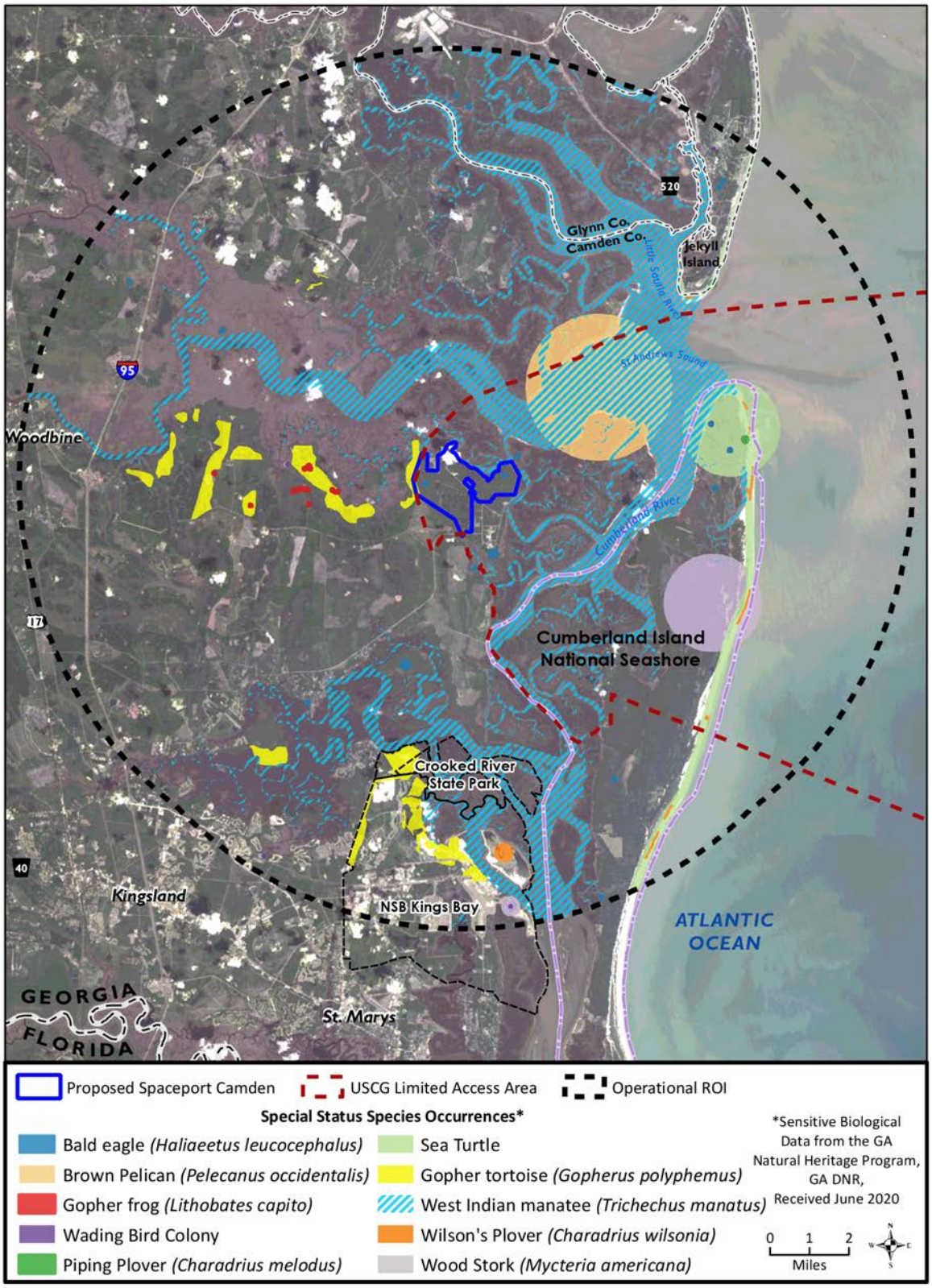


Exhibit 3.2-3. Known Occurrences of Special Status Animal Species Within the Operational ROI

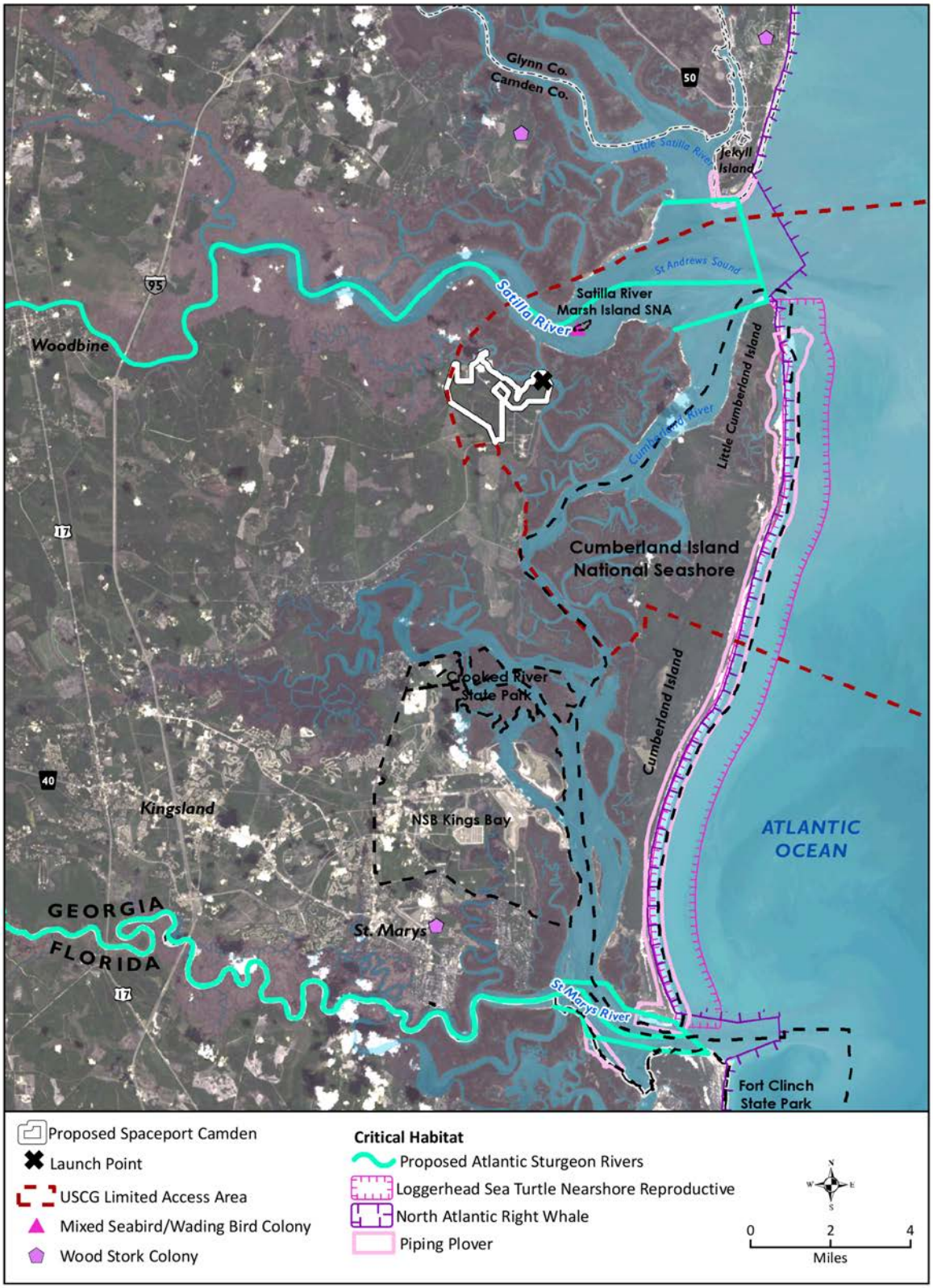


Exhibit 3.2-4. Terrestrial and Marine Species Critical Habitat
Source: (NMFS, 2016a; NMFS, 2016b; NMFS, 2014; USFWS, 2009)

- Bald eagle (*Haliaeetus leucocephalus*) – Protected by the Bald and Golden Eagle Protection Act, bald eagles typically nest in forested areas adjacent to large bodies of water, staying away from heavily developed areas when possible. Eagle nests occur within or near the construction ROI and operational ROI. Nest locations within the construction ROI, provided by GDNR, are indicated in Exhibit 3.2-2 (GDNR, 2020a) including one inactive nest within the proposed launch facility site footprint and an active nest near the Launch Control Center Complex site. An active nest also occurs on Pompey Island, approximately 0.5 mile north of the proposed launch facility site. There is another nest, located southwest of the Alternate Control Center and Visitor Center, which is outside the construction ROI (Exhibit 3.2-2) but within the operations ROI (Exhibit 3.2-3). Bald eagle nesting regularly occurs within the operational ROI, including the OEZ and portions of the composite USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*) on Cumberland Island (including Little Cumberland Island) and Jekyll Island.
- Piping plover (*Charadrius melodus*) – Federally listed as threatened in the Atlantic coast region, piping plovers have been known to occur throughout the year (July through late May) and utilize a variety of habitats, including beaches, mudflats, sandflats, and spoil islands. Piping plovers are known to occur within the operational ROI foraging along intertidal mudflats and beaches and the shorelines of streams, ephemeral ponds, lagoons, and salt marshes (Exhibit 3.2-2). Piping plover critical habitat includes portions of Cumberland Island and Jekyll Island (Exhibit 3.2-4).
- Red knot (*Calidris rufa*) – Federally listed as threatened, red knots are found within the operational ROI primarily in intertidal, marine habitats, especially near coastal inlets, estuaries, and bays. Red knots may occur on Cumberland Island and Jekyll Island (Exhibit 3.2-4).
- Wilson's plover (*Charadrius wilsonia*) – State-listed as threatened, Wilson's plovers are found within the operational ROI primarily in coastal beach habitats, including dry sand beaches, dunes, newly forming beaches, intertidal sand flats, mudflats, saltpans, and coastal lagoons (Exhibit 3.2-2). Breeding habitat in Georgia is primarily on the outer barrier island beaches, with limited nesting on dredge deposit sites. Wilson's plover may occur on Cumberland Island and Jekyll Island.
- Eastern black rail (*Laterallus jamaicensis jamaicensis*) – Federally listed as threatened and one of four subspecies of black rail, the eastern black rail is broadly distributed, living in salt and freshwater marshes in portions of the United States, Central America, and South America. Partially migratory, the eastern subspecies winters in the southern part of its breeding range. Black rails are considered very rare in Georgia with a limited number of recorded occurrences in the past century (Watts, 2016). While there are no known occurrences within the project area, the eastern black rail may occur throughout associated marshy areas.
- Southeastern pocket gopher (*Geomys pinetis*) – State-listed as threatened, pocket gophers require loose, sandy, well-drained soil for burrow construction and an abundant supply of grasses and forbs for food. Most of the known remaining populations in Georgia are found in areas where natural longleaf forest and associated groundcover remains; no suitable habitat exists within the construction ROI (CH2M Hill, 2015).
- Round-tailed muskrat (*Neofiber alleni*) – State-listed as threatened, muskrats live in shallow grassy ponds, marshes, and bogs. The easternmost Georgia occurrence record is of skulls found in barn owl pellets near Woodbine in Camden County (GDNR, 2016). No suitable habitat exists within the construction ROI (CH2M Hill, 2015).
- Sea turtles with terrestrial species status are further described in Section 3.2.3.4, *Marine Animals*.

Migratory Birds, Seabirds, and Wading Birds

Migratory birds pass through the Spaceport Camden site, and breeding neotropical migrants may be found primarily in riparian, hammock, and barrier island habitats. These areas can serve as temporary habitat for neotropical birds migrating to and from the Caribbean and South and Central America. Neotropical migrants are more common within the site during fall migration than spring migration.

The USFWS has identified certain migratory nongame bird species that are at risk of becoming candidates for listing under the ESA without additional conservation actions. The most recent listing of these "birds of conservation concern" for the ROI is from 2008 (Table 3.2-2).

As listed in Table 3.2-2, a variety of shorebirds, seabirds, and wading birds are known to occur within the operational ROI, specifically on Cumberland Island National Seashore and the Satilla River Marsh Island Natural Area (Section 3.4, *Coastal Resources*). Cumberland Island is recognized as a globally significant important bird area and is known as a sanctuary for migrating shore birds (NPS, 2020a; Audubon, 2020). Cumberland Island provides critical nesting habitat for multiple protected shorebird, wading bird, and seabird species such as least terns, herons, and egrets. Nesting season for shorebirds, wading birds, and sea birds occurs primarily between March 1 and August 31. Cumberland Island National Seashore is 1 of 18 sites along the Georgia Colonial Coast Birding Trail, where more than 300 species of birds have been observed. A total of 322 species of birds have been seen on the island, including songbirds, shorebirds, wading birds, waterfowl, and gull-like birds. Shorebirds are mostly observed on the island in the summer, winter, and spring, including piping plovers, red knots, and black skimmers (GDNR, 2020b).

The Satilla River Marsh Island is one of five sand bar islands covered under the Shorebird and Sea Bird Habitat Protection Rule (GDNR Board Rule 391-4-7-.03). Habitats on the island support breeding, feeding, and nesting areas for many bird species, including swallow-tailed kite, northern parula, seaside sparrow, saltmarsh sparrow, least terns, Wilson's plovers, American oystercatchers, black skimmers, and other shorebirds. Satilla River Marsh Island is considered one of the best waterbird nesting sites in Georgia and has the longest running brown pelican colony in Georgia (Schneider & Keyes, 2015). This colony has been active since 1990 with up to 400 nesting pairs per year.

Nonnative Animal Species

Coyotes, feral hogs, feral cats, and fire ants are nonnative animal species that are known to occur within the construction ROI (CH2M Hill, 2015).

Cumberland Island is also home to feral horses, which are considered nonnative. The NPS has conducted population surveys since 2003 that have returned counts ranging from 120 to 148 horses a year. These numbers are not considered a total count of all horses present but rather a measure of abundance. The actual number of horses on the island could be 30 to 40 more than annual survey results. The horse herd on Cumberland likely consumes between 200 to 400 tons of vegetation each year, removing up to 98 percent of it in areas they frequent. This impact can cause damage to island resources by destabilizing dunes and streambanks, selectively removing native grasses and forbs, and threatening the biodiversity of native plants and wildlife (NPS, 2018a).

3.2.3.3 Marine Vegetation and Habitats

Vegetation found in marine and estuarine waters within the ROI include algae and various grasses. EFH, including aquatic habitats such as wetlands, hardbottom areas, submerged vegetation, and rivers, where fish spawn, breed, feed, or grow to maturity, are described below.

Submerged Vegetation

Submerged vegetation refers to plant species that occur entirely under water (marine and high-salinity estuarine environments) and may be categorized as submerged aquatic vegetation (fresh/brackish environments). Submerged vegetation is a major component of productive coastal estuaries. Submerged vegetation provides sediment stabilization, primary production, detrital and nutrient production, habitat, nursery foraging grounds, and protection for many aquatic and marine species (Dawes, 1987; Wolfe et al., 1988).

Intertidal Mudflats and Sandflats

Intertidal mudflats and sandflats have characteristically different benthic community assemblages based on differences in grain size, organic content (which provides a food source for deposit feeders), and physical disturbance/sediment reworking by currents or wind waves. Intertidal mudflats occur in areas with less physical disturbance from currents or waves, are composed of fine-grained silts and clays, and are rich in organic material. These conditions allow development of diverse, abundant, and stable infaunal and epifaunal communities that provide important foraging areas in the estuary (Dame et al., 2000; Alber et al., 2005). Benthic algae colonize the mudflat surface and are also important to the estuarine food web, accounting for as much as one-half of the primary productivity within these systems (Velasquez, 2005; Alexander & Robinson, 2006; Businski, n.d.).

Essential Fish Habitat

EFH is defined as those waters and substrate necessary for fish spawning, feeding, or growth to maturity. As defined in Section 3 of the MSA, "fish" includes finfish, mollusks, crustaceans, and all other forms of marine animal and plant life, other than marine mammals and birds. Various types of communities, including diverse physical and biological features, are considered EFH. EFH communities range from naturally occurring hardbottom areas and artificial reefs to floating mats of *Sargassum* algae.

Habitat utilized by a species can change with life history stage, abundance of the species and competition from other species, and environmental variability in time and space. The type of habitat available, its attributes, and its functions are important to species productivity and societal benefits. Some potential threats to habitat include certain fishing practices, marina construction, navigation projects, dredging, alteration of freshwater input into estuaries, and runoff. The South Atlantic Fishery Management Council identified and described 36 EFH types and associated fisheries that occur within the Atlantic Ocean from North Carolina to Florida. Table 3.2-3 lists EFH and managed species in these areas. Exhibit 3.2-5 shows the EFH within the ROI.

In addition to establishing EFH, the MSA also directs the identification of habitat areas of particular concern (HAPCs). HAPCs are subsets of EFH that are rare, especially ecologically important, particularly susceptible to human-induced degradation, or located in environmentally stressed areas (50 CFR §600.815(a)(8). HAPCs typically include high-value intertidal and estuarine habitats, offshore areas of high habitat value or vertical relief, and habitats used for migration, spawning, and rearing of fish and shellfish. HAPCs that may occur in the ROI are described in Table 3.2-4 and shown in Exhibit 3.2-5. Specifically, HAPCs for shrimp and the snapper grouper complex are located within the Satilla River estuary. Other HAPCs have been identified by the South Atlantic Fishery Management Council, but they do not occur within the ROI.

3.2.3.4 Marine Animals

Marine animals include species found in both marine and estuarine environments. Additional information on marine animals is included in Appendix D, *Biological Resources*.

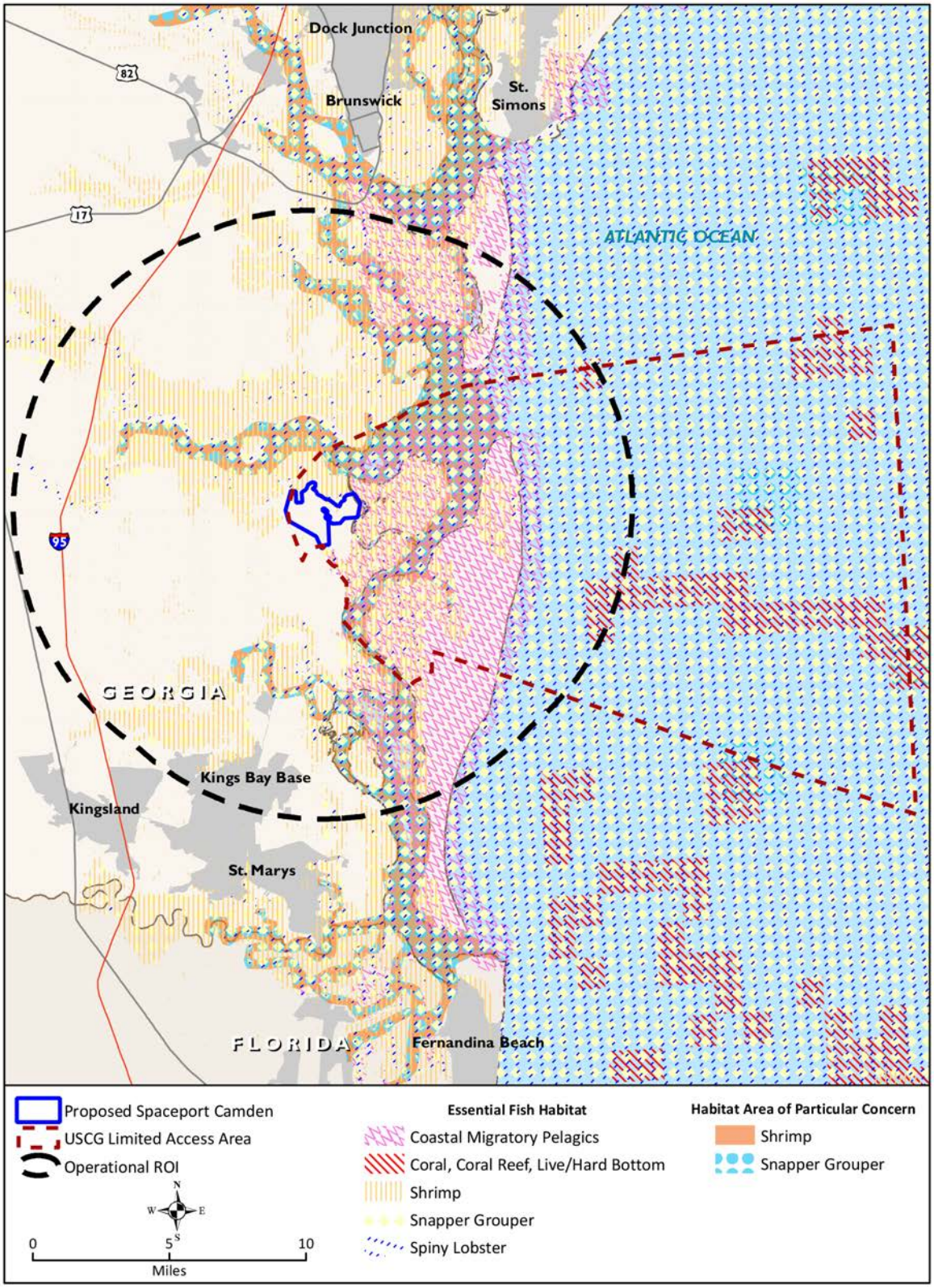


Exhibit 3.2-5. Essential Fish Habitat and Habitat Areas of Particular Concern in the Region of Influence

Table 3.2-3. Essential Fish Habitat and Associated Fishery Management Plan Identified by the South Atlantic Fishery Management Council Within the Operational ROI

Habitat Type	Associated Fishery Management Plan
Tidal freshwater (palustrine)	Shrimp
Estuarine and marine emergent wetlands (e.g., intertidal marshes)	Shrimp; snapper grouper
Tidal palustrine forested areas	Shrimp
Estuarine scrub/shrub (mangroves and mangrove fringe)	Shrimp; snapper grouper, spiny lobster
Estuarine and marine submerged vegetation	
Subtidal and intertidal nonvegetated flats	Shrimp
Oyster reefs and shell banks	Snapper grouper
Unconsolidated bottom	Snapper grouper; spiny lobster
All interconnecting water bodies as described in the Habitat Plan	Shrimp
All interconnecting water bodies as described in the Habitat Plan	
Offshore terrigenous and biogenic sand bottom habitats from 18 to 182 meters	Rock shrimp (included in Shrimp Fishery Management Plan)
Ocean high-salinity surf zones	Snapper grouper
Live/hard bottom	Snapper grouper; spiny lobster
Medium- to high-profile outcroppings on and around the shelf break one from shore to at least 600 feet (or 2,000 feet for wreckfish) where the annual water temperature range is sufficiently warm to maintain adult populations of members of this largely tropical complex	Snapper grouper
Spawning area in the water column above the adult habitat and the additional pelagic environment, including *Sargassum*	
Sandy shoals of capes and offshore bars	Coastal migratory pelagics
All State-designated nursery habitats of particular importance, including primary nursery areas and secondary nursery areas	
High-salinity bays, estuaries, and seagrass habitat	Cobia included in Coastal Migratory Pelagics Fishery Management Plan
Nearshore shelf/oceanic waters	Spiny lobster
Shallow subtidal bottom	
Rough, hard, exposed stable substrate in subtidal to outer shelf depths, subtropical temperatures (15° to 35°C), within a wide range of salinity and turbidity levels sufficiently low enough to provide algal symbionts and adequate sunlight penetration for photosynthesis	Coral
Defined hard substrate in subtidal to outer shelf depths throughout the management area	
Muddy, silty bottoms in subtidal to outer shelf depths within a wide range of salinity and light penetration	
Charleston Gyre	Dolphin wahoo
Florida Current	

Note: °C = degrees Celsius.
Source: (SAFMC, 2020a; SAFMC, 2020b)

Table 3.2-4. Habitat Areas of Particular Concern that Occur in the Region of Influence and Associated Fishery Management Plan

Habitat Areas of Particular Concern Description	Associated Fishery Management Plan
All coastal inlets, all State-designated habitats of particular importance to shrimp, State-identified overwintering areas	Shrimp
Mangrove habitat; seagrass habitat; oyster/shell habitat; all coastal inlets, all State-designated nursery habitats of particular importance to snapper grouper	Snapper grouper complex

Source: (SAFMC, 2020a; SAFMC, 2020c)

Marine Mammals

Marine mammals are species that rely on ocean environments for all or a significant portion of their life cycles. Marine mammals that occur in the ROI include whales, dolphins, porpoises (under the National Oceanic and Atmospheric Administration [NOAA] jurisdiction) and manatees (under USFWS jurisdiction). All marine mammals are protected under the MMPA and two of these species (North Atlantic right whale and West Indian manatee) are also protected under the ESA. Twenty-eight marine mammal species are present in the Atlantic Ocean waters along the southeast United States. Of those species, only five marine mammals occur within the nearshore and coastal waters that are included in the ROI for the proposed Spaceport Camden. These species are discussed below. Refer to Appendix D, *Biological Resources*, for more detailed information.

- **North Atlantic right whale (*Eubalaena glacialis*).** Federally endangered, North Atlantic right whale 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 & Hatch, 2001). 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).
- **Humpback whale (*Megaptera novaeangliae*).** The humpback whale, designated as depleted under the MMPA, may occur in the waters off Camden County from fall through spring. The probability of occurrence in the ROI is low, considering life history characteristics, historical records of sightings, and strandings of humpback whales (refer to Appendix D, *Biological Resources*, for additional information).
- **Atlantic spotted dolphin (*Stenella frontalis*).** The Atlantic spotted dolphin, protected under the MMPA, belongs to the Western North Atlantic Stock. This species may occur within the ROI, considering the habitat preferences and historical records of sightings (refer to Appendix D, *Biological Resources*, for additional information).
- **Bottlenose dolphin (*Tursiops truncatus*).** The bottlenose dolphin, protected under the MMPA, occurs in tropical and temperate waters of the Atlantic Ocean and can be found in inshore, nearshore, and offshore waters along the U.S. east coast. Based on habitat preferences and incidental sightings in the vicinity of Spaceport Camden (Foley, Paxton, et al., 2019; Foley, Waples, et al., 2019), bottlenose dolphins are expected to occur regularly within the ROI.
- **West Indian manatee (*Trichechus manatus*).** Federally threatened, West Indian manatees that occur off Spaceport Camden belong to the Florida Stock and are closely monitored and managed by the USFWS (Exhibit 3.2-2). The Florida manatee population is further broken down into four management units, and the ROI overlaps with the Atlantic Coast Management Unit.

Sea Turtles

There are five species of sea turtles which may occur within the operational ROI: the green sea turtle (*Chelonia mydas*), the hawksbill sea turtle (*Eretmochelys imbricata*), the Kemp's ridley sea turtle (*Lepidochelys kempii*), the loggerhead sea turtle (*Caretta caretta*), and the leatherback sea turtle (*Dermochelys coriacea*). The USFWS and NMFS share Federal jurisdiction for sea turtles, with the USFWS having lead responsibility on nesting beaches and NMFS in the marine environment. All sea turtle species that occur in the area are listed under the ESA as either threatened or endangered. The occurrence of the olive ridley sea turtle (*Lepidochelys olivacea*) in the project area is extralimital (outside the species' normal range). Currently, there are no olive ridley nesting beaches in the eastern United States, and there are no known feeding, breeding, or migration areas within the vicinity of Spaceport Camden.

- **Green sea turtle (*Chelonia mydas*).** Federally threatened, the green sea turtle female nesting abundance in Georgia was estimated to be five individuals between 2011 and 2012 (NOAA, 2015). Nesting data from Cumberland Island between 2010 and 2019 show green sea turtles regularly nest on these beaches with an average four nests each year over the last 10 years, including peak years occurring in 2013 with 14 nests and in 2017 with 11 nests (Seaturtle.org, 2020). Critical habitat was designated for the green sea turtle in 1998 (63 FR 46693) but does not occur within the ROI.
- **Hawksbill sea turtle (*Eretmochelys imbricata*).** The likelihood that the federally endangered hawksbill sea turtle will occur within the ROI is low, considering that Camden County, Georgia, is located north of the typical nesting range for the hawksbill turtle, and the region lacks suitable juvenile and adult habitat. Critical habitat was designated for the hawksbill sea turtle in 1998 (63 FR 46693) but does not occur in or near the ROI.
- **Kemp's ridley sea turtle (*Lepidochelys kempii*).** The federally endangered 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; NMFS, 2016c). There is a low potential in the ROI for the Kemp's ridley sea turtle, since only occasional nesting occurs in Georgia. In the last 10 years, there have only been two Kemp's ridley nests on Cumberland Island, which occurred in 2017 (Seaturtle.org, 2020).
- **Loggerhead sea turtle (*Caretta caretta*).** The federally threatened loggerhead sea turtle is known to nest 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, consistently the most sea turtle nests of any beach in Georgia. During the 2019 nesting season, 1,018 sea turtle nests were identified on the beaches of Cumberland Island (Seaturtle.org, 2020), breaking the previous record of 867 nests in 2016 (NPS, 2019a). The vast majority (1,012) were loggerhead nests (Seaturtle.org, 2020). Given the presence of both nesting and foraging habitat, loggerhead sea turtles are expected to occur regularly in the ROI.
- **Leatherback sea turtle (*Dermochelys coriacea*).** The federally endangered leatherback sea turtle occurrence in the ROI 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 ROI 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, 2020a). Over the last 10 years, there have been a total of eight leatherback sea turtle nests identified on Cumberland Island, including five nests in 2011 and one nest each in years 2012, 2015, and 2017 (Seaturtle.org, 2020).

Marine Fish

To protect marine fish resources, NMFS works with the regional fishery management councils to identify the essential habitat for every life stage of each federally managed species using the best available scientific information. EFH has been described for approximately 1,000 managed species to date. EFH includes all types of aquatic habitat including wetlands, submerged vegetation, rivers, and all locations where fish spawn, breed, feed, or grow to maturity (see the *Essential Fish Habitat* subsection). The most abundant fish species and their life stages occurring within the ROI and federally managed fisheries covered under the MSA are discussed in Appendix D, *Biological Resources*. Two federally listed fish species may occur within the ROI:

- **Atlantic sturgeon (*Acipenser oxyrinchus).*** Critical habitat for the federally endangered Atlantic sturgeon has been proposed, including in the Satilla River (82 FR 39160, August 17, 2017), which is north of Spaceport Camden (Exhibit 3.2-4).
- **Shortnose sturgeon (*Acipenser brevirostrum*).** The National Marine Fisheries Shortnose Sturgeon Recovery Plan indicates that collection efforts for sturgeon in the St. Marys and Satilla Rivers in 1994 and 1995 were not successful (NMFS, 1998); therefore, probability of occurrence within the Spaceport Camden area is low.

Marine Invertebrates

Many invertebrates represent a large and diverse group with approximately 367,000 species across 34 phyla (i.e., a level of classification or taxonomic rank used in classifying and naming organisms) described worldwide (World Register of Marine Species Editorial Board, 2015). The total number of invertebrate species in the ROI is unknown, but it is likely to be many thousands. All phyla, except Placozoa (Pearse & Voigt, 2007), are likely represented in the ROI. Example invertebrates include crabs, shrimps, clams, oysters, corals, sponges, and worms. Many of these species are important food sources to fish, birds, mammals, and other invertebrates and utilize a variety of habitats that are considered EFH, including marshes, estuaries, benthic sediments, and the water column (Section 3.2.3.3, *Marine Vegetation and Habitats*). No invertebrate species listed under the ESA are expected in the project area. Some shrimp species potentially present in the area are a federally managed fishery under the MSA. Please refer to Appendix D, *Biological Resources,* Section D.5, *Marine Invertebrates* for a more detailed discussion of marine invertebrates that may occur in the ROI. Section 3.6, *Farmlands*, provides information on aquaculture, including commercial and recreational shellfish lease areas, growing areas, and harvest areas.

3.3 Climate

3.3.1 Definition and Description

Climate describes the weather characteristics and patterns in a region over time. It is measured by assessing the patterns of variation in temperature, humidity, atmospheric pressure, wind, precipitation, atmospheric particle count, and other meteorological variables in a given region over long periods of time. Climate differs from weather, in that weather only describes the short-term conditions of these variables in a given region. The climate of a location is affected by its latitude, terrain, and altitude, as well as nearby water bodies and their currents.

GHGs are gas emissions that trap heat in the atmosphere. These emissions occur from natural processes and human activities. Scientific evidence indicates a trend of increasing global temperature over the past

century due to an increase in GHG emissions from human activities. The climate change associated with this global warming is predicted to produce negative economic and social consequences across the globe.

Research has shown there is a direct correlation between fuel combustion and GHG emissions. In terms of U.S. contributions, the General Accounting Office (GAO) reports that "domestic aviation contributes 3 percent of total carbon dioxide emissions, according to USEPA data," compared with other industrial sources, including the remainder of the transportation sector (20 percent) and power generations (41 percent). The International Civil Aviation Organization estimates that GHG emissions from aircraft account for roughly 3 percent of all anthropogenic GHG emissions globally. Climate change due to GHG emissions is a global phenomenon, so the affected environment is the global climate.

The scientific community is continuing efforts to better understand the impact of aviation emissions on the global atmosphere. FAA is leading and participating in a number of initiatives intended to clarify the role that commercial aviation plays in GHG emissions and climate. FAA, with support from the U.S. Global Change Research Program and its participating Federal agencies (e.g., NASA, NOAA, USEPA, and the Department of Energy), has developed the Aviation Climate Change Research Initiative in an effort to advance scientific understanding of regional and global climate impacts of aircraft emissions. FAA also funds the Partnership for Air Transportation Noise & Emissions Reduction (PARTNER) Center of Excellence research initiative to quantify the effect of aircraft exhaust and contrails on global and U.S. climate and atmospheric composition. Similar research topics are being examined at the international level by the International Civil Aviation Organization.

The six primary GHGs, defined in Section 202(a) of the CAA, are carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. Perfluorocarbons, sulfur hexafluoride, and nitrogen trifluoride are produced in relatively very small quantities, and most often, by very specific niche industries, such as electronic component manufacturers. Each GHG has an estimated global warming potential, which is a function of its atmospheric lifetime and its ability to absorb and radiate infrared energy emitted from the Earth's surface. The global warming potential rating system is standardized to carbon dioxide, which has a value of one. The carbon dioxide equivalent (CO_2e) rate is calculated by multiplying the emissions of each GHG by its global warming potential and adding the results together to produce a single, combined emissions rate representing all GHGs.

On June 26, 2019, the CEQ released a new *Draft National Environmental Policy Act Guidance on Consideration of Greenhouse Gas Emissions* (CEQ, 2019). On July 24, 2019, the public comment period was extended to August 26, 2019, and the guidance has yet to be made final. This guidance reinforced many of the principles outlined in the rescinded 2009 guidance. However, this guidance does not include a recommended threshold for consideration similar to the 25,000 metric tons recommended previously, and instead relies on the "rule of reason" and recommends quantification of GHG emissions as a proxy for climate change effects. As such, this document will quantify GHG emissions associated with the Proposed Action and will provide the regional air basin baseline GHG annual emissions (per the 2017 NEI) for context and comparison.

3.3.2 Regulatory Setting

The following laws, executive orders, agency regulations, and other guidance apply to the Proposed Action.

U.S. Environmental Protection Agency's *Mandatory Reporting of Greenhouse Gases Rule*

USEPA issued the Final *Mandatory Reporting of Greenhouse Gases Rule* on September 22, 2009. GHGs covered under the Final *Mandatory Reporting of Greenhouse Gases Rule* are carbon dioxide, methane, nitrogen oxide, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and other fluorinated gases including nitrogen trifluoride and hydrofluorinated ethers. GHG emissions are also regulated under PSD and Title V permitting programs, which was initiated by a USEPA rulemaking issued on June 3, 2010, known as the GHG Tailoring Rule (75 FR 31514). GHG emissions thresholds for permitting of stationary sources are an increase of 75,000 tons per year of CO_2e at existing major sources and facility-wide emissions of 100,000 tons per year of CO_2e for a new source or a modification of an existing minor source. The 100,000 tons per year of CO_2e threshold defines a major GHG source for both construction (PSD) and operating (Title V) permitting, respectively. However, on June 23, 2014, the U.S. Supreme Court issued its decision in Utility Air Regulatory Group v. USEPA (No. 12-1146). As a result of the decision, USEPA will no longer apply or enforce Federal regulatory provisions or USEPA-approved PSD SIP provisions that require a stationary source to obtain a PSD permit if GHGs are the only pollutant that the source emits or has the potential to emit above the major source thresholds, or for which there is a significant emissions increase and a significant net emissions increase from a modification (e.g., 40 CFR §52.21 (b)(49)(v)). Nor does USEPA intend to continue applying regulations that would require that states include in their SIP a requirement that such sources obtain PSD permits.

Similarly, USEPA will no longer apply or enforce Federal regulatory provisions or provisions of USEPA-approved Title V programs that require a stationary source to obtain a Title V permit solely because the source emits or has the potential to emit GHGs above the major source thresholds (e.g., the regulatory provision relating to GHG subject to regulation in 40 CFR §71.2). USEPA also does not intend to continue applying regulations that would require Title V programs submitted for approval by USEPA to require that such sources obtain Title V permits. Therefore, Spaceport Camden will not be required to obtain a Title V permit based solely upon potential to emit GHGs.

3.3.3 Existing Conditions

Camden County, Georgia, is located in the extreme southeast corner of Georgia on the Atlantic Coast and the St. Marys River, which creates the border between Georgia and Florida. From 1915 to 2014, the average annual high and low temperatures in Camden County were 78.5 and 58.6 degrees Fahrenheit (°F), respectively. The average high temperature in July is 91.8 °F and the average low in January was 42.8 °F. Annual precipitation averages 51.38 inches of rain per year with most of the rain falling during the summer months. The number of days with any measurable precipitation is 106 (University of Georgia, 2016).

The six primary GHGs, defined in Section 202(a) of the CAA, are carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride. However, perfluorocarbons, sulfur hexafluoride, and nitrogen trifluoride are produced in relatively very small quantities, and most often by very specific niche industries, such as electronic component manufacturers. It is likely that hydrofluorocarbons would be used in commercial heating, ventilation, and air conditioning systems. However, no hydrofluorocarbons are planned for intentional release. Any release of hydrofluorocarbons would be accidental, minimal, and remedied quickly (especially in the hot and humid southeast Georgia climate). Additionally, USEPA's NEI database only tracks the most abundant GHGs (carbon dioxide, nitrous oxide, and methane). Therefore, analysis will focus on these three primary GHGs represented as CO_2e based on their global warming potential. Although climate change is a global impact, the impacts from this project are also evaluated in the context of local and regional GHG emissions. Baseline GHG emissions for Camden County, obtained from USEPA's 2017 NEI, are summarized in Table 3.3-1.

Table 3.3-1. Camden County Greenhouse Gas Air Emissions Inventory (2017)

Location	GHG Emissions (tpy)			
	Carbon Dioxide	Methane	Nitrous Oxide	CO_2e
Camden County	679,292	199	12	687,708
Jacksonville-Brunswick Interstate Air Quality Control Region	48,654,573	55,534	649	50,236,387

Notes: CO_2e = carbon dioxide equivalent; GHG = greenhouse gas; tpy = tons per year.
Source: (USEPA, 2020a)

Due to Camden County's coastal location, the area is likely to be more susceptible to the potential impacts of climate change such as sea-level rise and increased frequency of extreme weather events such as hurricanes. Conversely, because this is a coastal area, some protective measures are likely to already be in place such as hurricane evacuation routes.

3.4 Coastal Resources

3.4.1 Definition and Description

The Georgia Coastal Management Program was enacted in 1998 to protect the natural, environmental, historic, archaeological, and recreational resources in Georgia's coastal zone. Georgia's coastal zone includes the counties of Chatham, Effingham, Bryan, Liberty, Long, McIntosh, Wayne, Glynn, Brantley, Camden, and Charlton. The seaward boundary of Georgia's coastal zone extends to the outer limits of State jurisdiction, which is 3 nautical miles seaward from the mean low watermark. The inland boundary of Georgia's coastal zone is the political boundaries of the 11 counties noted above. Encompassed within these boundaries are all upland areas in these 11 counties, as well as all waters of the State and all submerged lands within the defined coastal zone.

Coastal resources within the construction and operational ROIs consist of the natural, environmental, archaeological, and recreational resources specific to Camden County that overlap with the proposed construction site for the spaceport, the OEZ, and portions of USCG LAA boundaries associated with operations (described in Section 2.1.2.5, *Pre-Launch Activities*).

The Georgia Coastal Management Program does not include lands that are subject solely to the discretion of, or held in trust by, the Federal government. Lands within the ROI that are excluded from the coastal zone boundary include the Cumberland Island National Seashore and NSB Kings Bay. However, Federal agencies are required to be fully consistent with Georgia's Coastal Management Program.

3.4.2 Regulatory Setting

The following laws, executive orders, agency regulations, and other guidance apply to the Proposed Action.

Coastal Zone Management Act of 1972

The CZMA provides for the effective, beneficial use, protection, and development of the U.S. coastal zone. Under the CZMA, the term "coastal zone" is defined as coastal waters and adjacent shorelands strongly influenced by each other and in proximity to the several coastal states, including islands, transitional and intertidal areas, salt marshes, wetlands, and beaches. Camden County is 1 of the 11 coastal counties under the Georgia Coastal Management Program.

One of the programs outlined by the CZMA is the National Coastal Zone Management Program, which is a voluntary partnership among the Federal government and coastal and Great Lakes states and territories. Under this program, state governments design unique coastal zone management programs which are subsequently approved by NOAA. Once these programs have been approved, the CZMA requires that any Federal actions that could have a reasonably foreseeable impact on a state's coastal zone (even if the action occurs outside the designated coastal zone) be consistent with the approved coastal management program for that state. FAA may not issue a license, permit, or authorization to an applicant unless an applicant's proposed action meets the consistency requirements of the state's coastal management program.

Georgia Coastal Management Program

The mission of the Georgia Coastal Management Program is to balance economic development in Georgia's coastal zone with the preservation of natural, environmental, historic, archaeological, and recreational resources for the benefit of Georgia's present and future generations (GDNR, 2020c). The Georgia Coastal Management Program is based on a network of agencies implementing 33 statutes that protect and enhance the state's natural, cultural, and economic coastal resources.

The Federal permit applicant must submit a CZMA consistency determination to GDNR to ensure the Proposed Action is consistent with the Georgia Coastal Management Program (15 CFR §§930.57–930.58). The following types of Federal actions must be consistent with the statutes of the Georgia Coastal Management Program:

- **Direct Federal activities.** Activities and development projects performed by a Federal agency, or a contractor for the benefit of a Federal agency
- **Federal license or permit activities.** Activities not performed by a Federal agency, but requiring Federal permits or licenses or other forms of Federal approval
- **Outer Continental Shelf Plans.** Plans for the exploration or development of, or production from, any area which has been leased under the Outer Continental Shelf Lands Act
- **Federal financial assistance.** Financial assistance to state agencies and local governments

In its simplest form, the consistency process involves two stages: (1) a consistency determination or certification is made by a Federal agency or Federal permit applicant regarding a proposed activity that affects the coastal area, and; (2) the Coastal Resources Division makes a consistency decision (i.e., concurs with or objects to the consistency determination or certification of the Federal agency or permit applicant). The Division's role is to ensure that each relevant State permit is issued before the corresponding Federal permit is issued. The Coastal Resources Division does not usurp the authority of any other State agency; rather, the Division provides the necessary coordination to review Federal activities in the coastal area.

Part of the necessary data and information required to complete the State's review is the issuance of any applicable State licenses or permits. Enforceable statutes that may require a permit/license include: Air Quality Act, Coastal Marshlands Protection Act, Comprehensive Solid Waste Management Act, Erosion and Sedimentation Control Act (including buffer variances where applicable), Groundwater Use Act, Hazardous Waste Management Act, Programmatic General Permits for docks, Revocable License Program, Septic Tank Law, Shore Protection Act, Surface Mining Act, Underground Storage Tank Act, Water Quality Control Act, and Water Wells Standards Act. GDNR has 6 months to review the consistency determination (16 CFR §930.62), then either concur with or object to the determination that the Proposed Action is consistent with the Georgia Coastal Management Program.

Coastal Marshlands Protection Act

The Coastal Marshlands Protection Act provides the GDNR Coastal Resources Division with the authority to protect and regulate activities within marshland, intertidal area, mudflats, tidal water bottoms, and salt marsh area within estuarine areas of the state.

Coastal Barrier Resources Act of 1982

The Coastal Barrier Resources Act designated relatively undeveloped coastal barriers along the Atlantic and Gulf coasts as part of the John H. Chafee Coastal Barrier Resources System and made these areas ineligible for most new Federal expenditures and financial assistance. In the 1970s and 1980s, Congress recognized that certain Federal actions and programs had historically subsidized and encouraged development on coastal barriers, resulting in the loss of natural resources; threats to human life, health, and property; and the expenditure of millions of tax dollars each year. This law removed the Federal incentive to develop these areas and encourages the conservation of hurricane-prone, biologically rich coastal barriers by restricting Federal expenditures that encourage development. Since this law only applies to Federal actions or those involving Federal funds, it does not apply to this Proposed Action and is not further addressed in this EIS.

EO 13158, Marine Protected Areas

Marine protected areas (MPAs) are broadly defined as areas of the ocean that are established for the protection of natural or cultural resources (NOAA, 2016). There are currently over 1,600 total MPAs designated in U.S. waters in habitats ranging from open ocean environments to estuaries. Examples include national marine sanctuaries, national seashores, and national wildlife refuges, among many others. While some activities are restricted within MPAs, most allow certain types of use. Two MPAs exist within the ROI, the Satilla River Marsh Island Natural Area and Cumberland Island National Seashore (NOAA, 2020).

3.4.3 Existing Conditions

Existing conditions of coastal resource areas are described in the following sections of this EIS: Section 3.1, *Biological Resources*; Section 3.8, *Historical, Architectural, Archaeological, and Cultural Resources*; Section 3.9, *Land Use*; and Section 3.14, *Water Resources*. Background information collected on the existing site includes, but is not limited to, the following:

- Results of previous onsite characterization studies
- Information or issues of concern to coastal resources identified during public scoping meetings, including response letters from the USFWS, NMFS, NPS, and GDNR
- Archaeological survey results
- Wetland survey results

Cumberland Island National Seashore was identified in the EIS scoping meetings as a main area of concern within the coastal zone from operational activities at the spaceport (Austin, 2015). Cumberland Island contains 9,886 acres of designated wilderness and 10,500 acres of potential wilderness (Public Law 108-447, Cumberland Island Wilderness Boundary Adjustment Act of 2004). Public comments expressed concern from noise, vibration, and potential debris occurring during launch operations over the island.

3.4.3.1 Satilla River Marsh Island Natural Area

The Satilla River Marsh Island Natural Area is managed by GDNR and has a total area of 0.18 square kilometer. Historically, the river was part of a transportation and subsistence network for the Creek Indian Nation. The designated natural area occurs at the mouth of the Satilla River, within the estuary. The tidal influence of the Satilla River estuary extends approximately 106 kilometers upstream. Vegetation along the estuary correlates with the highly variable salinity regime of the area, consisting of salt marshes closest to the mouth, brackish marshes in the middle of the estuary, and freshwater marshes farthest upstream (Alber et al., 2003). Rush plant communities are found in areas of higher elevation near upland vegetation as well as in areas that border salt, brackish, and fresh marsh. Broad distributions of tidal marsh vegetation are driven by salinity, but local plant communities are dynamic with frequently changing borders (Alber et al., 2003). Designated HAPC for shrimp (a subset of EFH) also occurs around the Satilla River Marsh Island Natural Area (Exhibit 3.2-5), but this area is not directly adjacent to the proposed construction footprint for the spaceport.

In 1998, the Satilla River Marsh Island was also covered under the Shorebird and Sea Bird Habitat Protection Rule (GDNR Board Rule 391-4-7-.03) also known as the Bird Island Rule, which protects seabird and shorebird nesting and roosting at this and other sand bar islands. This island provides one of the best waterbird nesting sites in Georgia. Species that nest there include the longest running brown pelican colony in Georgia, as well as gull-billed tern, sandwich tern, least tern, royal tern, American oystercatcher, black skimmer, and Wilson's plover. The island is also heavily utilized by migratory birds during migration stopover and in the winter (Schneider & Keyes, 2015).

3.4.3.2 Cumberland Island National Seashore

Cumberland Island National Seashore was created by Congress in 1972 (Public Law 92-536, codified at 16 U.S.C. §§459i et seq. "to provide for public outdoor recreation use and enjoyment of certain significant shoreline lands and waters of the United States and to preserve related scenic, scientific, and historical values." Cumberland Island is the southernmost sea island off the coast of Georgia and is separated from the mainland by the Cumberland River (which is part of the Intracoastal Waterway) (NPS, 2014a). Cumberland Island is approximately 17.5 miles long and has a width ranging from 0.5 mile to 3 miles. The north end of Cumberland Island is the widest with the western edge bordering the Intracoastal Waterway, approximately 4 miles due east of the proposed spaceport site and the beach side of Cumberland Island about 7 miles from the spaceport. The south end of Cumberland Island is across from NSB Kings Bay and the city of St. Marys, with the western shoreline of the island approximately 1.5 to 2 miles due east of the base and the city, respectively, and the beach side about 2.5 miles due east. The barrier island has more than 16,500 acres of coastal wetlands, and there are more than 2,500 acres of freshwater wetlands that range from permanent and semi-permanent ponds to seasonal wetland areas, including emergent, scrub/shrub, and forested palustrine areas (NPS, 2017a). Included in the coastal wetlands are 9,341 acres of salt marsh, which occur primarily on the western side of the island. Tidal creeks also flow through areas of grasses within the salt marsh (NPS, 2018b). Maritime forests, consisting of dense collections of live oak trees, occur on Cumberland Island and act as a stabilizing force for the shoreline. These maritime forests are surrounded by dunes on one side and salt marsh on the other (NPS, 2018c).

In accordance with NPS policy (Director's Order #18: Wildland Fire Management), Cumberland Island National Seashore is required to have an approved Fire Management Plan. The Fire Management Plan serves as a detailed and comprehensive plan of action to implement fire management policy, principles, and goals, including regular planned burns ("prescribed fire") on Cumberland Island and managing unplanned ignitions (e.g., fires caused by lightning strikes or other sources) in accordance with the park's fire management objectives. The complete park, including Little Cumberland Island, is arranged into three Fire Management Units (FMUs): Natural (FMU 1), Historic (FMU 2), and Little Cumberland Island (FMU 3)

(see Exhibit 3.5-1). The Natural Zone (FMU 1) includes all of the wilderness areas of the park that are within the planned trajectory of the spaceport. The northernmost division of FMU 2 and Little Cumberland Island Zone (FMU 3) is also within the planned trajectory of the spaceport.

Thirty species of mammals are found on Cumberland Island, including white-tailed deer, bobcat, opossum, raccoon, otter, mink, armadillo, bat, mole, shrew, squirrel, and several species of rats and mice (NPS, 2017a; NPS, 2020b; NPS, 2014a). Feral animals include horses and swine. Coyotes appeared on the island circa 2003 (NPS, 2017a). Dolphins, manatees, and several species of whales occur in offshore waters (NPS, 2017a). More than 300 bird species, including full-time residents, nesters, and winter migrants, have been documented on Cumberland Island National Seashore, which offers important habitat to winter migratory shore and wading birds (NPS, 2017a; NPS, 2020b). The 2012 mid-winter shorebird survey tallied 30,958 birds and 37 species (NPS, 2017a). The beach and associated dunes provide nesting habitat in the spring/summer months to American oystercatchers, least terns, Wilson's plovers, and willets (NPS, 2017a).

In 2017, the Western Hemisphere Shorebird Reserve Network designated approximately 79,000 acres (32,257 hectares) of Georgia's barrier islands, including Cumberland Island National Seashore and Little Cumberland Island, as a Landscape of Hemispheric Importance for shorebirds. The Georgia Barrier Islands Western Hemisphere Shorebird Reserve Network Landscape was designated due to holding more than 30 percent of the biogeographic population of red knots and the Great Lakes breeding population of piping plover. The area also holds more than 10 percent of biogeographic populations of American oystercatcher, short-billed dowitcher, and black-bellied plover. Habitats of importance to shorebirds that are found on these barrier islands include beaches and dunes, offshore sand bars, extensive sand and mud flats, natural inlets, and extensive salt marsh (WHSRN, 2020). Additionally, 1 of the 18 sites along Georgia's Colonial Coast Birding Trail is located at the southern end of the Cumberland Island National Seashore (GDNR, 2020b).

3.5 Department of Transportation Act, Section 4(f)

This section provides impact analyses for resources under Section 4(f) of the U.S. Department of Transportation Act.

3.5.1 Definition and Description

Section 4(f) refers to the original section within the U.S. Department of Transportation Act of 1966, which established the requirement for consideration of park and recreational lands, wildlife and waterfowl refuges, and historic sites in transportation project development. Properties eligible for protection under Section 4(f) include the following:

- Parks and recreational areas of national, state, or local significance that are both publicly owned and open to the public
- Publicly owned wildlife and waterfowl refuges of national, state, or local significance that are open to the public to the extent that public access does not interfere with the primary purpose of the refuge
- Historic sites of national, state, or local significance in public or private ownership regardless of whether they are open to the public (see 23 U.S.C. §138(a) and 49 U.S.C. §303(a))

Section 4(f) applies to projects that require approval by an agency of the U.S. Department of Transportation (DOT), including FAA.

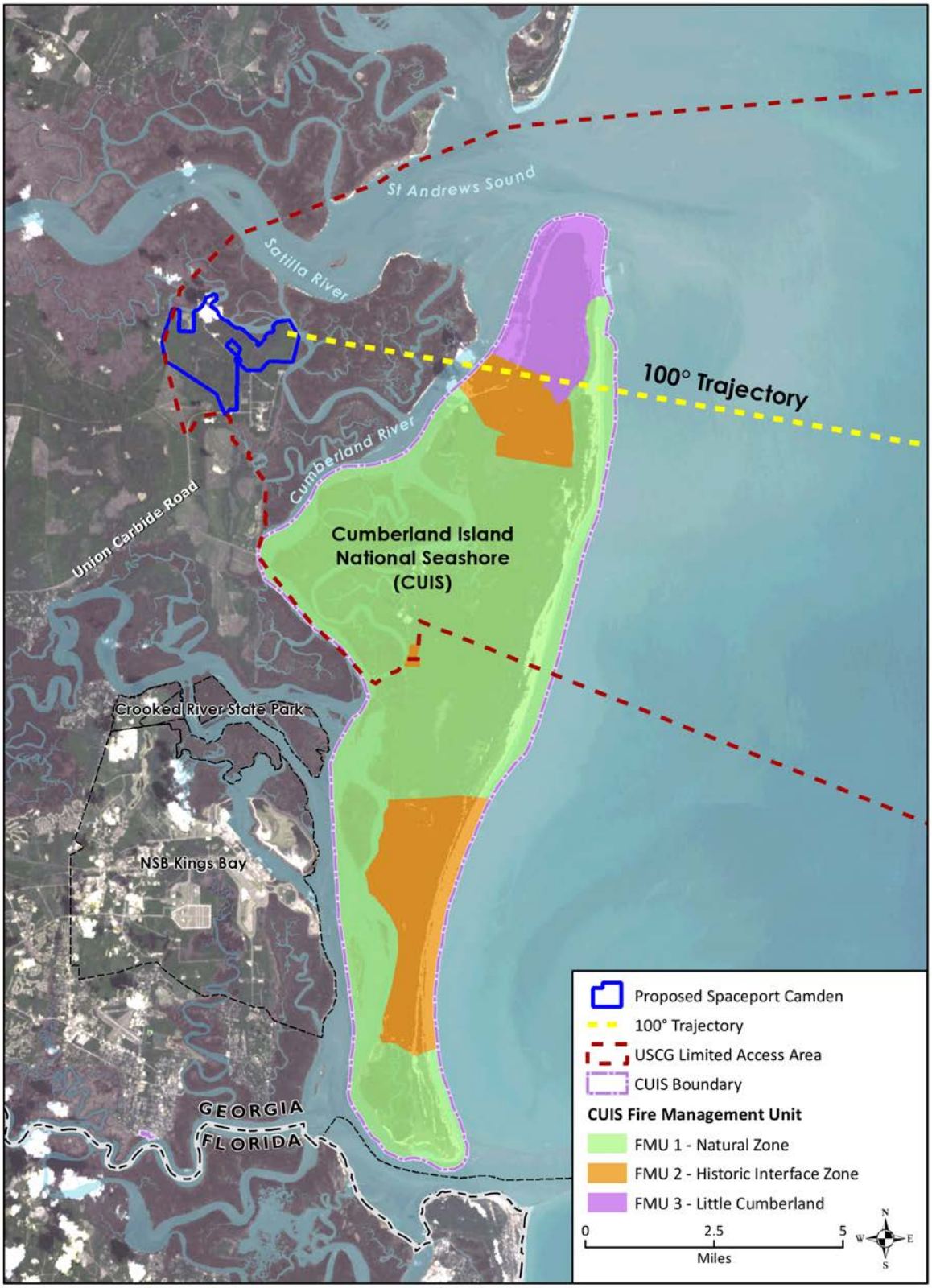


Exhibit 3.5-1. Cumberland Island National Seashore Fire Management Units (FMUs)
Source: (NPS, 2015)

3.5.2 Regulatory Setting

The regulation known as Section 4(f) was originally established in the U.S. Department of Transportation Act of 1966 (49 U.S.C. §1653(f) and later recodified as 49 U.S.C. §303. In 2005, Congress enacted legislation that required the DOT to issue additional regulations that clarify Section 4(f) standards and procedures (DOT, 2012). These new regulations were finalized in March 2008 (23 CFR Part 774). Section 4(f) mandates that the Secretary of Transportation will not approve any transportation project requiring the use of publicly owned parks, recreation areas, wildlife and waterfowl refuges, or significant historic sites, regardless of ownership, unless the following conditions apply.

- There is no prudent and feasible alternative to using that land.
- The program or project includes all possible planning to minimize harm to the public park, recreation area, wildlife or waterfowl refuge, or significant site, resulting from that use.

To be protected under Section 4(f), public parks, recreation facilities, and wildlife or waterfowl refuges must be considered *significant* (DOT, 2012). Pursuant to 23 CFR §771.135(c), Section 4(f) resources are presumed to be significant unless the official having jurisdiction over the site concludes that the entire site is not significant. Historic sites qualifying for Section 4(f) protection must be officially listed on or eligible for inclusion on the NRHP, or contribute to a historic district that is eligible for or listed on the NRHP. Archeological sites qualifying for Section 4(f) protection must be officially listed on or eligible for the NRHP and warrant preservation in place. Section 4(f) does not typically apply if the archeological resource is important chiefly because of what can be learned by data recovery.

A *use* of properties protected under Section 4(f) occurs under either of the following conditions (23 CFR §771.135(p)).

- Land from a qualifying Section 4(f) property is acquired and permanently incorporated into a transportation facility.
- There is a temporary occupancy of Section 4(f) land during construction of the transportation facility that is considered adverse to the preservationist purposes of the Section 4(f) statute.

In addition, a *constructive use* could occur when no land is acquired from a Section 4(f) property, but the proximity of the project results in indirect impacts that would substantially impair the current use of the property, such as visual, noise, or vibration impacts or impairment of property access.

The regulations require coordination with the official(s) having jurisdiction over affected Section 4(f) properties for a number of situations, including (but not limited to) determining if a property is significant, for determining *constructive use*, for evaluating the reasonableness of measures to minimize harm, and prior to making approvals. FAA has coordinated with officials with jurisdiction over the Section 4(f) properties identified in Section 3.5.3, *Existing Conditions*.

3.5.3 Existing Conditions

Region of Influence

The ROI for historic sites eligible for protection under Section 4(f) corresponds to the APE for historical, architectural, archaeological, and cultural resources as defined in Section 3.8, *Historical, Architectural, Archaeological, and Cultural Resources*. To adequately capture all publicly owned parks, recreation areas, or wildlife and waterfowl refuges potentially eligible for protection under Section 4(f), a conservative ROI

was developed.[21] Section 4(f) properties may experience impacts amounting to use through three primary mechanisms, each of which was considered in the development of the ROI:

- The ROI for Section 4(f) includes the 11,800-acre footprint of the proposed Spaceport Camden site where *permanent incorporation* could result for any eligible Section 4(f) properties, if located in the area.
- Areas of *temporary occupancy* (e.g., temporary construction access roads or material staging areas outside of the project site) were considered for the development of the Section 4(f) ROI; however, no areas outside the fence line for the Spaceport Camden site would be occupied during construction.
- The ROI includes a wider area where proximity-related impacts may result in a substantial impairment of the activities, attributes, or features of a Section 4(f) property, also known as *constructive use*. Because the proximity-related impacts are the farthest reaching, an ROI developed to cover potential constructive use would also cover areas where permanent incorporation and temporary occupancy could occur.

To include a full range of possible proximity impacts that may impair Section 4(f) properties and potentially result in constructive use, the ROI includes areas where noise impacts from construction activities, facility operations, and launch activities would occur. It also includes USCG LAAs where public access would be limited.

FAA Order 1050.1F states, in most locations, a significant noise impact would occur if the Proposed Action would cause noise-sensitive areas to experience a 1.5 dB day-night average sound level (DNL) increase when compared to the No Action Alternative during the same time frame and the end-state noise level would be at or above 65 dB DNL. This threshold applies to A-weighted decibel levels (dBA), which emphasize frequencies heard best by humans. Although this threshold is commonly used to evaluate noise impacts, it is not used to develop the Section 4(f) ROI in this EIS for two primary reasons. First, as noted in FAA Order 1050.1F, the 65 dBA DNL threshold does not fully address the effects of noise on visitors to areas such as national parks or wildlife refuges where a quiet setting is a recognized attribute and purpose of the area. Additionally, and as described in Section 3.11.1, *Noise and Noise-Compatible Land Use, Definition and Description*, of this EIS, DNL is a day-night average sound level that is typically used to evaluate noise impacts from regularly occurring transportation sources such a railroads, highways, and airports.

For these reasons, the Section 4(f) ROI was developed using a maximum A-weighted noise level (or $L_{A,max}$) to evaluate the short-duration, high-intensity nature of launch noise from Spaceport Camden. While DNL is a cumulative noise metric that typically expresses values as the average level over a 24-hour day. $L_{A,max}$ represents the maximum sound level achieved over the duration of the event. A composite of 65 dBA $L_{A,max}$ noise contours under the 100-degree trajectory was modelled and used to delineate the Section 4(f) ROI.

For this EIS, the County has identified their proposed representative launch vehicle as a small launch vehicle; a two-stage, liquid-fueled launch vehicle, with approximately 18,500 pounds of thrust at lift-off, carrying a small (100 to 300 pound) payload to low Earth orbit. The representative launch vehicle is anticipated to be between 40 to 60 feet tall. Because the maximum sound level generated by a launch vehicle is related to the thrust generated by the vehicle, and because the representative launch vehicle analyzed in the Final EIS would generate significantly less thrust than that of a medium-large launch

[21] The approach to developing the ROI for Section 4(f) as described in this EIS is specific to and unique for the Spaceport Camden EIS and does not represent a new standard approach that will be implemented by the FAA Office of Commercial Space Transportation on future reviews of spaceport facilities or launch activities.

vehicle (as analyzed in the previous Draft EIS), the 65 dBA $L_{A,max}$ noise contours associated with launch activities in this Review Draft EIS are significantly smaller than those used to determine the ROI for Section 4(f) properties in the Draft EIS.

The 65 dBA $L_{A,max}$ contour represents the geographic extent that noise from launches under the 100-degree trajectory considered in this EIS would result in a maximum noise level of 65 dBA or greater. The level of 65 dBA was chosen based on a review of outdoor speech interference data presented in *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* (USEPA, 1974). Using outdoor speech interference as a proxy for potential Section 4(f) impairment and delineating the limits of the ROI on a contour representing the extent of 65 dBA $L_{A,max}$ noise, therefore, corresponds to an area where noise impacts may affect the most sensitive of Section 4(f) properties. This represents a conservative ROI from which to identify and screen potential Section 4(f) use.

Screening Process

As a first step in the Section 4(f) screening used in the Draft EIS, FAA conducted an initial screening of the ROI to identify all properties eligible for protection under Section 4(f) that have the potential to be affected by the Proposed Action. Each property was evaluated to determine if it is publicly owned; is open and accessible to the public; has the major or primary purpose for park, recreation, or refuge activities; and is *significant* as a park, recreation area, or refuge. FAA identified over 50 properties eligible for protection under Section 4(f) for the Draft EIS.

None of the properties identified in the ROI would experience use through *permanent incorporation* or *temporary occupancy*, and the only possible Section 4(f) use of the properties would be *constructive use*. *Constructive use* may occur if a project's proximity impacts are so severe as to substantially impair the activities, features, or attributes that qualify a property for protection under Section 4(f). In general, *constructive use* may include impacts such as noise, access limitations, vibration, ecological intrusions, and visual impacts. The primary mechanism by which the Proposed Action could result in *constructive use* are noise impacts from launch activities. *Constructive use* may also occur from visual impacts should the proximity of the Proposed Action substantially impair the aesthetic features or attributes of the properties where those features are considered contributing elements of the property. Additional screening criteria were applied to the properties to determine if they required more detailed consideration under Section 4(f) to identify potential *constructive use* as a result of proximity impacts, including noise and visual impacts, or if they could be dismissed from further consideration.

To rise to the level of *constructive use*, a noise impact must substantially impair the activities, features, or attributes that qualify the property for protection under Section 4(f). For noise impacts to result in substantial impairment, a lack of noise must be a recognized attribute of the property. The Draft EIS identified eight properties in the ROI where serenity and quiet are significant attributes of the property and which may be sensitive to new sources of noise. The other properties eligible for Section 4(f) protection were dismissed from detailed consideration in the Draft EIS because a certain level of noise is an inherent and pre-existing attribute of the property or because already existing noise exposure from outside sources was identified during the screening. In these cases, the launch noise from the Proposed Action or alternatives in the Draft EIS would not substantially impair the Section 4(f) property and further evaluation for the potential of *constructive use* due to launch noise is not necessary.

To rise to the level of *constructive use*, a visual impact must substantially impair an aesthetic feature or attribute of a property protected by Section 4(f) where that feature or attribute is considered an important element contributing to the value of the property. The properties described in this section are ones for which a relatively natural or undeveloped viewshed may be part of the property's setting.

The screening process used in the Draft EIS identified eight parks and recreational areas that are both eligible for Section 4(f) protection and which have been considered in detail for the potential for *constructive use* resulting from the Proposed Action. These included Cumberland Island National Seashore, Jekyll Island State Park, Crooked River State Park, Harriet's Bluff Community Park, Coastal Georgia Greenway, Blythe Island County Park, Fort Clinch State Park, and Egan's Creek Greenway.

As described previously, the Final EIS analyzes smaller representative launch vehicles that result in a smaller 65 dBA $L_{A,max}$ contour and a smaller ROI. Of the eight areas eligible for Section 4(f) protection in the Draft EIS, four are found in the revised ROI for the Final EIS. These include Cumberland Island National Seashore, Jekyll Island State Park, Crooked River State Park, and Harriet's Bluff Community Park. These properties are described below.

Cumberland Island National Seashore

The Cumberland Island National Seashore is located on the largest and southernmost of Georgia's barrier islands. Cumberland Island, where the park is located, is located about 2 miles east of St. Marys, Georgia, and is only accessible by boat. The island is over 17 miles long measured from north to south and totals 36,415 acres in size (NPS, 2014b). Cumberland Island National Seashore is managed by the NPS and is located approximately 2 miles southeast of the proposed Spaceport Camden site at its closest point. Cumberland Island National Seashore was included in the National Park System because of its unique historical, natural, and cultural resources. It was established on October 23, 1972. The establishing legislation, Public Law 92-536, states that the purpose of the park is "to provide for public outdoor recreation use and enjoyment of certain significant shoreline lands and waters of the United States, and to preserve related scenic, scientific, and historical values…"

Cumberland Island National Seashore contains over 50 miles of trails and roads as well as 18 miles of beach and it also includes over 9,800 acres of congressionally designated Wilderness. Human-dominated habitats including isolated residences and historical landscapes make up a small percentage of the island's area. NPS-operated and maintained facilities on the island include the Sea Camp Ranger Station, Ice House Museum, Dungeness Ruins, five campgrounds, the remains of Robert Stafford's plantation and cemetery, Plum Orchard Mansion, Cumberland Wharf, the Settlement, and First African Baptist Church.

Activities that take place in Cumberland Island National Seashore include camping, hiking, biking, birdwatching, and beachcombing. In general, the park provides outdoor recreational opportunities in an uncrowded and undeveloped environment and offers the opportunity to experience outdoor solitude and natural soundscapes for visitors.

The park's general management plan limits visitation to approximately 300 people per day (NPS, 2014b) and in 2016, approximately 61,897 people visited the island (Wright, 2017). Except for December 25, the park is open year-round. An NPS concessioner provides year-round ferry service for visitors to the Cumberland Island National Seashore; however, ferry service to Cumberland Island National Seashore from December 1 to February 28 is limited to only 5 days per week with no service on Tuesdays and Wednesdays. In addition to the concessioner ferry, private operators carry island residents, their vehicles, and/or guests to the island, which includes a network of public roads. Two airstrips are found on the island, including the Stafford Airstrip and Candler Airstrip. Generally, one flight per day of single engine, fixed-wing aircraft takes place at the Stafford Airstrip.

Jekyll Island State Park

Jekyll Island State Park, owned by the State of Georgia and managed by the Jekyll Island State Park Authority, is located within Glynn County, Georgia, on a barrier island located off the southeastern coast of Georgia. At its closest point, Jekyll Island is located approximately 6 miles northeast of the proposed Spaceport Camden site. It is approximately 5,700 acres in size and measures about 7 miles long by

1.5 miles wide. The park has 8 miles of wide, flat beaches on its east shore with sand packed hard enough for easy walking or biking and approximately 20 miles of hiking trails. It also hosts a residential community, 10 hotels, rental cottages and several recreational opportunities and businesses including golf courses, a tennis center, miniature golf and bike rentals, an oceanfront soccer complex, a convention center, a waterpark, campground, and restaurants. The island also hosts a youth learning facility, with a focus on environmental education, called Camp Jekyll. The island is also the home to approximately 1,000 private residences and 75 commercial businesses, including hotels, restaurants, variety stores, a marina, real estate managers, and private tour operators.

The island itself is open all year round, at all times of the day. According to the Jekyll Island *FY2021 Strategic Update*, the annual traffic count on the island in Fiscal Year 2019 was 1,239,079 (Jekyll Island Authority, 2020). Common activities in the park include golf, tennis, fishing, camping, cycling, birdwatching, walking and hiking, and water-based recreation. The island hosts a variety of organized events including weddings, ceremonies, races, festivals, and conventions. Environmental education, research, environmental conservation, and historic preservation activities also take place on the island through various programs including the Georgia Sea Turtle Center, an in-house Conservation Department, the Jekyll Island Museum, and the Jekyll Island National Historic Landmark District (Carswell, 2017).

Serenity and quiet is an important attribute in Jekyll Island's multi-use trail system, historic sites, and natural areas. In other parts of the park, visitors may experience noise related to cars, recreational vehicles, landscaping, construction, music festivals, fireworks, and propeller aircraft and helicopters using the airstrip at the northwestern side of the island (Carswell, 2017).

Crooked River State Park

Crooked River State Park is a publicly owned park located in Camden County on southern tip of Georgia's Colonial Coast at the north end of NSB Kings Bay and is managed by Georgia State Parks. At approximately 500 acres, it contains a bait and tackle shop, 11 cottages, 63 campsites, a campground, 4 picnic shelters, 2 group shelters, a boat ramp and dock, a nature center, and a playground. There are also approximately 4 miles of nature trails and a mini golf course within its boundaries. The park is located approximately 7 miles southwest of the proposed Spaceport Camden site and 11 miles from I-95, which draws travelers to the park during their north/south migration (GDNR, 2020d). The park is utilized for camping, birdwatching, boating, hiking, fishing, and biking. Water access from the park includes both motorized and non-motorized boats and river tours depart from the park. The park is accessible year round and overnight to campers. Access for day visitors closes at 10:00 p.m. nightly.

Harriett's Bluff Community Park

Harriett's Bluff Community Park is located in Camden County along Harriett's Bluff Road, approximately 7 miles southwest of the proposed Spaceport Camden site. Consisting of 21 acres, the park offers a screened pavilion with full kitchen facilities, picnic tables, basketball court, tennis court, a nature trail, and restrooms. The park is open every day of the year, from dawn to dusk and primary uses of the park include family gatherings and parties, walking trail usage, playground usage, tennis, and basketball. Approximately 4,000 to 5,000 people visit the park each year (Brunson, 2017).

3.6 Farmlands

3.6.1 Definition and Description

Farmlands include prime farmlands, unique farmlands, and any ongoing farming areas, including pasturelands, croplands, and forests. Farmlands are defined as those agricultural areas considered important and protected by Federal, State, and local regulations. Important farmlands include all

pasturelands, croplands, and forests (even if zoned for development) considered to be prime, unique, or of statewide or local importance.

The *prime farmlands* classification is defined as those having the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and must also be zoned (or available) for these uses. In addition, prime farmland is defined by a combination of characteristics from the soil quality, growing season, and moisture supply that can produce economically sustained high yields of crops when treated and managed according to acceptable farming methods. It requires an adequate and dependable water supply from precipitation or irrigation, favorable temperature, and soils with acceptable acidity or alkalinity, acceptable salt and sodium content, few or no rocks, and permeable to water and air. The U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) data shows that prime farmland is not excessively erodible or saturated with water for a long period and does not flood frequently or is protected from flooding (USDA NRCS, 2017).

The *unique farmlands* classification is used for those producing specific high-value food and fiber crops. Unique farmlands require a special combination of soil quality, location, growing season, and moisture supply needed to produce economically sustained high quality and/or high yields of a specific crop when treated and managed according to acceptable farming methods (USDA NRCS, 2017).

Other agricultural areas that produce food, feed, forage, fiber, and oilseed crops are of local or statewide importance. This classification can include pasturelands, croplands, and forests. Typically, these areas are adjacent to prime or unique farmlands and/or designated, zoned, or protected by State or local agencies (e.g., land use zoning for agricultural or farmland type land uses) (Department of Energy, 1980).

Although not considered prime farmlands under the regulatory classification as described above, for the purposes of analysis, aquaculture is considered a type of farmland within the context of this EIS. Aquaculture is defined as the farming of marine or freshwater organisms (finfish, reptiles, mollusks, and crustaceans), especially food fish or shellfish, at a medium to industrial scale (AgMRC, n.d.). Important aquaculture areas include all state and local areas designated for aquaculture purposes and permitted sites for commercial and recreational aquaculture uses.

3.6.2 Regulatory Setting

The following laws, executive orders, agency regulations, and other guidance apply.

Farmland Protection Policy Act of 1981

The purpose of the Farmland Protection Policy Act of 1981 (Public Law 97-98, §§1539–1549; 7 U.S.C. §§4201 et seq.) is to minimize impacts from Federal programs by preventing avoidable and irreversible change in farmland land uses to nonagricultural uses. It ensures that Federal programs are implemented while being compatible with State, local government, and private programs and policies to protect farmland (USDA, 2017a).

There is a farmland conversion impact rating (Form AD-1006) to evaluate the degree of impact and determine if consultation with the NRCS is required for this resource. The Proposed Action does not recommend a change in land use; therefore, no consultation is needed.

CEQ Memorandum on the Analysis of Impacts on Prime or Unique Agricultural Lands

The CEQ memorandum provides guidance on the identification and impact analysis of prime or unique farmlands from Federal programs.

National Aquaculture Act of 1980

The purpose of the National Aquaculture Act of 1980 (Public Law 96-362, as amended) is to establish a policy and development plan at the national level specific to aquaculture, coordinate Federal agencies, and promote the development of aquaculture within the United States (USLegal, n.d.).

2019 State of Georgia Code, Title 27 Game and Fish, Chapter 4 Fish

The State of Georgia approved their latest legislation in May 2019. This includes regulations for aquaculture (Georgia Code §27-4 [Fish]), mostly focusing on assigning the responsibility roles of GDNR and the Board of Natural Resources. GDNR is responsible for the designations, monitoring, and leasing of areas for growing and harvesting molluscan shellfish and other game fishing and hunting. These regulations provide a general outline on how to manage aquaculture resources in the state of Georgia.

Other State and Local Regulations

Other applicable State and local regulations include Camden County's zoning code (existing land use), proposed land use, and their comprehensive planning vision and guidelines related to farmlands.

Additionally, the GDNR Coastal Resources Division is currently working on a management plan for aquaculture resources, estimated to be completed before the end of 2020 (Guadagnoli, 2020).

3.6.3 Existing Conditions

The ROI for farmlands is identified by two areas:

- **Construction ROI.** The construction ROI includes land that may be directly affected by construction and site specific operation within the proposed Spaceport Camden site boundary, as shown in Exhibit 2.1-2.
- **Operational ROI.** The operational ROI includes the land that may be indirectly affected by the proposed launch trajectory, the proposed access-controlled areas, and the composite USCG LAA, as shown in Exhibit 2.1-10.

Prime and Unique Farmland

The Soil Survey Geographic database for Camden County was used to identify prime and unique farmlands. There are no prime or unique farmlands within the construction or operational ROI. The closest location of prime or unique farmlands is approximately 5 miles west of the western boundary of the Spaceport Camden site. Refer to Exhibit 3.6-1 to see the prime and unique farmland.

Statewide and Locally Important Farmland

Statewide and locally important farmlands were identified using the Camden County zoning code, proposed land use, and visual inspection of aerial imagery (Exhibit 3.6-1).

There are no farmlands located within the construction ROI. The Camden County zoning code and proposed land use identifies the Spaceport Camden site as general industrial land use. General industrial uses can include supporting forestry activities and post-crop harvesting but not forestry and logging (Camden County, 2016). Currently, there are no agreements for either supporting forestry activities or post-crop harvesting within the construction ROI (Camden County, 2016). The last known timber-harvesting type use of this area was as a tree farm in the 1940s to 1960s (CH2M Hill, 2015). This and other similar previous uses have characterized the land, and a majority of the surrounding areas, as planted rows of trees. Based on the Camden County zoning code and proposed land use, there are no farmlands within the operational ROI. This area is primarily zoned for conservation uses, and a parcel to

the southwest, north of Union Carbide Road, is zoned as planned development. The closest farmland land use is an area designated as agriculture forestry, approximately 1 mile west-southwest of the western spaceport site boundary. This is outside the construction and operational ROIs. See Section 3.9, *Land Use*, for additional detail on land use.

Visual analysis of aerial imagery can be misleading for areas within and around the construction and operational ROIs because of the historical use of the land for tree planting and timber harvesting (CH2M Hill, 2015). Aerial imagery shows that areas within both the site-specific and operational ROIs have trees planted in rows. The construction ROI has the potential for timber harvesting. The operational ROI is mostly composed of marshlands and wetlands, which are not conducive to timber harvesting. The exception is the parcel owned by Big Pasture LLC, bordered by the spaceport site and the roads proposed for limited access (by using access control checkpoints as shown in Exhibit 2.1-10) and located north of Union Carbide Road, which also has the potential for timber harvesting. It is zoned as planned development. Areas west and south of the ROI are likely used for forestry and supporting forestry activities like timber harvesting but are not considered part of the ROI for farmlands.

Aquaculture

Areas significant to aquaculture resources (specifically molluscan shellfish) were identified by using mapping data provided by the GDNR Coastal Resources Division (see Exhibit 3.6-1). There are no areas significant to aquaculture located within the construction ROI, as the adjacent bodies of water are not considered adequate for aquaculture uses due to their high variability in salinity, which cannot support a stable molluscan shellfish population. There are three types of aquaculture areas within the operational ROI (or the composite USCG LAA, described in Section 2.1.2.5, *Pre-Launch Activities*): (1) one inactive commercial shellfish lease area, (2) three recreational shellfish harvest areas, and (3) a single shellfish growing area (which is inclusive of the previously listed areas). There is also one active commercial shellfish lease area outside, south of the operational ROI.

Commercial shellfish leased areas give exclusive rights to the contracted party for molluscan shellfish harvesting. The inactive commercial lease area is currently under review by the GDNR Coastal Resources Division for redivision, to allow for more than one leasing party (Guadagnoli, 2020). There are 3,000 acres of the inactive commercial shellfish lease area within the composite USCG LAA. The active shellfish lease area is under contract to one firm. No part of the active shellfish lease area is within the operational ROI.

Recreational shellfish harvest areas are exclusively for public use. In order to harvest molluscan shellfish in these areas, the visitor must have a fishing license. Any harvesting in these areas must be for personal use and not allowed to be sold. Currently, the three recreational shellfish harvest areas are very popular and are expected to continue to be popular (Guadagnoli, 2020). Of these three areas, 1,658 acres are within the composite USCG LAA.

The shellfish growing area is defined by using the standards presented in a specific area known to have the water quality and conditions as defined by the USDA's *National Shellfish Sanitation Program (NSSP) Guide for the Control of Molluscan Shellfish*. A growing area is defined as a site that supports, or could support, the propagation of shellstock by natural or artificial means (USDA, 2017b). The purpose is to ensure that areas where harvesting occurs meet the health and safety standards. The growing area west of Cumberland Island has 28 stations used for monthly testing to ensure water quality is safe for molluscan shellfish growth and harvest uses. There are 8,724 acres of the shellfish growing area within the composite USCG LAA.

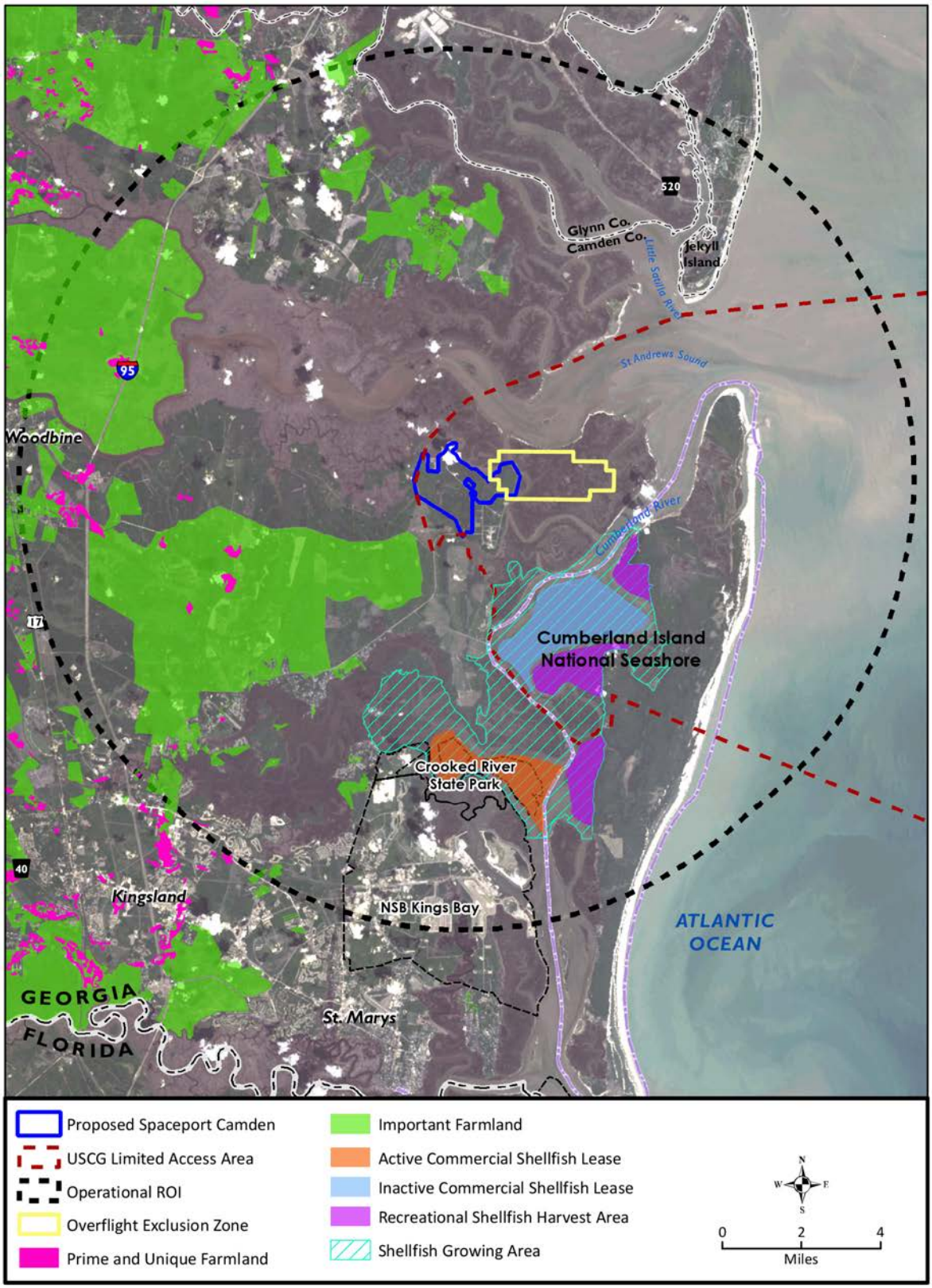


Exhibit 3.6-1. Existing Farmlands

3.7 Hazardous Materials, Solid Waste, and Pollution Prevention

3.7.1 Definition and Description

This section defines hazardous materials, solid waste, and pollution prevention commonly associated with industrial operations. This section includes a discussion of regulatory requirements relative to this resource area. This section also includes a description of hazardous materials and hazardous and solid wastes at the Proposed Action site, as well as a discussion of the regulatory status of the site. In this document, regulatory status relates to any applicable land covenants, restrictions on land use, restrictions on groundwater use, restrictions on future land conveyance, zones of contamination, levels of contamination, potential areas of concern, munitions response areas (MRAs), Resource Conservation and Recovery Act (i.e., RCRA) Landfill areas, ongoing site environmental monitoring requirements, ongoing site maintenance requirements, access requirements and access restrictions, etc. Note, under FAA Order 1050.1 Subclause EE and FF, a categorical exclusion only applies to environmental investigations and site remediation conducted "on previously developed FAA-owned, leased, or operated sites." This is not applicable to the current site of the Proposed Action.

3.7.2 Regulatory Setting

The following laws, executive orders, agency regulations, and other guidance apply to the Proposed Action.

The Federal statutes of most importance to FAA are RCRA, and CERCLA, as amended by the Superfund Amendments and Reauthorization Act of 1986, and the Community Environmental Response Facilitation Act of 1992. The Emergency Planning and Community Right-to-Know Act (EPCRA), Pollution Prevention Act, and Hazardous Materials Transportation Act also apply to the Proposed Action. Federal, State, and local statutes, regulations, executive orders, and other requirements related to hazardous materials, solid waste, and pollution prevention are included in this section.

FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*

FAA considers hazardous material, pollution prevention, and solid waste impacts in NEPA documentation such as this EIS. FAA Order 1050.1F, Section 7, defines the terms *hazardous material*, *hazardous waste*, *hazardous substance*, and *solid waste* as follows:

Hazardous material is any substance or material that has been determined to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce. The term *hazardous materials* includes hazardous wastes and hazardous substances, as well as petroleum and natural gas substances and materials (see 49 CFR §172.101).

Solid waste is defined by the implementing regulations of RCRA generally as any discarded material that meets specific regulatory requirement, and can include such items as refuse and scrap metal, spent materials, chemical by-products, and sludge from industrial and municipal waste water and water treatment plants (see 40 CFR §261.2 for the full regulatory definition).

FAA and CEQ guidance also encourages consideration of opportunities for pollution prevention in a proposed action and its alternatives.

Resource Conservation and Recovery Act

Hazardous waste is a type of solid waste defined under the implementing regulations of RCRA. A hazardous waste (see 40 CFR §261.3) is a solid waste that possesses at least one of the following four characteristics: ignitibility, corrosivity, reactivity, or toxicity as defined in 40 CFR Part 261 Subpart C, or is

listed in one of four lists in 40 CFR Part 261 Subpart D, which contains a list of specific types of solid waste that USEPA has deemed hazardous. RCRA imposes stringent requirements on the handling, management, and disposal of hazardous waste, especially in comparison to requirements for nonhazardous wastes.

National Emission Standards for Hazardous Air Pollutants

Asbestos requirements (currently found in 40 CFR Part 61, Subpart M) specify work practices for asbestos to be followed during demolitions and renovations of all facilities including, but not limited to, structures, installations, and buildings (excluding residential buildings that have four or fewer dwelling units). The regulations require a thorough inspection where the demolition or renovation operation will occur. The regulations require the owner or the operator of the renovation or demolition operation to notify the appropriate delegated entity (state agency) before any demolition or renovations of buildings that contain a certain threshold amount of regulated asbestos-containing material. The rule requires work practice standards that control asbestos emissions that involve removing all asbestos-containing materials, adequately wetting all regulated asbestos-containing materials, sealing the material in leak-tight containers, and disposing of the asbestos-containing waste material as expediently as practicable, as the regulation explains in greater detail. These work practice standards are designed to minimize the release of asbestos fibers during building demolition or renovation, waste packaging, transportation, and disposal.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980

Hazardous substance is a term broadly defined under Section 101(14) of CERCLA (see 42 U.S.C. §9601(14)). Hazardous substances include the following:

- Any element, compound, mixture, solution, or substance designated as hazardous under Section 102 of CERCLA
- Any hazardous substance designated under Section 311(b)(2)(A) or any toxic pollutant listed under Section 307(a) of the CWA
- Any hazardous waste under Section 3001 of RCRA
- Any hazardous air pollutant (i.e., HAPs) listed under Section 112 of the CAA
- Any imminently hazardous chemical substance or mixture for which the USEPA Administrator has "taken action under" Section 7 of the Toxic Substances Control Act

Please note that the definition of hazardous substances under CERCLA excludes petroleum products, unless specifically listed or designated thereunder and also does not include natural gas or synthetic gas usable for fuel.

Toxic Substances Control Act

Implemented in 1976, the Toxic Substances Control Act (TSCA) provides the USEPA with authority to require reporting, record-keeping and testing requirements, and restrictions relating to chemical substances and/or mixtures. In the case of lead-based paints, TSCA requires conducting lead-based paint abatement activities in most pre-1978 housing and "child-occupied facilities" such as child-care facilities and preschools, with properly trained and certified contractors in conformance with documented methodologies appropriate to lead-based paint activities. Additionally, TSCA requires disclosure of known lead-based paint and/or lead-based paint hazards upon sale or lease of residential property.

Other Requirements from the Code of Federal Regulations

Additionally, the following Federal requirements apply to the proposed activities.

29 CFR §1910.120, Hazardous Waste Operations and Emergency Response

This section of the regulations covers operations that may involve employee exposure to safety or health hazards. These operations may include cleanup operations involving hazardous substances conducted at uncontrolled hazardous waste sites; corrective actions involving cleanup operations at sites covered by RCRA; operations involving hazardous wastes conducted at treatment, storage, and disposal facilities; and emergency response operations for releases of, or substantial threats of releases of, hazardous substances without regard to the location of the hazard.

14 CFR §420.63, Explosive Siting

This section of the regulations requires a licensee to ensure the configuration of the launch site follows its explosive site plan. The explosive site plan must include certain components, including a scaled map that shows the location of all explosive hazard facilities at the launch site and the actual and minimal allowable distances between each explosive hazard facility and all other explosive hazard facilities, each public traffic route, and each public area including the launch site boundary; a list of the maximum quantity of energetic liquids, solid propellants and other explosives to be located at each explosive hazard facility; and a description of each activity to be conducted at each explosive hazard facility.

14 CFR §420.67, Separation Distance Requirements

This section of the regulations presents separation distance requirements for handling incompatible energetic liquids that are collocated. Where incompatible energetic liquids are collocated in a launch or reentry vehicle tank or other vessel, a launch site operator must separate each explosive hazard facility from each other explosive hazard facility, each public area, and each public traffic route in accordance with the minimum determined separation distance for each explosive hazard facility.

Georgia Comprehensive Solid Waste Management Act of 1990 and Georgia Rule Chapter 391-3-11

The State of Georgia has adopted Federal regulations for any solid waste that has been defined as a hazardous waste. These regulations are promulgated by the Board of Natural Resources, Georgia Rule Chapter 391-3-4. Solid waste in the form of construction debris would be generated during construction activities, or they could be generated in the form of litter or refuse during routine launch operations. Solid waste is defined in the Official Code of Georgia 12-8-20, Georgia Comprehensive Solid Waste Management Act of 1990, as garbage, rubbish, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility, and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, municipal, commercial, mining, and agricultural operations and from community and institutional activities. State regulations specify permit requirements for landfills and the types of waste that landfills can accept.

Georgia Hazardous Site Reuse and Redevelopment Act and 2003 Brownfields Tax Incentive Law

Brownfield sites are defined as "real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant" in Public Law 107-118 (House Resolution 2869), Small Business Liability Relief and Brownfields Revitalization Act of 2002. Section 101 of CERCLA (42 U.S.C. §9601) further specifies that brownfield sites include land that have been "contaminated by a controlled substance (as defined in Section 102 of the Controlled Substances Act (21 U.S.C. §802)" or sites that have been "contaminated by petroleum or a petroleum product." Georgia adopted similar environmental protection legislation (i.e., Georgia Hazardous Site Reuse and Redevelopment Act, last amended in 2005, and the 2003 Brownfields Tax Incentive Law) to regulate contaminated sites and to require certain remediation standards.

The purpose of the brownfields program is to encourage voluntary cleanup and reuse of brownfields by leveraging private funding for cleanups through redevelopment projects. Georgia provides incentives that

can be used by private parties, including liability limitation for prospective purchasers, and tax incentives to recoup investigation and cleanup costs. The program makes it possible to acquire contaminated property without assuming all the liability, as the new owner is protected from third-party claims (lawsuits) resulting from prior contamination.

Georgia Asbestos and Lead-Based Paint Regulations

Proposed activities may also affect asbestos and lead-based paint (LBP) in existing structures. Asbestos is a naturally occurring mineral that is a very effective heat and sound insulator. Consequently, it was used in many buildings as a fire and noise retardant. Friable (brittle) asbestos becomes hazardous when fibers become airborne and are inhaled. Georgia's Asbestos Program is responsible for protecting human health and the environment from activities that disturb asbestos. The program licenses asbestos contractors, approves asbestos supervisor training courses, and collects asbestos abatement/demolition project notifications as mandated under the Georgia Asbestos Safety Act.

LBP was used as an additive and pigment in paints for many years prior to 1978; therefore, older structures that have multiple layers of older paint are potential sources of lead. Exposure to lead is usually through inhalation during renovation and demolition activities or through ingestion of paint chips or lead-contaminated drinking water. The Georgia LBP program is responsible for enforcing the State's Renovation, Repair, and Painting Rules requirements, including accrediting training providers; issuing certifications for renovators/supervisors, dust sampling technicians, and renovation firms; conducting outreach and education; and developing technical guidance.

3.7.3 Existing Conditions

The ROI for hazardous materials, solid waste, and pollution prevention includes the existing contaminated sites at the proposed project site or in the immediate vicinity of a project site (i.e., adjacent to) and local disposal capacity for solid and hazardous wastes generated from the Proposed Action or alternatives.

Currently, hazardous materials are not used or stored and hazardous or solid wastes are not generated or stored on areas associated with the Proposed Action. A former hazardous landfill is located within the northwest corner of the site; however, this landfill is not part of the proposed land purchase, is closed and has been operating under a RCRA post-closure care permit (#HW-063[D]) since 2011. The closed landfill will be monitored through the post-closure care period. Monitoring of the closed landfill will continue until the GDNR EPD determines that the site is no longer subject to the post-closure and corrective action program requirement under permit. Activities associated with the Proposed Action, such as road improvement or facility construction, would not occur on or near the landfill. Consequently, no direct or indirect impacts to the landfill would be expected from the Proposed Action and the landfill is not discussed further in this section.

Identification of Contaminated Sites

There are no sites within the construction ROI that are included on the USEPA National Priorities List. However, activities associated with the Proposed Action do overlap historical areas of contamination from historical usage.

In 1962, Thiokol Corporation purchased the property for the production and testing of solid rocket motors for NASA. NASA cancelled the large rocket motor program in mid-1965. In 1966, Thiokol began production of silicone coatings and sealants for General Electric and TEMIK (aldicarb) for Union Carbide. In 1967, Thiokol began to manufacture orthochlorobenzalmalononitrile (CS) (also known as "tear gas") for Edgewood Arsenal. This work developed into Thiokol's production of several "deterrent containing"

munitions including 40-millimeter (40mm) CS rounds and the XM-15-CS canister cluster. Later, production included M49 trip flares, 81mm mortar illumination cartridges, and M84A1 fuzes.

From 1976 to 1986, the site was owned and operated by Union Carbide for pesticide manufacturing. In 1986, Rhone Poulenc (ultimately Bayer CropScience) acquired manufacturing, and Union Carbide retained the landfill and the Solid Waste Management Units (SWMUs). In 1994, a settlement agreement was established between Union Carbide and Thiokol to share the liability and subsequent risk. In 2001, Union Carbide became a wholly owned subsidiary of The Dow Chemical Company. Union Carbide continues to maintain the closed landfill. Bayer CropScience operates the manufacturing facility. Several of the activities associated with the Proposed Action overlap contamination sites primarily associated with Department of Defense and Thiokol historical operations (see Exhibit 3.7-1). These contamination sites are discussed below.

The Vertical Launch Facility overlaps two historical contamination sites, the MRA-2, also known as SWMU 9, and the Empty Drums Area. The proposed Mission Preparation Area overlaps two historical contamination sites, Loop Road Site and SWMU 6. The Proposed Action also includes improvements to several existing roads. These roads traverse the following historical contamination sites: MRA-1 (SWMU 8), MRA-2 (SWMU 9), Loop Road Site, and SWMU 6. Additionally, this section includes information on the former landfill (SWMU 1), which is located adjacent to the Proposed Action area.

MRA-2/SWMU 9

MRA-2 is located in the eastern portion of the Union Carbide Woodbine Facility (Exhibit 3.7-1). The majority of the MRA is heavily vegetated with the exception of an access road traversing the MRA and an open area in the central portion of the MRA. Open burning of off-specification Munitions and Explosives of Concern (MEC) was conducted in the open area in the central part of the MRA. The site was not intended for open detonation; however, burning activities resulted in inadvertent detonations. No explosive safety quantity distances (ESQDs) are known to have been established for the disposal site and the estimated boundary of MRA-2 as depicted on Exhibit 3.7-1 represents the maximum estimated kick-out radius from detonations in the disposal area (CH2M Hill, 2012).

Historical investigations at this site identified seven MEC items, consisting of one M71A2 primer, one M7A1 primer, and five partial M84 fuzes, on the ground surface at MRA-2. The locations and type of MEC were consistent with the site's use for munitions demolition in the center of MRA-2. Most items were found in the central portion of the MRA. A geophysical investigation at MRA-2 identified 218 geophysical anomalies, including 10 quality control items, representing potential MEC. The highest density of geophysical anomalies was in the central portion of the MRA where the former disposal area was located. Most of the additional anomalies were located along the access road to the Floyd Family Cemetery and some anomalies were detected northwest of the road (CH2M Hill, 2012).

Excavation of these anomalies during a 2009 Phase II MEC RCRA Facility Investigation (RFI) resulted in the discovery of eight subsurface munitions-related items. None of these items was classified as MEC. The items included M49 flare components, M84 fuze components, and a mortar projectile primer. (Note: The Facility Investigation Report does not provide information as to how/if items discovered were managed or disposed of.) The Phase I and II MEC RFIs concluded that at that time, the extent of MEC and munitions debris was adequately defined using the existing boundary (CH2M Hill, 2012).

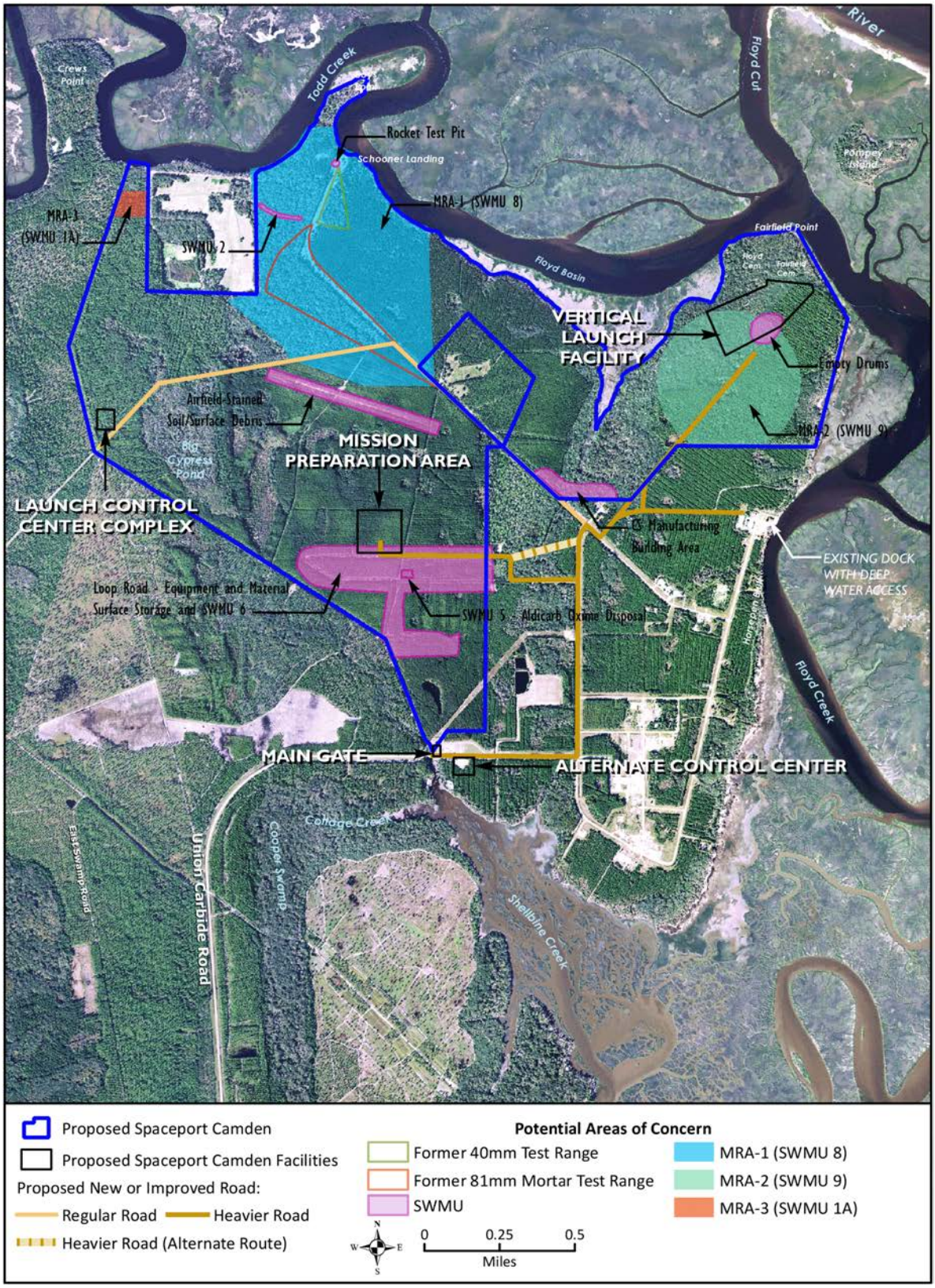


Exhibit 3.7-1. Proposed Project Locations and Existing Contamination Sites

The Decision Logic Process (used by U.S. Army Corps of Engineers at Formerly Used Defense Sites Military Munitions Response Program sites) was utilized to support risk management decisions associated at SWMU 9, which potentially contains MEC. The Decision Logic Process considered current and future land use and employing land use controls consisting of MEC warning signage, site security to control access, and deed restrictions prohibiting residential land use. The Decision Logic Process evaluation indicated acceptable conditions for SWMU 9 with incorporation of the land use controls. The Decision Logic Process was presented to GDNR EPD in collaborative meetings on March 26 and May 23, 2018, and GDNR EPD agreed that the Decision Logic Process was appropriate for assessing MEC hazards and with the findings of the Decision Logic Process for SWMU 9.

An MEC Corrective Action Plan (CAP) will be submitted to GDNR EPD for SWMUs 8 and 9 for a final decision regarding the remedial activities completed onsite. Three corrective action alternatives are anticipated to be presented in the MEC CAP as follows (Union Carbide Corporation, 2020):

- Alternative 1 – No Action: No additional investigative or remedial activities would be completed within SWMUs 8 and 9. Institutional controls would not be implemented.
- Alternative 2 – Update and Implement Institutional Controls: Implementation of an updated MEC-specific Institutional Controls Plan (ICP) that consists of an MEC safety training program for all personnel visiting the site, restricted motor vehicle access to the site, and signage placed along access roads within the property boundary and at the perimeter locations of SWMUs 8 and 9 to alert employees and visitors to the possible presence of MEC. Also, an updated environmental covenant would be recorded for the property to include the following restrictions: prohibiting residential land use and any activity that could result in release or exposure to MEC, establishing restricted use zones where visitors must be accompanied by a person with Department of Defense 3R training for MEC, requiring construction to be conducted with the support of a qualified unexploded ordnance technician, and requiring installation and maintenance of permanent warning signage at vehicular access points and along roads and boundaries of SWMUs 8 and 9.
- Alternative 3 – Additional Surface and Near-Surface MEC Clearance and Institutional Controls: This alternative includes all actions outlined in Alternative 2 plus a surface and near-surface clearance of approximately 210 acres of SWMU 8 (area not covered in the Interim Measures Corrective Action completed 2018 through 2020), and all of SWMU 9 (approximately 111 acres). This alternative would require the removal of all shrubs and vegetation less than 4 inches in diameter and surface clearing using hand-held geophysical instruments and visual inspection to locate MEC and manually remove items from the ground surface. Near surface clearance would be conducted using geophysical instruments to locate MEC and a combination of hand tools and mini-excavator, as necessary to remove MEC from the subsurface (to a maximum depth of 3 feet below ground).

The MEC CAP will be submitted to GDNR EPD for approval of the remedial alternative.

MRA-1 (SWMU 8)

MRA-1 consists of a former 40mm grenade test range and a former 81mm mortar test range located in the central portion of the Union Carbide Woodbine Facility (Exhibit 3.7-1). The majority of the area is heavily wooded, with thin-to-moderate undergrowth.

Twenty-one MEC items, consisting of 40mm tear gas ("CS") and high-explosive grenades, were discovered on the ground surface at MRA-1 during surface clearance and other site investigation activities during a 2008 Phase I MEC RFI. The locations were consistent with past use as a 40mm test range, as all but one MEC items were discovered within or near the boundaries of the 40mm test range. No surface MEC was discovered in the southern portion of MRA-1 (CH2M Hill, 2012).

The subsurface geophysical investigation at MRA-1 identified 597 geophysical anomalies, including 19 quality control items, representing potential subsurface MEC. The highest density of geophysical anomalies was concentrated in the northern portion of MRA-1 within the 40mm range and rocket test pad and along the access road to the landfill. Anomalies in the southern portion of MRA-1 were concentrated primarily along the access road bisecting the 81mm mortar range. Excavation of these anomalies during a 2009 Phase II MEC RFI resulted in the discovery of 26 subsurface munitions-related items, of which 16 were classified as MEC and 10 as munitions debris. All the MEC items were 40mm CS or high-explosive grenades. The munitions debris consisted of 40mm grenade components, without energetic or chemical fillers, and one 81mm mortar component. The majority of MEC was concentrated on the north end of MRA-1 in the estimated area of the 40mm test range. The locations of most MEC items were consistent with historic use of the 40mm and 81mm ranges (CH2M Hill, 2012). (Note: Available information does not provide details as to how/if items discovered, such as the empty drums, were managed or disposed of.)

Surface and near-surface of removal of MEC, material potentially presenting an explosive hazard, and cultural debris within the former 40mm Test Range and former 81mm Mortar Test Range of SWMU 8 were initiated in 2018 in accordance with the *Interim Measure Work Plan, Removal Action for Solid Waste Management Unit 8* (Jacobs Engineering Group, 2018), which was approved by GDNR EPD January 8, 2019.

As with MRA-2/SWMU 9, a Decision Logic Process was utilized to support risk management decisions associated at SWMU 8, which potentially contains MEC. The Decision Logic Process considered current and future land use and employing land use controls consisting of MEC warning signage, site security to control access, and deed restrictions prohibiting residential land use. The results of the Decision Logic Process concluded that acceptable conditions would be present for SWMU 8 with appropriate land use controls and following a surface/near-surface removal action at the 40mm Test Range and a surface removal along the access road through the 81mm Test Range (Jacobs Engineering Group, 2018).

As stated for MRA-2/SWMU 9, an MEC CAP will be submitted to GDNR EPD for SWMUs 8 and 9 for a final decision regarding the remedial activities completed onsite. Three corrective action alternatives are anticipated to be presented in the MEC CAP as detailed for MRA-2/SWMU 9 and applicable also to MRA-1/SWMU 8.

Current Status of MRA-2/SWMU 9 and MRA-1 (SWMU 8)

A Phase III MEC RFI (dated August 2018) documented the latest conditions at MRA-2/SWMU 9 and MRA-1 (SWMU 8). (Note: The Phase III MEC RFI also included evaluations of SWMU 1A and of a former Rocket Test Pit.) Activities associated with the Proposed Action would not overlap these last two sites, and no direct or indirect impacts would be expected on these two sites from proposed road improvement or facility construction projects.

The Phase III MEC RFI was prepared at the request of the GDNR EPD in accordance with the Final (Revision 1) Phase III MEC RFI Work Plan, conditionally approved by the GDNR EPD on March 25, 2016, with subsequent Work Plan addendum approved by the GDNR EPD on February 28, 2018. The objective of the Phase III MEC RFI was to characterize surface soils in these areas for munitions constituents that resulted from past testing and detonation of munitions (and open burning of munitions at the Rocket Test Pit

concrete pad). Based on the sampling results, none of the explosives residues, tear gas compounds, or perchlorate or hexavalent chromium compounds were detected in the Decision Units in SWMUs 8, 9, and 1A. No Target Analyte List Metals or dioxins/furans were detected at concentrations above their residential or industrial Regional Screening Levels (RSLs), indicating additional soil characterization and corrective action is not warranted in SWMUs 8, 9, and 1A (CH2M, 2018).

Explosive residues and tear gas compounds were not detected in any of the four discrete soil samples collected in the former Rocket Test Pit area. The concentration of 2,3,7,8-tetrachlorodienzo-p-dioxin (TCDD) toxicity equivalent was the only parameter above the residential and industrial RSLs in samples collected in June 2016. The GDNR EPD requested further evaluation of the horizontal and vertical occurrence of TCDD toxicity equivalent associated with these samples. In 2018, samples were collected from four sampling units within and surrounding the former Rocket Test Pit to assess potential exposure risks to TCDD toxicity equivalent in surface soils around the horizontal extent. Discrete soil samples from hand auger borings were also collected to evaluate the vertical extent of elevated TCDD toxicity equivalent concentrations. Detections of dioxins/furans in the samples were all below the residential and industrial RSLs, indicating that additional soil or groundwater actions were not warranted (CH2M, 2018).

A Human Health Risk Assessment and Environmental Risk Assessment were also prepared to evaluate potential human health and ecological receptors associated with current and future exposure in munitions constituents in soil at SWMUs 8, 9 and 1A. The Human Health Risk Assessment and Environmental Risk Assessment concluded that concentrations of munitions constituents at these sites do not pose unacceptable risks to human health or ecological receptors under an industrial land use scenario, based on comparison to the GDNR EPD and USEPA acceptable risk levels. Based on the results of the Human Health Risk Assessment and Environmental Risk Assessment, further site characterization of munitions constituents is not warranted for SWMUs 8, 9, and 1A for ecological receptors under an industrial land use scenario for human receptors. At the request of the GDNR EPD, the Human Health Risk Assessment also included a future residential scenario; however, this scenario is unrealistic because the existing Environmental Covenant (discussed later in this section) prohibits future residential development at the entire Union Carbide Woodbine site (CH2M, 2018).

Surface and near-surface removal actions within SWMU 8 were initiated in 2018. Removal activities are being completed across approximately 49 acres of SWMU 8. Work is being completed in accordance with the *Interim Measure Work Plan, Removal Action for Solid Waste Management Unit 8* (Jacobs Engineering Group, 2018).

Empty Drums Area

The Empty Drums Area is estimated to be less than 5 acres. A site reconnaissance of the Empty Drums Area conducted on October 2007 included a visual inspection of the general drum disposal area and the surrounding wooded area; an area sweep was conducted using a Schonstedt ordnance locator to determine the overall concentration of magnetic anomalies and collection of three soil sample locations based on field observations (CH2M Hill, 2008).

Approximately 12 empty drums were observed on the ground surface. An extensive number of anomalies were also identified below ground surface in an area measuring approximately 30 meters (about 98 feet) (east to west) by 20 meters (about 66 feet) (north to south). No additional or significant metal debris or drums were observed in the outlying areas. Drums were removed over a 4-week period during the Phase II RFI (Apex Environmental, 1996). Based on field observations of areas containing unknown anomalies, three discrete soil samples and one field duplicate were collected. The samples were analyzed for VOCs, semi-VOCs, herbicides, and aldicarb. All detected parameters were significantly below their respective

Residential Screening Levels. No MEC or munitions debris were observed during the site reconnaissance or sampling activities. A 2007 site investigation recommended no further action for the site (CH2M Hill, 2008). Based on the amended hazardous waste facility permit (Number HW-063[D]) issued on June 7, 2017, no further action is required for this area.

Loop Road Equipment and Material Surface Storage

The Loop Road Site was reportedly used by Thiokol Corporation for the surface storage of miscellaneous equipment and materials. Materials and equipment stored in this location included totes, empty rounds, off-specification materials, CS canisters, and old equipment. The area encompasses approximately 81 acres. The majority of equipment and materials appear to have been removed. The area has never been formally investigated. The site reconnaissance of the Loop Road area, which was conducted on October 9 and 10, 2007, found no MEC or metallic debris during the sweep of the Loop Road area. A small amount of general metal debris was noted. Because the site reconnaissance activities determined that only small amounts of metallic debris were present within the Loop Road area, no further action was proposed. Consistent with USEPA's Final Guidance on Completion of Corrective Action at RCRA Facilities (FRL-7454-7), Union Carbide recommended that a determination of Corrective Action Complete without controls be considered for the Loop Road area (CH2M Hill, 2008). Based on the amended hazardous waste facility permit (Number HW-063[D]) issued on June 7, 2017, no further action is required for this area.

SWMU 6

At SWMU 6, surface and subsurface disposal activities occurred from 1966 to 1970. Unknown quantities of scrap metal, gypsum granules, corncob grit, and tear gas grenades (i.e., "CS") were disposed of in SWMU 6. Surface disposal of scrap metal, concrete, asphalt, and tar occurred south of Loop Road on the east side of the firebreak road. This surface disposal area is approximately 300 feet by 40 feet. South of the surface disposal area and paralleling the firebreak road are a series of discontinuous trenches in an area approximately 300 feet long, 40 feet wide, and less than 6 feet deep. The ground surface is broken by 3- to 4-foot-high mounds of earth, alternating with low areas running the length of the trenched area. The disposal trenches are located between the earthen mounds. The mounds are believed to be the soil excavated from the original trench during disposal activities. These trenches, which are designated as Disposal Trench #1, contain layers of material believed to be primarily Nuchar® and corncob grit (CH2M Hill, 2008).

A 2000 Screening Level Risk Assessment concluded that the soils in SWMU 6 did not pose unacceptable risks to human or ecological receptors under the future residential or industrial scenarios. Investigation activities conducted as part of a 2008 Focused Field Investigation at SWMU 6 did not identify any issues that would change the conclusions from the 2000 Screening Level Risk Assessment. The 2008 Focused Field Investigation report recommended no further action (without any controls) for SWMU 6 (CH2M Hill, 2008). Based on the amended hazardous waste facility permit (Number HW-063[D]) issued on June 7, 2017, no further action is required for this area.

Other Contamination Sites

Several other areas of contamination not discussed above are located within the spaceport site boundary (see Exhibit 3.7-1). (Note: Activities associated with the Proposed Action would not overlap areas for these sites, and no direct or indirect impacts would be expected from proposed road improvement or facility construction projects. Consequently, this information is provided for informational purpose only.) As Table 3.7-1 shows, most of the listed sites have a status of "no further action." However, additional investigations are ongoing for the former Rocket Test Pit.

Table 3.7-1. Other Contamination Sites Within the Spaceport Site Boundary

Site Name	Description	Activities	Status
Airfield Stained Soil/Surface Debris	A stained soil and debris area was located at the western end of the airfield and consists of a small pile of asphalt debris.[1]	Soil sampling results indicated that there has been no environmental impact to this area.[1]	No further action recommended.[1]
CS Manufacturing Building Area	The bunker and the surrounding area were reportedly used for manufacturing CS products.[1]	CS was not detected in any of the soil or groundwater samples collected during the FFI.[1]	No further action recommended.[1]
MRA-3 (SWMU 1A)	A 2006 visual inspection identified scrap metal in this area.	Investigations found no surface or subsurface munitions-related items and a Phase II RFI concluded that the likelihood of MEC or munitions debris being present at MRA-3 is low.[1]	No further action recommended.[2]
Rocket Test Pit	Area was used for testing of solid rocket boosters and various ordnance products.[1]	Based on the August 2018 Phase III MEC RFI, further site characterization of munitions constituents in soil and groundwater is not warranted under an industrial land use scenario for human receptors.[3]	Site characterization is ongoing to determine if contamination is present in surface water at the site.[4]
SWMU 2	Area was formerly used for surface storage activities that occurred during the period of 1967 to 1974.[1]	Site reconnaissance activities determined that all the surface drums formerly stored in the SWMU 2 area have been removed.[1]	No Further Action
SWMU 5/Aldicarb Oxime Disposal	Site was reportedly used for the "one-time" subsurface disposal in 1973 of a single drum of aldicarb oxime.[1]	Site reconnaissance activities determined that the drum disposed in the SWMU 5 area had been previously removed with no apparent impacts.[1]	No Further Action

Notes: CS = tear gas; FFI = Focused Field Investigation; MEC = Munitions and Explosives of Concern; MRA = Munitions Response Area; RFI = Resource Conservation and Recovery Act (RCRA) Facility Investigation; SWMU = Solid Waste Management Unit.

Sources:

[1] (CH2M Hill, 2008)

[2] (CH2M Hill, 2012)

[3] (CH2M, 2018)

[4] (Jacobs Engineering Group, 2020)

During the Phase III MEC RFI, discrete surface soil samples were collected adjacent to the former Rocket Test Pit. Because the former test pit is fenced off and has filled with water, there are no opportunities for direct exposure to wastes that, in theory, may be present in the former Rocket Test Pit. However, if wastes were disposed of in the former test pit, it is possible that water in the former test pit could have become contaminated and that leakage of water could result in potential exposures. Consequently, an Investigation Plan (dated February 26, 2020) proposed additional sampling, focused on determining if water in the former Rocket Test Pit is affected from waste disposal (Jacobs Engineering Group, 2020a).

In accordance with the approved work plan, water in the Rocket Test Pit was sampled in March 2020 at three different depths and analyzed for possible contamination due to items that might have been disposed in the Rocket Test Pit. Union Carbide Corporation concluded in a report to GDNR EPD (Jacobs

Engineering Group, 2020b) that analytical results of the Rocket Test Pit water samples support available historical information that there is no evidence of waste disposal in the former Rocket Test Pit. Concentrations of constituents of potential concern that historically were manufactured, tested, and/or known to have been disposed of at the former Union Carbide Woodbine Facility either were not detected above laboratory method detection limits or were detected at concentrations less than the USEPA maximum contaminant level or, if there was no maximum contaminant level, then less than the USEPA tap water regional screening level. The only constituent exceeding a screening level was polychlorinated biphenyls (PCBs) in one of the three samples collected from the former Rocket Test Pit. While the origin of PCBs in the water is not certain, it is postulated that it could have originated from electrical equipment associated with former Rocket Test Pit operations that was not removed when decommissioned. Union Carbide recommended no further action; however, in a phone conversation on July 17, 2020, a GDNR EPD official commented to Union Carbide and Jacobs Engineering representatives that additional investigation is necessary because the laboratory method detection limit for some of the constituents was higher than the screening levels and because of the detected PCBs in one of the samples.

Semiannually, the owner must submit to the GDNR EPD a report that includes groundwater monitoring results, maintenance and inspection activities, certification of nonresidential use, and documentation stating whether the activity and use limitation in the Covenant are being abided by. The most recent groundwater monitoring event was submitted in January 2020, covering the June 2019 to November 2019 reporting period. Results of the sampling event showed the following (Arcadis, 2020):

SWMU 1, Closed Landfill

SWMU 1 consists of the closed landfill (or regulated unit) that was closed in 1988 under an approved closure plan. The landfill is approximately 22 acres in size and was used for the disposal of both hazardous and non-hazardous waste. The landfill was operated by Thiokol; however, the company does not appear to have maintained records related to chemicals disposed at the site. The landfill is covered under an Environmental Covenant (discussed later in this section) between the owner, Union Carbide Corporation, and the GDNR EPD (Arcadis, 2020). (Note: Activities associated with the Proposed Action would not overlap areas associated with the landfill, and no direct or indirect impacts would be expected from proposed road improvement or facility construction projects. Consequently, this information is provided for informational purposes only.)

- Of the 37 constituents analyzed in the 37 monitoring wells, 19 constituents have never been detected above their respective groundwater protection standards (GWPS), from June 2006 through September 2019. These constituents include the following: 1,4-dichlorobenzene; 2,4,5-trichlorophenoxy propionic acid; 2-chlorophenol; acetone; antimony; barium; carbon disulfide; ethylbenzene; fluorine; fluoride; m-cresol; methyl ethyl ketone; nickel; phenanthrene; phenol; sulfide; toluene; xylenes; and zinc. Note: None of the monitoring wells are located in areas that would be disturbed as part of proposed activities.
- Formaldehyde, naphthalene, p-cresol, pyridine, and vanadium were detected above their respective GWPS during the September 2019 sampling event.
- Acetone concentrations in the groundwater samples collected from the point-of-compliance and Todd Creek sentinel wells associated with the hazardous waste landfill continue to decrease or show no significant changes because of natural attenuation.
- Formaldehyde, naphthalene, pyridine, sulfide, and vanadium were statistically above the GWPS in the point-of-compliance wells during this monitoring event.

- The statistical trend evaluation indicates that the majority of constituents detected in the point-of-compliance wells and the Todd Creek sentinel wells show no significant change in concentration or are decreasing.
- Based on the dissolved oxygen measurements collected from the oxygen diffusion wells during this reporting period, the in situ Submerged Oxygen Curtain system is functioning as intended, by creating an oxygenated zone along the downgradient edge of the landfill.

In addition to the semiannual groundwater sampling results, the January 2020 report included the semiannual corrective action effectiveness report. During the second half of 2019, the landfill was maintained and inspected in accordance with permit requirements. The report documented that the landfill cover and ditches were visually inspected quarterly and after major rainfall events. The ditches were observed to be functioning as intended. Groundwater monitoring wells were inspected at least quarterly to verify that visible portions of the wells were being maintained. Wells were also inspected during sampling to verify their condition and proper hydraulic operation. The groundwater wells were observed to be functioning as intended. Overall, the inspections indicated that the landfill cover, drainage, groundwater monitoring wells, and landfill security fence/warning signs were being maintained in accordance with permit requirements (Arcadis, 2020).

The landfill is located adjacent to Todd Creek, which borders on the north. Groundwater flow direction is generally north, from the landfill towards Todd Creek, and there are currently eight monitoring wells located between the landfill and the creek. Erosion along the creek bank has created a concern for the stability of the bank and associated impacts related to the landfill and monitoring wells. In December 2014, Union Carbide Corporation was asked by GDNR to reevaluate the streambank measurement methodology included in the Todd Creek Stabilization Plan. The evaluation was to include reevaluation of the number of reference lines incorporated into the plan, the locations of marking pins (for monitoring and to trigger contingency actions), and the specific contingency actions to be taken if the streambank were to reach one of the trigger marking pins. The existing creek bank monitoring program added new reference lines, adjusted the location of trigger points (to take corrective action), and established a secondary contingency plan, in the event the initial plan does not adequately arrest the continuing erosion. The GDNR EPD incorporated a new monitoring program in the amended Post-Closure Care and Corrective Action Permit, dated June 7, 2017; quarterly measurements are collected, and that information is submitted to the GDNR EPD (Arcadis, 2020).

Based on quarterly erosion monitoring results along Todd Creek, Union Carbide is proposing stabilization of the streambank to addresses specific areas of the site that exhibit erosion and where the top of the bank is proximal to regulatory trigger marking pins. The bank will be stabilized at two locations: one location on the western portion of the site where the highest erosion rate occurs and one location on the eastern portion of the site where little erosion has occurred but the top of bank is close to the trigger pin for contingency actions. The streambank stabilization plan will consist of stabilization through bank grading, installation of launchable stone toe protection, and a riprap revetment at both areas. The launchable stone toe protection is designed to adapt to future channel conditions by self-launching stone to armor scour holes against further erosion. Construction of the streambank stabilization is anticipated to begin in late 2020 pending receipt of permits.

GDNR Environmental Covenant

The approximate 4,011-acre site is covered under an Enviromental Covenant, dated March 29, 2011, between the property owner (Union Carbide Corporation) and the GDNR EPD, due to the historical disposal of both hazardous and non-hazardous wastes at the site. Post-closure care and corrective actions, as required by the Hazardous Waste Facility Permit HW-063(D), Sections II and III, include the

installation and maintenance of institutional controls (limits use to nonresidential and prohibits groundwater use) and engineering controls (clay cap, fencing, maintenance of vegetative cover, and groundwater monitoring), to protect human health and the environment (GDNR, 2011).

The Covenant prohibits any residential use on the site, to include the RCRA landfill. The Covenant also prohibits any activity at the site (including the RCRA landfill) that may result in the release of or exposure to hazardous wastes, hazardous constituents, or constituents of concern, with the exception of work necessary for the maintenance, repair, or replacement of existing controls. Activities that are prohibited in the capped area include any earth-disturbing activities, such as drilling, digging, bulldozing, etc., that may compromise the surface. In addition, the Covenant prohibits the use or extraction of groundwater beneath the area for drinking water or for any other nonremedial purpose (GDNR, 2011).

Semiannually, the owner of the site must submit to the GDNR EPD a report that includes groundwater monitoring results, maintenance and inspection activities, certification of nonresidential use, and documentation stating whether the activity and use limitation in the Covenant are being abided by. The site owner must also give a 30-day advanced written notice to the GDNR EPD of the owner's intent to convey the property. The conveyance of title, easement, lease, or other interest in the site is prohibited without the owner's adequate and complete provision for continued monitoring, operation, and maintenance of the post-closure care and corrective action program. The Covenant shall remain in full force, unless and until the GDNR EPD determines that the site is no longer subject to the post-closure and corrective action program requirement under the Hazardous Waste Facility Permit HW-063(D) (GDNR, 2011).

Bayer CropScience Contamination Sites

Preliminary investigations have also identified 10 additional sites that may be potentially contaminated within the Bayer CropScience property. These sites are identified with the name of the suspected contaminant(s): (1) sanitary wastewater disposal; (2) gas/diesel compounds/benzene, toluene, ethylbenzene and xylene (BTEX); (3) pesticides; (4) BTEX; (5) munitions waste; (6) munitions waste; (7) acids and pesticides; (8) pesticides; (9) munitions/rocket fuel waste; and (10) pesticides.

They are located on the northwest quadrant of the Bayer CropScience property, with most of the sites adjoining or located near Union Carbide Road (which would be improved as part of the Proposed Action). They range in size from approximately 2 to 30 acres, with an average size of approximately 8 to 10 acres. Detailed information on the presence of hazardous constituents is unavailable from by Bayer CropScience. Thorough site investigations would be required prior to ground disturbance, and appropriate land restrictions and remediation would be identified in coordination with State regulators.

Asbestos/Lead-based Paint

Information regarding existing buildings or foundations, when previous buildings were removed, or if remaining structures contain asbestos or LBP was not available from documents provided. Demolition or modification of any existing structures as part of the Proposed Action would be accomplished according to applicable regulatory requirements for asbestos and LBP (see Section 4.7, *Hazardous Materials, Solid Waste, and Pollution Prevention*, for more information for more information).

Identification of Solid and Hazardous Waste Disposal Capacity

Solid waste in the ROI would be disposed of at the Camden County Municipal Solid Waste (MSW) Landfill (License Number 020-017D). The MSW Landfill is located at 5395 Highway 110, Woodbine, Georgia, approximately 14 miles west of the proposed Spaceport Camden site. It is located on a 202-acre site with 56 acres currently permitted for solid waste disposal. In operation since 1992, the MSW landfill receives approximately 336 tons per day of solid waste. It is anticipated to be in operation until at least 2033 (GDNR EPD, 2020a).

Construction and demolition (C&D) debris in the ROI would be disposed of at the Camden County C&D and Industrial Waste Landfill (License Number 020-019D). The landfill is located at 1600 Highway 110, Woodbine, Georgia, approximately 13 miles west of the proposed Spaceport Camden site. In operation since 2003, the landfill receives an average of 723 tons per day of debris. The landfill covers 1,178 acres, with 294 acres permitted to receive wastes, including C&D debris, yard trimmings, and land-clearing debris. This landfill is also approved to receive industrial wastes resulting from the manufacturing processes. It is anticipated to be in operation until at least 2093 (GDNR EPD, 2020a). Both landfills are accessible from the proposed Spaceport Camden site via county-maintained roads that would be suitable for travel by disposal vehicles.

3.8 Historical, Architectural, Archaeological, and Cultural Resources

Historical, architectural, archaeological, and cultural resources in the study area may be affected by the proposed activities. This section outlines specific details of the NHPA Section 106 process as identified in the regulations at 36 CFR Part 800, including describing the regulatory setting, the APE, and the scope of resources within that area.

3.8.1 Definition and Description

This section provides descriptive and statutory definitions for the categories of cultural resources discussed in this EIS. Cultural resources are any prehistoric or historic district, site, building, structure, or object that meets the significance criteria for listing on the NRHP (36 CFR §60.4). These resources may also be considered important to a culture or community for scientific, traditional, religious, or other purposes. They include archaeological resources, historic architectural resources, and traditional cultural resources. Historic properties (as defined in 36 CFR §800.16(l)(1)) are significant archaeological, architectural, or traditional resources that are either listed on, or eligible for listing on, the NRHP. Both historic properties and significant traditional cultural resources that may or may not meet the NRHP criteria (as defined in 36 CFR §60.4) but that are identified by American Indian Tribes or other recognized traditional cultural groups are evaluated for potential adverse effects from an action.

Eligibility for listing on the NRHP is defined in 36 CFR §60.4. A historic property must possess integrity of location, design, setting, materials, workmanship, feeling, and association and meet at least one of four criteria: (a) association with events that have made a significant contribution to the broad patterns of our history; (b) association with the lives of persons significant in our past; (c) embodiment of distinctive characteristics of a type, period, or method of construction; (d) yield, or likeliness to yield, information important in prehistory or history. Ordinarily, a historic property must be more than 50 years old, and certain types of properties are not typically considered for listing on the NRHP, such as birthplaces and graves, and cemeteries. However, under certain criteria considerations, these properties may be eligible for listing on the NRHP, assuming that they already meet the regular requirement. For example, a grave may be eligible for listing on the NRHP if it is associated with a historical figure of outstanding importance (Criteria Consideration C) or a cemetery may be eligible for the NRHP if it derives its primary significance from age, distinctive design features or association with historic events (Criteria Consideration D).

3.8.2 Regulatory Setting

The following laws, executive orders, agency regulations, and other guidance apply to the Proposed Action.

National Historic Preservation Act and other Federal Regulations for Cultural Resources

A number of Federal statutes, regulations, or guidelines must be considered when analyzing the effects of the Proposed Action on architectural, archaeological, and cultural resources. Foremost among these is the NHPA, as amended, of which Section 106 requires Federal agencies to take into account the effects of their undertakings on historic properties. Laws pertinent to the Proposed Action include, but may not be limited to, the NHPA of 1966, as amended; the Antiquities Act of 1906; the Historic Sites Act of 1935; NEPA; the Archaeological and Historic Preservation Act of 1974; the Archaeological Resources Protection Act of 1979; the Native American Graves Protection and Repatriation Act of 1990; and the American Indian Religious Freedom Act of 1978.

Federal regulations governing cultural resource activities include the following: 36 CFR Part 800, *Protection of Historic Properties* (incorporating amendments effective August 5, 2004); 36 CFR Part 79, *Curation of Federally Owned and Administered Archaeological Collections*; 43 CFR Part 7, *Protection of Archaeological Resources*; 36 CFR Part 60, *National Register of Historic Places*; 36 CFR Part 63, *Determinations of Eligibility for Inclusion in the National Register*; and 36 CFR Part 68, *Secretary of Interior's Standards for the Treatment of Historic Properties*. Cultural resource-related executive orders that may affect the NEPA process include the following: EO 11593, *Protection and Enhancement of the Cultural Environment*; EO 13007*, Indian Sacred Sites*; EO 13175, *Consultation and Coordination with Indian Tribal Governments*; and EO 13287, *Preserve America*.

Consultation

FAA has initiated and is in the process of conducting Section 106 consultation and government-to-government consultations with federally recognized Native American tribes, the Georgia SHPO, and other entities. Other Section 106 consultations may include members of the public, non-federally recognized tribes or other ethnic identifies, or entities with economic or other interests in the resources that could experience direct or indirect effects.

On January 6, 2016, FAA initiated Section 106 consultation with the Georgia SHPO regarding the Proposed Action, and the SHPO acknowledged receipt of the notice on January 27, 2016. FAA coordinated further with the Georgia SHPO on May 24, 2016, again under Section 106 of the NHPA, regarding the APE; SHPO concurred with FAA's definition of the APE for the Proposed Action on June 12, 2016 (Exhibit 3.8-1). On April 3, 2017, and November 22, 2017, the SHPO concurred with FAA's recommendations of NRHP eligibility for archaeological and historic structure cultural resources, respectively, within the APE. On January 26, 2018, FAA submitted a Finding of Effects determination letter to the SHPO for potential impacts to those resources that are listed on, or eligible for listing on the NRHP. On December 3, 2018, the SHPO concurred that the construction portion of the subject project, as proposed, will have no adverse effect to historic resources within its APE. Additionally, the SHPO concurred that the construction portion of the proposed project will have no adverse effect to archaeological resources within its APE, provided the following conditions are met:

- Provide a plan of archaeological surveying for the remainder of the site that has yet to be surveyed due to ownership and/or hazardous material concerns and submit an archaeological survey for these areas once complete.
- Within the proposed facility site, avoid archaeological sites for which NRHP eligibility is unknown. If sites cannot be avoided, conduct Phase II testing to determine site eligibility and, if determined to be NRHP eligible, resolve adverse effects.

As noted, Camden County modified its Launch Site Operator License application to address only small launch vehicles without first-stage returns. Because of the modification of the application, FAA reinitiated consultation with the SHPO in October 2020 and proposed to retain the same APE that was delineated for the original undertaking, even though the footprint of the potential noise and visual impacts had been reduced due the elimination of first-stage returns and ocean landings. FAA received a number of comments from the SHPO and consulting parties. On March 29, 2021, FAA submitted a revised letter that noted FAA's determination that the Spaceport Camden project APE should retain the same boundary as the one concurred with by the SHPO in 2016. On April 15, 2021, the SHPO concurred with the APE (see Appendix A).

On August 12, 2019, the ACHP informed FAA of the council's intent to participate in the NHPA Section 106 consultation. FAA also formally invited the NPS as a signatory on the Programmatic Agreement on May 5, 2020. In addition, Little Cumberland Island Homes Association and the Gullah/Geechee Sea Island Coalition are participating as consulting parties in the Section 106 process. All correspondence is provided in Appendix A, *Public Involvement/Agency Coordination and Consultation*. FAA continues to consult on the Programmatic Agreement with the SHPO, ACHP, NPS, Gullah/Geechee, National Trust on Historic Preservation, and Little Cumberland Island Homes Association.

FAA also invited the following Native American tribes to participate in Section 106 consultation in compliance with the NHPA, and in government-to-government consultation in compliance with EO 13007, EO 13175, and NEPA: Cherokee of Georgia Tribal Council, Chickasaw Nation, Choctaw Nation of Oklahoma, Georgia Tribe of Eastern Cherokee, Lower Muskogee Creek Tribe, Muscogee (Creek) Nation, Poarch Band of Creeks, Seminole Nation of Oklahoma, Seminole Tribe of Florida, and Thlopthlocco Tribal Town. The Gullah Geechee Commission on the Gullah Geechee Cultural Heritage Corridor was invited to participate in Section 106 consultation, as well. As of July 2020, only the Choctaw Nation of Oklahoma and the Muscogee (Creek) Nation have responded. The Choctaw Nation of Oklahoma responded that the spaceport is "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" (e-mail dated February 3, 2016). The Muscogee (Creek) Nation responded that they "concur with the findings/recommendations of the report" and requested that work be stopped and they be "contacted immediately if any Native American cultural materials are encountered." The Gullah/Geechee Sea Island Coalition requested to be a consulting party on June 17, 2020; FAA accepted the request on July 28, 2020.

The Little Cumberland Island Homes Association requested to be a consulting party on September 6, 2019, and FAA invited the Little Cumberland Island Homes Association to be a consulting party on May 7, 2020. On April 8, 2021, the National Trust for Historic Preservation requested to be a consulting party; FAA accepted the request. All relevant correspondence through May 7, 2021, for the Section 106 consultation is included in Appendix A.

FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*

With FAA as the lead Federal agency for this EIS, FAA regulations pertain to the Proposed Action. Relevant FAA regulations and guidelines include FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, and the explanatory guidance provided by the FAA 1050.1F Desk Reference (FAA, 2020a). FAA interaction with Native American tribes is outlined in FAA Order 1210.20, *American Indian and Alaska Native Tribal Consultation Policy and Procedures.*

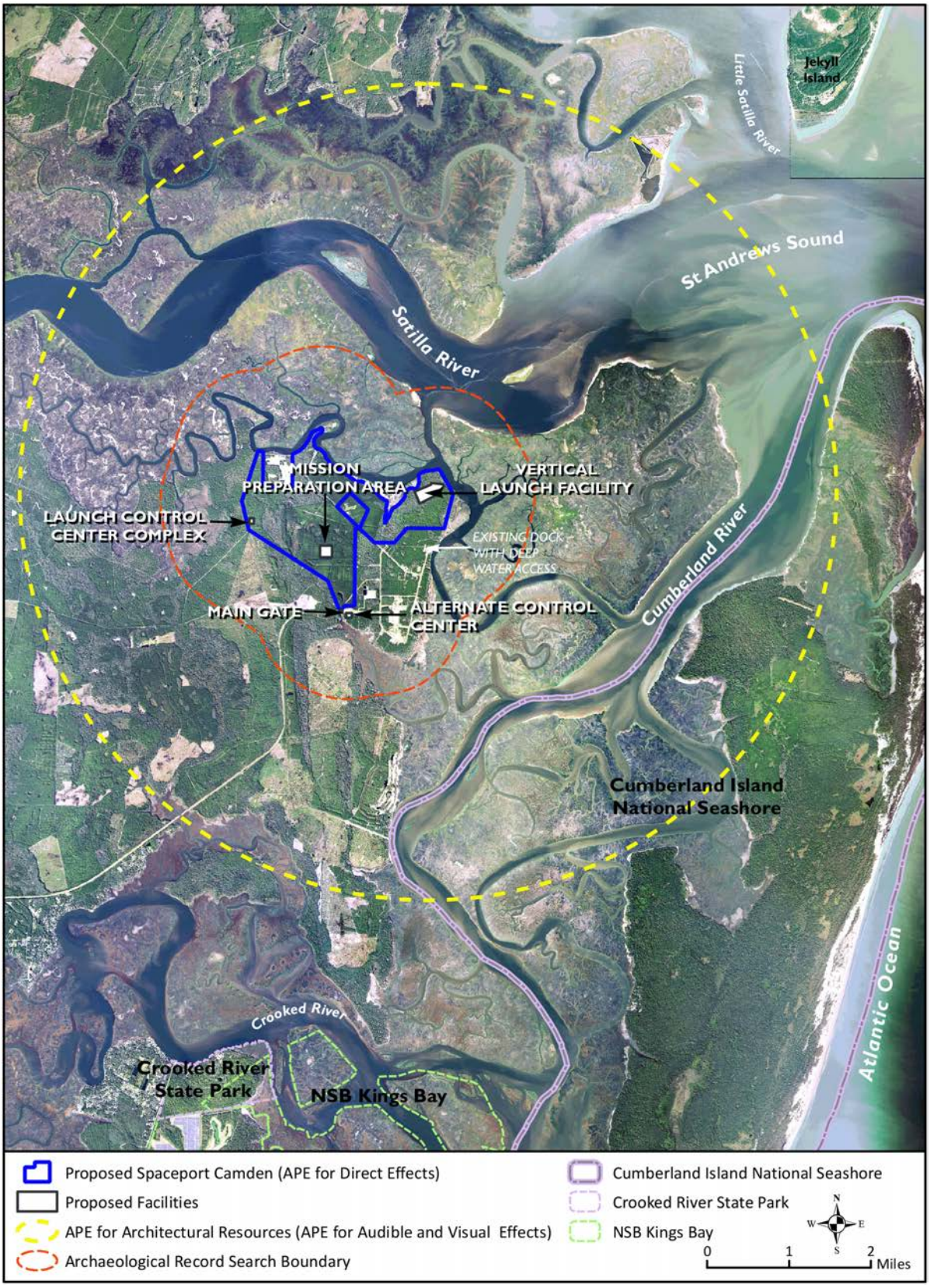


Exhibit 3.8-1. Area of Potential Effect for Proposed Spaceport Camden

Georgia Historic Preservation Act of 1980 and other State Regulations for Cultural Resources

This subsection describes State or local statutes, regulations, or guidelines that must be considered when analyzing the effects of the Proposed Action. Georgia has a number of pertinent planning and environmental laws that dovetail with the Federal laws mentioned above (Reap, 2013). These include the Georgia Historic Preservation Act of 1980, Georgia Planning Act of 1989, the Georgia Environmental Policy Act, and the 1991 Cemetery and Burial Ground Protection Policy Act. Title 12, Chapter 3, Georgia Code protects and regulates exploration of archaeological resources on State lands and in State waters. Programs and regulated actions include the 1998 State Agency Historic Property Stewardship Program, the 1992 Georgia Council on American Indian Concerns, demolition of pre-1905 courthouses and other designated properties, and transfer of authority governing development rights to local communities.

3.8.3 Existing Conditions

Area of Potential Effect

The ROI for cultural resources is equivalent to the APE as defined under the NHPA's Section 106 regulations (36 CFR §800.16(d)). The APE of an undertaking is defined as "the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist" (36 CFR §800.16(d)). The APE accounts for potential direct and indirect effects resulting from the proposed undertaking and considers both the construction and operation of the proposed project. Because of the nature of the Proposed Action, FAA developed two APEs in consultation with the SHPO. The APE for direct effects addresses primarily archaeological resources, the resource type that may be most affected by construction-related activities, including ground disturbance. For archaeological resources, the integrity of the location (i.e., lack of ground disturbance) is often the key element in determining NRHP eligibility. The APE for indirect effects, which is associated with operational activity (i.e., launches) covers a greater geographical area than the APE for direct effects and includes architectural resources. Because architectural historic properties often rely heavily on other key elements of integrity, including location, setting, workmanship, feeling, design, and association, to convey their NRHP eligibility, noise and visual effects are the primary cause of impacts to this resource type. The APE for indirect, or audible, vibratory, and visual effects, extends in a circle with a radius of 5 miles from the center of the proposed spaceport site.

The APE for direct effects is defined as the boundary of the proposed Spaceport Camden site (Exhibit 3.8-1) and consists of areas where there would be direct ground disturbance, including construction of facilities, installation or upgrading of utilities, access roads or other routes, and staging areas, as well as the location of maintenance and operations activities. NRHP eligibility for archaeological sites is based primarily on the integrity of the location and materials, whereas setting has less importance. The APE for direct effects considers not only the horizontal extent of ground disturbance but the depth of ground disturbance as well, in consideration of the potential for buried archaeological resources to be present in the APE. Architectural resources, traditional cultural resources, and landscapes may also be affected by ground disturbance or other aspects of construction.

The APE for audible, vibratory, and visual effects covers a greater geographical area than the APE for direct effects and consists of the area within a 5-mile radius of the proposed Spaceport Camden, extending around the proposed project limits (Exhibit 3.8-1). It includes archaeological resources as well as architectural, traditional, and landscape historic properties. However, these resource types often rely heavily on other key elements of integrity, including location, setting, workmanship, feeling, design, and association. The APE for audible, vibratory, and visual effects also takes into account potential impacts caused by noise and vibration that may extend farther than the area of direct ground disturbance. The

APE for the proposed project is consistent with precedents set by NEPA analyses for other commercial launch facilities. The Georgia SHPO concurred with the APE in a letter dated June 12, 2016 (see Appendix A). On April 15, 2021, the Georgia SHPO concurred with FAA's determination to retain the APE.

Summaries of the state of knowledge of historic properties and other properties considered within the APEs are presented in this section under the subheadings of *Archaeological Resources*, *Architectural Resources*, *Cumberland Island Resources*, *Traditional Cultural Resources*, and *Historic Landscapes*.

This description of existing conditions relies primarily on the cultural resources surveys conducted in 2016, which included consultation with knowledgeable sources (Cultural Resources Analysts, Inc., 2017a; 2017b). The cultural resources investigations included a detailed records search that encompassed previous archaeological survey work within the proposed Spaceport Camden site boundary plus a 1-mile radius, as well as previous architectural survey work within the proposed Spaceport Camden site boundary plus an APE with a 5-mile radius. Fieldwork consisted of an archaeological and architectural survey of the APE that covers direct ground disturbance. The Bayer CropScience–owned parcel, located inside the APE for direct effect (within the proposed Spaceport Camden site boundary), has not been surveyed for archaeological resources; therefore, identification of archaeological historic properties is not complete. If the Proposed Action goes forward, a Section 106 Programmatic Agreement will allow phasing of identification and eventual survey of this area in the event of ground disturbance. Fieldwork also included an inventory of architectural resources within the APE that encompasses architectural resources, landscapes, and historic districts on Cumberland Island. Consultation with the Georgia SHPO, Native American tribes, and other traditional cultural groups provides information regarding traditional cultural resources.

Historic Context

Background information useful for understanding the importance of cultural resources by placing known historic properties into their historic context can be found in Appendix F, *Cultural Resources*. The analyst uses this information to determine the presence or absence of effects based on known aspects of the project. The material contained in Appendix F is summarized from the comprehensive cultural resources studies conducted for FAA (Cultural Resources Analysts, Inc., 2017a; 2017b), which contain complete citations and reference lists.

Table 3.8-1 lists a summary of recorded cultural resources within the APE that are listed on or are eligible for listing on the NRHP.

Table 3.8-1. Historic Properties Within the Spaceport Camden Areas of Potential Effect

Resource Number	Resource Description	NRHP Eligibility	Location in APE
Historic Properties in the APE for Direct Effects: Construction Areas			
9CM30[1]	Shell scatter & pottery, pre-contact	Potentially eligible, Criterion D	Vertical Launch Facility
9CM64[1]	Shell midden & pottery, Mississippian	Potentially eligible, Criterion D	Vertical Launch Facility
9CM570[1]	Shell midden & pottery, Woodland	Potentially eligible, Criterion D	Vertical Launch Facility
9CM571[1]	Shell midden & pottery, Woodland	Potentially eligible, Criterion D	Vertical Launch Facility

Table 3.8-1. Historic Properties Within the Spaceport Camden Areas of Potential Effect (Continued)

Resource Number	Resource Description	NRHP Eligibility	Location in APE
Historic Properties in the APE for Direct and Audible, Vibratory, and Visual Effects: Proposed Spaceport Camden Site Boundary			
9CM24	Shell scatter, Late Archaic - Mississippian	Potentially eligible, Criterion D	Outside of construction area, within proposed Spaceport Camden site boundary
9CM25	Shell midden, Woodland, Mississippian	Potentially eligible, Criterion D	Outside of construction area, within proposed Spaceport Camden site boundary
9CM26	Shell mounds, Woodland	Potentially eligible, Criterion D	Outside of construction area, within proposed Spaceport Camden site boundary
CM-CO 31	Floyd's Fairfield & Bellevue Plantations, c. 1804–c. 1877	Eligible, Criteria B, C, & D, Criteria Consideration C & D	Outside of construction area, within proposed Spaceport Camden site boundary
CM-CO 31, Resource A	Anchor House ruins, early 19th century	Eligible, Criterion C	Outside of construction area, within proposed Spaceport Camden site boundary
CM-CO 31, Resource B	Charles Rinaldo Floyd Burial Site, 1845	Eligible, Criteria B & C, Criteria Consideration C	Outside of construction area, within proposed Spaceport Camden site boundary
CM-CO 31, Resource C	Floyd Family Cemetery, early to mid-19th century	Eligible, Criteria A & C, Criteria Consideration D	Outside of construction area, within proposed Spaceport Camden site boundary
Historic Properties in APE for Audible, Vibratory, and Visual Effects: 5-mile Radius			
[No number for historic district]	Dover Bluff Club (DBC) Historic District (HD)	Eligible HD, Criterion C	Dover Bluff
CRA #1	Linear Ranch, 1960	Contributing to DBC HD, Criterion C	Dover Bluff
CM-DB 9	Southern Bungalow, c. 1930	Contributing to DBC HD, Criterion C	Dover Bluff
CM-DB 10	Single-story, hip-roof residence, c. 1890	Contributing to DBC HD, Criterion C	Dover Bluff
CM-DB 11	Single-story, front-gable residence, c. 1940–1950	Contributing to DBC HD, Criterion C	Dover Bluff
CRA #2	One-and-one-half-story, side-gable residence, 1967	Contributing to DBC HD, Criterion C	Dover Bluff
CRA #3	Linear Ranch, 1971	Contributing to DBC HD, Criterion C	Dover Bluff
CM-DB 12	Southern Bungalow, c. 1940	Contributing to DBC HD, Criterion C	Dover Bluff
CRA #4	Single-story, front-gable residence, 1950	Contributing to DBC HD, Criterion C	Dover Bluff
CRA #5	Single-story, front-gable residence, 1950	Contributing to DBC HD, Criterion C	Dover Bluff
CRA #6	Compact Ranch, 1970	Contributing to DBC HD, Criterion C	Dover Bluff

Table 3.8-1. Historic Properties Within the Spaceport Camden Areas of Potential Effect (Continued)

Resource Number	Resource Description	NRHP Eligibility	Location in APE
CM-DB 13	Southern Bungalow, c. 1900–1918	Contributing to DBC HD, Criterion C	Dover Bluff
CRA #7	Single-story, front-gable residence, c. 1938–1961	Contributing to DBC HD, Criterion C	Dover Bluff
CM-DB 14	Single-story, front-gable residence, c. 1944	Contributing to DBC HD, Criterion C	Dover Bluff
CRA #8	Single-story, front-gable residence, c. 1938	Contributing to DBC HD, Criterion C	Dover Bluff
CRA #9	Compact Ranch, 1960	Contributing to DBC HD, Criterion C	Dover Bluff
CM-DB 16	Southern Bungalow, c. 1940	Contributing to DBC HD, Criterion C	Dover Bluff
CM-DB 17	Single-story, front-gable residence, c. 1940	Contributing to DBC HD, Criterion C	Dover Bluff
CRA #10	Linear Ranch, 1953	Contributing to DBC HD, Criterion C	Dover Bluff
CRA #11	Compact Ranch, 1973	Contributing to DBC HD, Criterion C	Dover Bluff
CRA #12	Single-story, front-gable residence, 1936	Contributing to DBC HD, Criterion C	Dover Bluff
CM-DB 19	Single-story, front-gable residence, c. 1936–1939	Contributing to DBC HD, Criterion C	Dover Bluff
CRA #13	Single-story, side-gable secondary residence, 1970	Contributing to DBC HD, Criterion C	Dover Bluff
CRA #14	Single-story, side-gable residence, c. 1900–1915	Contributing to DBC HD, Criterion C	Dover Bluff
CRA #16	Tabby Ruins	Contributing to Black Hammock Plantation (outside APE, of unknown NRHP eligibility), Criteria A & D	Dover Bluff
CRA #15	Cabin Bluff Cumberland River Retreat HD (CBCRR HD), c. 1920s-1930s	Eligible, Criteria A & C	Cabin Bluff
CRA #15, Resource A	Main lodge, 1928	Contributing to CBCRR HD, Criteria A & C	Cabin Bluff
CRA #15, Resource B	Cabin Bluff Outfitters, c. late 1920s-early 1930s	Contributing to CBCRR HD, Criteria A & C	Cabin Bluff
CRA #15, Resource C	Cabin c. late 1920s–early 1930s	Contributing to CBCRR HD, Eligible, Criteria A & C	Cabin Bluff
CRA #15, Resource D	New Hope Cabin c. late 1920s–early 1930s	Contributing to CBCRR HD, Eligible, Criteria A & C	Cabin Bluff
CRA #15, Resource E	Pine Tree Cabin c. late 1920s–early 1930s	Contributing to CBCRR HD, Eligible, Criteria A & C	Cabin Bluff
CRA #15, Resource F	Heritage Cabin c. late 1920s–early 1930s	Contributing to CBCRR HD, Eligible, Criteria A & C	Cabin Bluff
CRA #15, Resource G	Shellbine Cabin c. late 1920s–early 1930s	Contributing to CBCRR HD, Eligible, Criteria A & C	Cabin Bluff

Table 3.8-1. Historic Properties Within the Spaceport Camden Areas of Potential Effect (Continued)

Resource Number	Resource Description	NRHP Eligibility	Location in APE
CRA #15, Resource H	Cumberland Cabin c. late 1920s–early 1930s	Contributing to CBCRR HD, Eligible, Criteria A & C	Cabin Bluff
CRA #15, Resource I	Coolidge Tavern c. late 1920s–early 1930s	Contributing to CBCRR HD, Eligible, Criteria A & C	Cabin Bluff
CRA #15, Resource N	Bocce Ball Court, c. late 1920s–early 1930s	Contributing to CBCRR HD, Eligible, Criteria A & C	Cabin Bluff
CRA #15, Resource O	Picnic Area, c. 1960s–2000	Contributing to CBCRR HD, Eligible, Criteria A & C	Cabin Bluff
CRA #15, Resource P	Floyd Cabin, c. late 1920s–early 1930s	Contributing to CBCRR HD, Eligible, Criteria A & C	Cabin Bluff
CRA #15, Resource Q	Wharf/Boat House, c. 1990s	Contributing to CBCRR HD, Eligible, Criteria A & C	Cabin Bluff
CRA #15, Resource T	Tennis Court and Gazebo, c. 1960–1980	Contributing to CBCRR HD, Eligible, Criteria A & C	Cabin Bluff
CRA #15, Resource U	Golf Course, c. 1960–1980	Contributing to CBCRR HD, Eligible, Criteria A & C	Cabin Bluff
CRA #15, Resource X	Landing Strip, c. 1930s–1958	Contributing to CBCRR HD, Eligible, Criteria A & C	Cabin Bluff
#78000265	High Point-Half Moon Bluff (HP-HMB) Historic District, c. 1700–mid-20th century	Listed as HP-HMB HD, Criteria A & D	CUIS: HP-HMB HD
#78000265, Resource A	First African Baptist Church, 1937	Contributing to HP-HMB HD, Criterion A	CUIS: Half Moon Bluff
#78000265, Resource B	Rischarde Red Barn, c. 1935–1945	Contributing to HP-HMB HD, Criterion A	CUIS: Half Moon Bluff
#78000265, Resource C	Alberty House, c. 1935–1945	Contributing to HP-HMB HD, Criterion A	CUIS: Half Moon Bluff
#78000265, Resource D	Trimmings House, c. 1935–1945	Contributing to HP-HMB HD, Criterion A	CUIS: Half Moon Bluff
#78000265, Resource I	Cemeteries, c. 1880	Contributing to HP-HMB HD, Criterion A	CUIS: Half Moon Bluff
#78000265, Resource J	High Point Road, c. 1880	Contributing to HP-HMB HD, Criterion A	CUIS: Half Moon Bluff to High Point
#84000941	Main Road, c. 1800–1870	Listed individually (no HD), Criterion A	North end of CUIS
[no number]	Cumberland Island Cultural Historic Landscape	Eligible as Historic Landscape (no HD), Criteria A, B, C, & D	CUIS

Notes: CBCRR = Cabin Bluff Cumberland River Retreat; CUIS = Cumberland Island National Seashore; c. = circa; DBC = Dover Bluff Club; HD = historic district; HP-HMB = High Point-Half Moon Bluff; n/a = not applicable; NRHP = National Register of Historic Places.

[1] If project design cannot avoid this resource, then further investigations will determine if it is eligible for listing on the NRHP; if eligible, then there would be an adverse effect on historic properties.

Archaeological Resources

Known archaeological resources are found in the APEs, which include historic properties from the pre-contact (often described as prehistoric) era; Table 3.8-1 above summarizes these resources.

The portions of the APE for direct effects where ground disturbance would occur, consisting of the four construction zones, laydown areas, and utility corridors, have been intensively surveyed. Seven archaeological sites and three isolated finds have been recorded within the proposed Spaceport Camden site that also includes a portion of the APE for audible, vibratory, and visual effects. All seven sites date from the pre-contact era and include shell material, either in the form of scattered shell or in shell middens. Most of the archaeological sites that include dateable material appear to be from the Woodland (3,000 to 1,000 years before present [B.P.]) and/or Mississippian (1,100 to 500 B.P.) eras. Four of the sites are located within the APE for direct effect from ground disturbance, within the Vertical Launch Facility footprint. All four sites have not been evaluated for NRHP eligibility, and the SHPO concurs that they should be treated as if they are "potentially eligible" (SHPO letter dated April 3, 2017), until such time that a formal evaluation for listing on the NRHP is completed for each site. If found to be eligible, it would most likely be under Criterion D, for their potential to yield information important in prehistory. The isolated finds, two of which are within the Vertical Launch Facility footprint and one within the Launch Control Center Complex area, are not considered eligible for listing on the NRHP as they lack integrity and are unlikely to make a significant contribution to our understanding of history or prehistory. Three sites outside of the construction area, but within the proposed Spaceport Camden site boundary, have not been evaluated for NRHP eligibility, and thus are treated as if they are eligible until such time as there could be an effect, at which time compliance with Section 106 of the NHPA would include NRHP eligibility evaluation.

Architectural Resources

Known architectural resources are found in the APE for direct effects and the APE for audible, vibratory, and visual effects outside of Cumberland Island (Cumberland Island resources are discussed in the following subsection). This category includes historic properties (i.e., those that are listed on, or eligible for listing on the NRHP) within the proposed Spaceport Camden site boundary and within the 5-mile radius APE for audible, vibratory, and visual effects, to aid in the analysis found in Chapter 4, *Environmental Consequences*. Refer to Table 3.8-1 for a summary of information on individual resources discussed in this section.

No architectural resources are located within the construction areas of the APE for direct effects. Within the proposed Spaceport Camden site boundary, but outside of the construction areas, architectural inventory efforts identified and recorded nine architectural resources as individual features within the Floyd's Fairfield and Bellevue Plantations/Union Carbide Property. These date to two eras: the Floyd Plantations of Fairfield and Bellevue, circa 1805 to circa 1877, and the Thiokol Chemical Company, circa 1960s. From the plantation era, the ruins of the Anchor House, the Charles Rinaldo Floyd Burial Site, and the Floyd Family Cemetery are eligible for listing on the NRHP. The Anchor House ruins (Resource A of CM-CO 31) is eligible under Criterion C because of its unique design as an example of antebellum architecture in Georgia. Although lacking integrity as a complete structure, the ruins retain integrity of location, design, materials, and workmanship. The ruins still convey the original dwelling's unique anchor-shaped floor plan, and the walls retain their original tabby construction material. The Charles Rinaldo Floyd burial site (Resource B of CM-CO 31) is eligible based on its integrity, particularly of location, design, and material and under NRHP Criterion B for its association with Charles Rinaldo Floyd, whose historical significance lies in his exploration of Okefenokee Swamp and subsequent writing about the antebellum era, and Criterion C as a good and representative example of the family cemetery type. Criteria Consideration C, which states that a birthplace or grave of a historical figure is eligible if the person is of outstanding importance and if there is no other appropriate site or building directly associated with his or her productive life, also applies regarding the eligibility of his burial site. The Floyd Family Cemetery dates to the mid-19th century and is one of the oldest remaining cemeteries in the region that has not

been modernized. It is eligible for listing on the NRHP based on its integrity, particularly of location, design, and material; under Criterion A for its association with Camden County's early history on a local level; Criterion C as a good and representative example of the family cemetery type; and Criteria Consideration D, which requires that a cemetery derive its primary significance (in part) from age.

None of the resources related to development and operation of Thiokol are considered to be eligible for listing on the NRHP. They lack integrity of setting and significant associations and do not meet any of the NRHP criteria.

Outside of the proposed Spaceport Camden site boundary, but within the 5-mile radius of the architectural APE, architectural inventory of the entire APE for audible, vibratory, and visual effects identified three groups of resources. Table 3.8-1 lists the structures within the APE for audible, vibratory, and visual effects. Cabin Bluff, Cumberland River Retreat, south of the proposed Spaceport Camden site boundary, was part of the Camden Hunt Club, founded by C.R. Floyd. The remaining 23 structures include the main lodge, the Cabin Bluff Outfitters, numerous named cabins, and various associated outbuildings (e.g., garages, recreation structures). Sixteen of these resources are considered part of a historic district that is eligible for listing on the NRHP under Criterion A as good and representative illustrations of recreational trends in the United States and under Criterion C for the architectural embodiment of those trends. Dover Bluff, north of the proposed Spaceport Camden site boundary, had a similar origin, as the location of a hunting club and associated housing. The remaining Dover Bluff structures are within the 5-mile APE but outside of Cumberland Island. These are also considered to be eligible for listing on the NRHP as contributing elements of the Dover Bluff Club Historic District under Criterion C as good and representative examples of coastal versions of vernacular house types. Also located on Dover Bluff, Tabby Ruins, associated with the Black Hammock Plantation Historic District (which is outside the APE), are eligible under Criterion A for the Black Hammock association and Criterion D for information potential.

Cumberland Island National Seashore

Several structures on Cumberland Island, south of the APE for audible, vibratory, and visual effects, are from the 1880s and are associated with the Carnegie occupation. A few resources pre-date this period, such as the tabby house associated with the Greene-Miller occupation, a handful of cemeteries, the slave chimneys associated with the Stafford plantation, and archaeological sites.

The historic resources on Cumberland Island are contained within the following five historic districts, two archaeological districts, and three individual sites, all of which are listed on the NRHP:

- High Point-Half Moon Bluff Historic District, located at the island's north end, within the APE for audible, vibratory, and visual effects (#78000265, listed on the NRHP on December 22, 1978)
- Little Cumberland Island Lighthouse, privately owned within privately held property, located at the island's north point, outside the APE for audible, vibratory, and visual effects (#89001407, listed on the NRHP on August 28, 1989)
- Dungeness Historic District, located on the island's south end, outside the APE for audible, vibratory, and visual effects (#84000920, listed on the NRHP on February 13, 1984)
- Greyfield Historic District, privately owned and located on the south end within privately held property, outside the APE for audible, vibratory, and visual effects (#03000675, listed on the NRHP on July 24, 2003)
- Stafford Plantation Historic District, located mid-island, outside the APE for audible, vibratory, and visual effects (#84000265, listed on the NRHP on November 23, 1984)

- Plum Orchard Historic District, located mid-island, outside the APE for audible, vibratory, and visual effects (#84000258, listed on the NRHP on November 23, 1984)
- Table Point Archaeological District, located mid-island, outside the APE for audible, vibratory, and visual effects (#84000260, listed on the NRHP on November 23, 1984)
- Rayfield Archaeological District, located mid-island, outside the APE for audible, vibratory, and visual effects (#84000924, listed on the NRHP on February 13, 1984)
- Duck House, outside the APE for audible, vibratory, and visual effects (#84000938, listed on the NRHP on February 13, 1984)
- Main Road, within the APE for audible, vibratory, and visual effects (#84000941, listed on the NRHP on February 13, 1984)

The NRHP-listed High Point-Half Moon Bluff Historic District contains two complexes of buildings: (1) an African-American Settlement at Half Moon Bluff and (2) a former resort at High Point. The African-American Settlement at Half Moon Bluff is located in the current project's APE, as is a portion of the NRHP-listed Main Road. The remainder of these historic districts and properties are outside the APE for audible, vibratory, and visual effects.

At Cumberland Island, the NPS has documented 91 historic structures and 64 archaeological sites. Most of these resources are considered contributing historic properties to the island's historic districts and date from the early 19th century to mid-20th century. Archaeological resources on the island may be as old as 4,000 years. Those archaeological sites within the defined historic districts are contributing resources to each district, while additional archaeological sites are located outside the districts. Archaeological sites on Cumberland Island are outside the APE for archaeological resources, as established through NHPA Section 106 consultation (see Appendix A) and are not further detailed or analyzed in the EIS.

Five NRHP historic districts and two archaeological districts have been documented within Cumberland Island National Seashore. The High Point-Half Moon Bluff Historic District, located on the north end of Cumberland Island, is the only NRHP-listed historic district within the APE for audible, vibratory, and visual effects.

Shown in Table 3.8-1, contributing elements of the NRHP-listed High Point-Half Moon Bluff Historic District that are also within the APE for audible, vibratory, and visual effects include portions of the African-American Settlement, the First African Baptist Church, Rischarde Red Barn, Alberty House, Trimmings House and Outbuildings, three cemeteries, and High Point Road. The historic district and its contributing elements are listed on the NRHP, under Criterion A, representing the evolution of an African-American community transitioning from slavery to a community without property rights to landowners who transferred their land to their descendants. The buildings and structures retain sufficient integrity of location, setting, feeling, and association to convey their meaning (NPS, 1978).

Outside of the historic district, the NRHP-listed Main Road is listed separately on the NRHP (#84000941), eligible under Criterion A for significance in the area of transportation.

Cultural Landscape

The Cumberland Island Cultural Historic Landscape has been identified as eligible for listing on the NRHP under Criterion A for association with events that have made a significant contribution to the broad patterns of history. This extensive resource may also be eligible under Criteria B, C, and D. This resource runs nearly the entire length of Cumberland Island and overlaps with the outer mile of the 5-mile radius APE for audible, vibratory, and visual effects.

Traditional Cultural Resources

When the Spanish first arrived in the region, the interior portions of what is now Camden County were inhabited by the Mocama Native Americans, followed by the Creek Native Americans. The Tacatacura tribe of the Timucua Native Americans lived on Cumberland Island. They spoke the Mocamo dialect of Timucuan. These tribes disappeared from the region centuries ago, but numerous tribes continue to have interests in Camden County. FAA continues to consult with the following State and federally recognized tribes: Cherokee of Georgia Tribal Council, Chickasaw Nation, Choctaw Nation of Oklahoma, Georgia Tribe of Eastern Cherokee, Lower Muskogee Creek Tribe, Muscogee Creek Nation, Poarch Band of Creeks, Seminole Nation of Oklahoma, Seminole Tribe of Florida, and Thlopthlocco Tribal Town. In January 2018, the Choctaw Nation of Oklahoma responded that they did not want to participate in the consultation. FAA has also invited the Gullah/Geechee Commission on the Gullah Geechee Cultural Heritage Corridor to participate in Section 106 consultation. The Gullah/Geechee Sea Island Coalition accepted FAA's invitation to be included in consultation under Section 106 of the NHPA on June 17, 2020. Resources within the APE considered to be traditional cultural resources by the Gullah/Geechee include the African-American Settlement and associated structures at Half Moon Bluff. If consultation with tribes or other identified groups results in the identification of traditional cultural resources, FAA will continue to consult with the appropriate groups to determine the nature of the resource. All relevant correspondence is provided in Appendix A, *Public Involvement/Agency Coordination and Consultation*.

3.9 Land Use

3.9.1 Definition and Description

Land use is the classification of activities occurring at a given location whether the land is in a natural state or has been modified or developed. Land uses are often identified by general plans, management plans, and land use policies that determine the type and extent of land use allowable in specific areas and protect specially designated or environmentally sensitive areas. Ordinances (e.g., zoning) regulate the types of activities determined to be acceptable within the identified land uses.

The Wilderness Act of 1964 (Public Law 88-57) was passed "to assure that an increasing population accompanied by expanding settlement and growing mechanization, does not occupy and modify all areas within the United States and its possessions, leaving no lands designated for preservation and protection in their natural condition." *Wilderness Area* is defined in Public Law 88-57 (16 U.S.C. §§1131–1136) as "an area where the earth and its community of life are untrammeled by man, where man himself is a visitor who does not remain" and "an area of undeveloped Federal land retaining its primeval character and influence, without permanent improvements or human habituation, which is protected and managed so as to preserve its natural conditions." Based on this legal definition, five qualities of wilderness character have been identified and defined as:

- **Untrammeled.** Wilderness is essentially unhindered and free from the actions of modern human control or manipulation.
- **Natural.** Wilderness ecological systems are substantially free from the effects of modern civilization.
- **Undeveloped.** Wilderness is essentially without permanent improvements or the sights and sounds of modern human occupation.

- **Solitude or primitive and unconfined recreation.** Wilderness provides opportunities for people to experience natural sights and sounds, solitude, freedom, risk, and physical and emotional challenges of self-discovery and self-reliance. This quality focuses on the tangible aspects of the setting that affect the opportunity for people to directly experience wilderness.

- **Other features of value.** This quality captures ecological, geological, or other features of scientific, educational, scenic, or historical value that are not covered by the other four qualities but may not occur in all wilderness areas (Landres et al., 2015).

There is no record in the legislative history of the Wilderness Act as to what the framers meant by the phrase "outstanding opportunities for solitude or a primitive and unconfined type of recreation" (Landres et al., 2008). Meanings for the term "solitude" range from a lack of seeing other people to freedom from societal constraints and management regulations. Holistic views of "solitude" involve providing inspiration for an awakening of the senses, connection with the beauty of nature, and allowing one to let go of everyday obligations and to go at one's own pace (Landres et al., 2015). Similarly, meanings for "primitive" and "unconfined" recreation are wide-ranging. The term *primitive recreation* implies traveling by non-motorized and non-mechanical means and relying on personal skills rather than facilities or outside help (Roggenbuck, 2004). "Unconfined" refers to attributes including self-discovery, exploration, and freedom from societal or managerial controls (Dawson & Hendee, 2009). Combined together, this wilderness quality provides opportunities for physical and mental challenges associated with adventure, real consequences of mistakes, and personal growth resulting from encountering and overcoming obstacles (Landres et al., 2015).

No national standards have been developed that define an acceptable degree of solitude or primitive and unconfined recreation, because each wilderness is unique in its legislative, administrative, social, and biophysical setting (Landres et al., 2005). Dawson (2004) suggests that outstanding opportunities for solitude require some degree of separation in sight, sound, and distance between visitors in the wilderness from people and activities occurring outside the wilderness. Signs of human activity and development outside wilderness that can degrade the wilderness experience include (1) automobiles and off-road vehicles, (2) aircraft overflights, (3) development and use of inholdings, (4) air and light pollution, and (5) urbanization from high ridges and peaks (Landres et al., 2015).

Within wilderness areas, the desire is for human-produced noise to be substantially unnoticeable, and thus it is possible that even "quiet urban daytime" noise levels may be perceived as too loud and would detract from solitude. Natural soundscapes within wilderness areas are composed of many natural sounds, near and far, and may include the sounds of ocean waves, blowing wind, chirping birds, insects, and many other sounds found in nature, including at times complete silence. The opportunity to experience the natural soundscape of a wilderness area unimpaired by the sounds of human civilization is considered an important part of the overall visitor experience, especially as it contributes to the solitude character of the wilderness area. However, no noise thresholds have been established for wilderness.

Light pollution affects even otherwise pristine sites because it is easily observed during the night at great distances from its source in landscapes that seem untouched by humans during the day. Specifically, it can damage nighttime landscapes in protected areas such as national parks and wilderness areas (Falchi et al., 2016). The view of a dark night sky can be interpreted as part of the intent of the Wilderness Act of 1964 to provide all Americans access to primitive and unconfined recreation and opportunities for the spiritual enlightenment and personal development from wilderness experiences.

3.9.2 Regulatory Setting

The following laws, executive orders, agency regulations, and other guidance apply to the Proposed Action.

National Environmental Policy Act and Implementing Regulations

Specific guidance relevant to land use is given in the CEQ's NEPA-implementing regulations (40 CFR §1502.16(c)), which requires the discussion of environmental impacts including "possible conflicts between the Proposed Action and the objectives of Federal, regional, State, and local land use plans, policies and controls for the area concerned." Where an inconsistency exists, the NEPA document should describe the extent to which the agency would reconcile its action with the plan (see 40 CFR §1506.2(d)).

Georgia Planning Act of 1989

The Georgia Planning Act of 1989 provides a framework for local, regional, and State comprehensive planning. The Act enables, but does not require, Georgia municipalities and counties to develop comprehensive plans and land use regulations. Only qualified local governments, which have met the minimum local planning requirements established by the State, are eligible for certain State funding programs and permits. Additionally, development impact fees may only be enacted by qualified local governments that have adopted State-approved capital improvement elements. The Georgia Department of Community Affairs establishes minimum local planning requirements and provides guidance and assistance to local governments to support planning needs.

In compliance with Georgia Department of Community Affairs requirements, the County developed a local Joint Comprehensive Plan along with the City of Kingsland, City of St. Marys, and City of Woodbine (Coastal Georgia Regional Development Center, 2007). Although the Joint Comprehensive Plan did not specifically consider the proposed spaceport, it did acknowledge that the Bayer CropScience area would remain used for industrial development.

Camden County Unified Development Code and Policies

Land use is regulated by all levels of government. Typically the most immediate governmental jurisdiction, such as county or local municipalities, is most likely to control land use and have site-specific stipulations. The proposed Spaceport Camden would be located entirely within Camden County. Land use planning for Camden County is primarily guided by the following:

- *Camden County, City of Kingsland, City of St. Marys, City of Woodbine Joint Comprehensive Plan 2007 – 2027* (Coastal Georgia Regional Development Center, 2007)
- *Camden Kings Bay Joint Land Use Study* (AMEC, 2014)
- *Camden County Strategic Plan 2020–2025–2035* (Camden County, 2020)
- Camden County Unified Development Code (UDC) & Amendments (www.co.camden.ga.us/548/UDC-Amendments)

The Wilderness Act of 1964

Congress provided for a system of wilderness lands that shall be administered for the "use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness." The Act also describes these areas as "places where the earth and its community of life are untrammeled by man" and where "the imprint of man's work (is) substantially unnoticeable." Refer to Section 3.2.2, *Biological Resources, Regulatory Setting*, Section 3.11.2, *Noise and Noise-Compatible Land Use, Regulatory Setting*, and Section 3.13.2, *Visual Effects, Regulatory Setting*, for laws, regulations, and other guidance associated with those resource areas as they relate to wilderness.

3.9.3 Existing Conditions

The ROI for land use includes the 11,800-acre proposed Spaceport Camden industrial site (Exhibit 2.1-1 and Exhibit 2.1-2), areas immediately surrounding the proposed Spaceport Camden project area, areas under and near the proposed launch trajectory (Exhibit 2.1-4), areas within the composite USCG LAA (Exhibit 2.1-10) where public access would be limited by using access control checkpoints, and Cumberland Island Wilderness and proposed wilderness areas. It also includes areas where noise-compatible land use impacts are expected (Sections 3.11 and 4.11, *Noise and Noise-Compatible Land Use*).

The proposed Spaceport Camden would be located in an unincorporated area of Camden County, approximately 11.5 miles east of the city of Woodbine (see Section 1.1, *Background*). Presently the entire project site is owned by the Union Carbide Corporation and Bayer CropScience and is a combination of uplands and marshlands. The County has entered into an option agreement to purchase about 4,000 acres of the Union Carbide Corporation property and is considering an option to purchase an additional 7,800 acres of Bayer CropScience property.

Historic Land Use. Historical land use of the property has included two plantations and a ship-building enterprise in the 1800s. Between 1927 and 1942, the location was redeveloped and used as a hunting preserve. In the early 1940s it was used as a tree farm and source of fiber for a local paper mill. During the 1960s, the Thiokol Corporation (later Morton Thiokol) produced and tested solid rocket motors for NASA. After that, the site was converted to manufacture military hardware and supplies, including mortar ammunition, trip flares, tear gas, and assorted chemicals, during which time regular munitions testing occurred. In 1976, Union Carbide Corporation purchased the approximately 7,193-acre property from Morton and the facility was operated by a Union Carbide subsidiary from 1976 to 1986 for pesticide manufacturing. In 1986, Union Carbide sold the manufacturing plant and some of the adjacent land to Rhone-Poulenc, which was later renamed Aventis CropScience and then Bayer CropScience. Pesticide (Temik) manufacturing operations ceased in 2012, and most of the physical buildings and related infrastructure were removed by late 2015.

Most industrial activities on the site were on the southeastern portion of the current property or to the north along Todd Creek. The industrial complex included numerous large and tall buildings, water treatment facilities, storage facilities, a dock complex, and the main manufacturing facility, which stood over 300 feet tall and was surrounded by several conveyor ramps up to near the top of the facility. The facility hosted 24-hour operations with three shifts of employees. Due to the nature of the pesticide manufacturing operations, the site was well lit at night. A 58-acre, closed RCRA landfill, with buffer area, is on the site near Todd Creek, and Bayer CropScience owns an outparcel within the Union Carbide Corporation property that contains an inactive wastewater spray irrigation field. Other artifacts from the site's industrial history include former and closed solid waste management units, an abandoned asphalt airstrip and Loop Road, a rocket test pit, and several unimproved service roads (CH2M Hill, 2015).

Existing Land Use. Adjacent to and west of the Union Carbide Corporation property and the former Bayer CropScience industrial area, the site setting is rural and largely undeveloped. Adjacent and to the west is the Ceylon Wildlife Management Area (WMA). The WMA is a 16,000-acre property that offers hunting for deer, turkey, small game, and waterfowl. The entrance to the WMA is approximately 1 mile east of Exit 14 off I-95. Properties southwest of the site are owned by Mead Timber Company and the Nature Conservancy, which owns Cabin Bluff on the Cumberland River. In the fall of 2020, the Georgia Board of Natural Resources voted to acquire nearly 8,000 acres of the historic Cabin Bluff property in Camden County for designation as a state wildlife management area, while the remaining approximately

3,200 acres is slated to become a retreat for a Jacksonville, Florida-based church congregation. Land use to the north remains undeveloped marsh lands. The closest residence is located approximately 2.5 miles west of the western spaceport site boundary of the site and additional low-density residential properties are located further to the southeast along Union Carbide Road near Fancy Bluff Creek. Other land uses and recreational areas near the proposed Spaceport Camden site include the communities of Woodbine, Kingsland, and St. Marys, as well as NSB Kings Bay, Crooked River State Park, the Intracoastal Waterway, Cumberland Island National Seashore (see Section 1.1, *Background*), and Little Cumberland Island.

Cumberland Island has two primary land uses: residential and conservation preservation. Little Cumberland Island is located at the north tip of Cumberland Island. It is a 2,400-acre tract that is separated from the Great Cumberland by Christmas and Brockington Creeks. Although part of Cumberland Island National Seashore, Little Cumberland Island is privately owned, not open to visitors without an invitation, and primarily composed of residential uses. On Little Cumberland Island, there are 100 2-acre lots where development is allowed, but according to county records, only 44 lots have been built on. Little Cumberland Island Homes Association owns several developed lots, including, but not limited to, cottages, a shop, a tractor shed, an archive building, sheds, boat docks, and a lighthouse. Little Cumberland Island is only accessible by boat. Each private property owner on Little Cumberland Island has the right to use and enjoy their properties at any time, 365 days a year. A private ferry brings residents and their guests from a dock in Glynn County (to the north). The Little Cumberland Island dock is accessible at all times, except for approximately 1 hour during the lowest tide, due to the depth of the water. A main feature of Little Cumberland Island is the Little Cumberland Lighthouse, the southernmost beacon on the Georgia coast. Owned and maintained by the Little Cumberland Island Homes Association, the 60-foot-tall lighthouse began operation in 1838 (Sherpa Guides, 2017). The lighthouse was placed on the NRHP in 1989. Located south of Little Cumberland Island is the Cumberland Island National Seashore, which is managed by the NPS and considered a conservation preservation land use, accessible to the public during their listed hours of operation for recreation, unless a reservation and permit for camping is obtained.

Zoning and land use for Camden County is handled by the Camden County Planning and Development Department under the UDC and Amendments. Exhibit 3.9-1 shows the current zoning for the proposed Spaceport Camden and the surrounding area. The area proposed for Spaceport Camden includes two parcels (Parcel ID: 155 001 and 155 001A). The upland portion of the property (which includes the proposed Spaceport Camden site) is zoned I-G (general industrial), and the adjacent marsh portion is zoned C-P (conservation preservation). The description and permitted uses in each district can be found in Article 2 of the Camden County UDC. The Camden County UDC and zoning map can be accessed at www.co.camden.ga.us/74/Planning-Development on the Planning and Development website. The UDC was amended on September 23, 2014, to allow spaceport-related manufacturing as a permitted use and spaceport-related aviation as a special use in I-G zoning. The future land use designation for the upland portion of the property is shown as “Industrial” and the marsh portion is shown as “Conservation.” Parcels to the west and south of the proposed Spaceport Camden site are zoned as PD (planned development) with the future land use designated as “Mixed Use” and A-F (general agriculture-forestry) with the future land use designated as “Rural Residential” (A-R).

Table 3.9-1 shows that these designations are consistent with the zoning as required by UDC table 12.2 (Camden County, 2015).

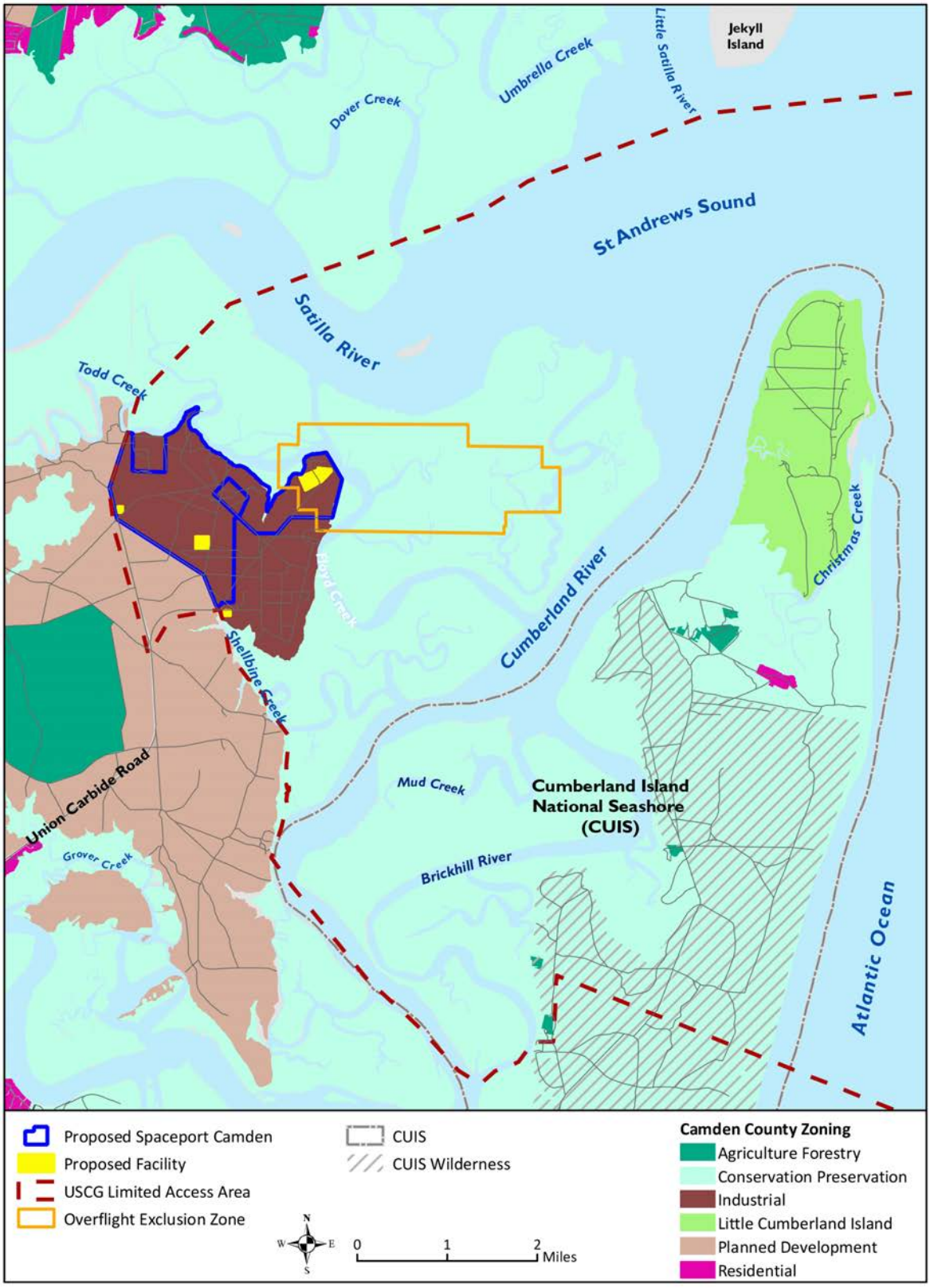


Exhibit 3.9-1. Camden County Zoning and Land Use

Table 3.9-1. Future Land Use Categories and Zoning

Future Land Use Map Category	Consistent Zoning Districts	Comments
Industrial	I-R	In proximity to areas where compatibility with nearby residential or commercial uses is of concern
	I-G	In areas where restrictions and compatibility issues are at a minimum
Parks, Recreation, and Conservation	C-P	Areas designated as public parks, the Cumberland Island National Seashore, marshes and other protected environmental areas
Mixed Use	PD	Areas specifically approved for new or existing master planned and controlled development
Rural Residential	A-R	Areas where agricultural uses and limited residential development on minimum 2-acre lots, where public or community sewer is anticipated

Notes: A-R = Rural Residential; C-P = conservation preservation; I-G = general industrial; I-R = residential industrial; PD = planned development.

Cumberland Island Wilderness

Congress designated the Cumberland Island Wilderness in 1982 (Public Law 97-250) along the northern portion of Cumberland Island, and the boundaries were later modified in 2004 (Public Law 108-447, Cumberland Island Wilderness Boundary Adjustment Act of 2004) to remove Main Road, North Cut Road, and the Plum Orchard Spur from the wilderness designation and increase the overall acreage to 9,886 acres (Exhibit 3.9-1). The 2004 Act also designated approximately 10,500 acres as potential wilderness. Potential wilderness includes non-qualifying lands that are surrounded by or adjacent to the designated wilderness. Both designated wilderness and potential wilderness areas are managed by the NPS to protect the existing wilderness values. For the purposes of this EIS, references to the Cumberland Island Wilderness include both the designated and potential wilderness areas at Cumberland Island. A wilderness management plan for Cumberland Island Wilderness has not been developed; however, the Cumberland Island National Seashore General Management Plan (NPS, 1984), Cumberland Island Fire Management Plan (NPS, 2015), and the Transportation Management Plan (NPS, 2009a) each contain measures that address managing and preserving the wilderness character of Cumberland Island.

The wilderness character of the Cumberland Island Wilderness is described below:

Untrammeled. The Cumberland Island Wilderness is allowed to function essentially unhindered and free from human manipulation; however, much of the upland portion of the wilderness is in transition from past human land-disturbing activities and historic fire suppression efforts. In addition, Cumberland Island Wilderness has multiple private inholdings that are not open to the general public, which impact the untrammeled quality of Cumberland Island Wilderness. Before 2004, the portion of Main Road that was included in the original wilderness designation was used by motorized vehicles of island residents. With the passage of Public Law 108-447 in 2004, which removed roads and right-of-ways from the designation, NPS was then authorized to provide motorized trips to access both the north and south ends of the island and to conduct management activities necessary for the administration and preservation of wilderness resources and reserved estates. Although these activities are typically viewed as beneficial, the following NPS management activities do impact the untrammeled quality of the wilderness, as they involve human actions to manipulate the components of ecological systems within the wilderness: monitoring and protecting endangered species, accessing and preserving cultural resources, managing invasive nonnative species, setting prescribed fires, and managing wildfires. Vehicle use by private residents and NPS management actions on the roads directly adjacent to wilderness degrades the untrammeled quality of

Cumberland Island. Climatic and oceanic forces associated with climate change also influence the wilderness. Natural processes are degraded in some areas by existing development in proximity to the wilderness (i.e., fire regime) (NPS, 2013).

Natural. Cumberland Island Wilderness protects a diversity of natural habitats and species, many of which are protected under State and Federal law (i.e., sea turtles, piping plovers). Although these habitats and species now are largely free from the influences of modern civilization, much of the forested portion of the wilderness was historically grazed, cultivated, and logged. These influences, plus past exclusion of natural fire, have impacted the vegetative communities in the wilderness, but current prescribed burning efforts and invasive nonnative plant species management are positive forces for restoring natural communities on the island. Nonnative feral animals (i.e., pigs and horses) do continue to negatively impact the natural quality of the wilderness through disturbance of natural successional processes and vegetative patterns (NPS, 2013). Refer to Section 3.2.3, *Biological Resources, Existing Conditions*, for additional descriptions of vegetative communities and wildlife species found within the wilderness.

Undeveloped. Although most of the Cumberland Island Wilderness is undeveloped, the island has a long history of human occupation, and some private property, improvements, and development still exist within the wilderness boundary. Development includes a small number of residential structures on reserved estates, along with dirt access roads. The Main Road, Plum Orchard Spur, and North Cut Road are technically outside of designated wilderness (25-foot right-of-way), but they do traverse through the wilderness, and provide access for more vehicular access than is typical for wilderness areas (NPS, 2013).

Solitude or Primitive and Unconfined Recreation. The Cumberland Island Wilderness provides an opportunity for visitors to directly experience wilderness, including solitude, risk, challenge, and freedom from societal pressures. Entrance to Cumberland Island National Seashore is only accessible via ferryboat or private boat, and the maximum number of daily visitors allowed access to Cumberland Island National Seashore per day is 300. This limit does not include residents or overnight campers. Within the wilderness, camping is allowed only at three designated camping areas (Hickory Hill, Yankee Paradise, and Brickhill Bluff). The maximum number of overnight campers allowed at each wilderness camping area is 24 (NPS, 2020c). To reach the wilderness portion of the island, visitors must hike in from the ferry drop-off, and most visitors remain in the immediate vicinity of the drop-off area. This physical isolation and daily visitor cap provides visitors with outstanding opportunities for outdoor recreation and solitude. Although recreation is largely "unconfined" within the wilderness, visitors are subject to some restrictions (i.e., seasonal restriction from nesting areas of federally listed species). Access is also restricted to hunters only during certain times of year; bows, primitive weapons, and modern weapons are permitted during hunts. Visitors enjoy recreational activities such as hiking, camping, hunting, fishing, stargazing, photography, bird watching, beach combing, wildlife viewing, swimming, private boating, and biking. See Section 3.12.1.3, *Socioeconomics, Existing Conditions*, for additional information on recreational activities on Cumberland Island.

Alterations to the natural soundscape, lightscape, or viewshed can diminish a wilderness visitor's perception of solitude, and in some cases may impact the natural quality of the wilderness. The natural soundscape of the island includes blowing wind, ocean waves, and chirping birds, frogs, and insects, and at times may include total silence. Anthropogenic noise sources within and adjacent to Cumberland Island Wilderness that alter the natural soundscape include other visitors, park management activities, silvicultural operations, residents of the reserved estates, vehicles on Main Road, Plum Orchard Spur, and North Cut Road, and operation of the Land and Legacies Tour. Beach driving, which is regulated by GDNR, can be seen and heard from the wilderness (NPS, 2013). Noise sources from the areas outside wilderness include industrial and military facilities to the south and west, mid- and low-level aircraft over-flights, and

vessel traffic on the waterways around the island (NPS, 2013). Acoustic readings recorded for the Cumberland Island National Seashore Travel Management Plan documented daytime noise levels across the island ranging from 35 to 70 dBA (NPS, 2009a). More recently, NPS estimates that median sound levels in the area are between 36 and 38 dBA, based on long-term measurements in parks as well as urban and rural areas across the country (NPS, 2016).

The lightscape is an important element of wilderness character. Although Cumberland Island National Seashore is not a "dark skies park" as designated by the International Dark-Sky Association (IDA) (IDA, 2017), there is no measurable nighttime radiance on the northern half of Cumberland Island and Little Cumberland Island (Exhibit 3.13-4). Pockets of measurably noticeable night radiance are evident at the Lodge at Cabin Bluffs (Exhibit 3.13-4 and Exhibit 3.13-3). Radiance levels increase around NSB Kings Bay and St. Marys. To the north of the Satilla River, light is detectable near Dover Drive (see observation point 15 on Exhibit 3.13-3) and on Piney Bluff, continuing to intensify toward Jekyll Island and Brunswick. To the west, the proposed Spaceport Camden site is essentially unilluminated by artificial light sources, but light levels do increase around Woodbine. Section 3.13.3.2, *Visual Effects*, *Existing Conditions*, *Light Emissions*, provides additional description of the current light emissions at the proposed spaceport site and surrounding areas.

Viewsheds for the Cumberland Island Wilderness are dominated by vegetation, water, and sky, depending upon the viewer's location. From interior portions of the wilderness, views to the mainland and proposed spaceport site are typically blocked by intervening terrain (i.e., remnant dune formations) and forest. On the west shore of Cumberland Island, views toward the proposed site are intermittent through gaps in screening vegetation, and some areas have open views to the site over the low salt marsh (Exhibit 3.13-3 and Table 3.13-1). The proposed spaceport site is predominantly vegetated, with the imprint of industrial uses, infrastructure, forestry, and silviculture punctuating the landscape. From Cumberland Wharf and Brickhill Bluff, there are open views to the eastern portion of the proposed spaceport site as middle-ground marsh with a band of darker forest canopy beyond the marsh; sky and water are the dominant elements of the view. The wide viewshed from Brickhill Bluff includes small housing enclaves, Cabin Bluff resort, and Jekyll Island community, which are more noticeable at night when lights are visible, but not glaring. Overall viewshed quality to the west of the wilderness from Brickhill Bluff and Cumberland Wharf is moderate to high.

Exhibit 3.13-1 shows a series of photographs of the site and surrounding areas that illustrate the prevalent views and visual character. Although some locations have no view or limited visual connection to the proposed Spaceport Camden site, all the representative locations would have visibility to rocket launches if oriented toward the flight path (see Section 4.13.1.2, *Operation*, and Table 4.13-1). Section 3.13.3, *Visual Effects, Existing Conditions,* provides additional detail on the existing visual character of the proposed Spaceport Camden site and the surrounding areas and viewsheds.

Other features of value – **Cultural Resources.** Cultural features and remnants may be found throughout Cumberland Island, which contribute to the area's features of historic values. There are five historic districts and two archaeological districts that are listed on the NRHP. Two historic districts, High Point-Half Moon Bluff Historic District and Plum Orchard Historic District, occur either within or directly adjacent to Cumberland Island Wilderness. The High Point-Half Moon Bluff Historic District is located on the northern portion of the island and overlaps with Cumberland Island Wilderness. It contains two structural complexes, a cemetery, three archaeological sites, and an archaeological zone on Terrapin Point. These sites reflect Native American habitation, colonial occupation, an African American community, and hotel/retreat periods on Cumberland Island. Plum Orchard Historic District is adjacent to Cumberland Island Wilderness, located at approximately the island's mid-point along the western shoreline. This

district contains 16 structures, cultural landscape features, a cemetery, and a large archaeological site. Section 3.8.3, *Historical, Architectural, Archaeological, and Cultural Resources, Existing Conditions,* describes all other historic, architectural, archaeological, and cultural resources found on Cumberland Island.

3.10 Natural Resources and Energy Supply

3.10.1 Definition and Description

This section describes the natural resources (such as water, metal, asphalt, aggregate, etc.) and energy supplies (such as coal or diesel for electricity; natural gas for heating; and fuel for construction equipment and commercial space launch vehicles) that would be consumed under the alternatives evaluated in this EIS. Consumption of these resources would occur as a result of proposed construction and operational activities.

3.10.2 Regulatory Setting

The following laws, executive orders, agency regulations, and other guidance apply to the Proposed Action.

Safe Drinking Water Act

The Safe Drinking Water Act authorizes USEPA to set national health-based standards for drinking water to protect against both naturally occurring and man-made contaminants that may be found in drinking water.

Georgia State Executive Order 04.24.08.02

Executive Order 04.24.08.02, signed in 2008, required Georgia State departments and agencies to reduce energy consumption by 15 percent by 2020 compared to a 2007 baseline on a per square foot basis. This reduction would be achieved through energy efficiency or through a combination with renewable energy. The Executive Order also encourages local governments, schools, individuals, and businesses to match the State's commitment.

Georgia State Minimum Standard Energy Code and Georgia Safe Drinking Water Act of 1977

Other Georgia statutes and Executive Orders related to natural resources and energy include the following:

- **Georgia State Minimum Standard Energy Code.** The State of Georgia adopted the energy standards listed in the 2009 International Energy Conservation Code with some amendments and modifications as described in *Georgia State Supplements and Amendments to the International Energy Conservation Code (2009 Edition)*.
- **Georgia Safe Drinking Water Act of 1977.** Establishes policies, procedures, requirements, and standards to carry out the purposes and requirements of the Federal *Safe Drinking Water Act*.

Camden County Unified Development Code Article 9: Environmental Protection

The Camden County UDC Article 9: Environmental Protection defines the minimum requirements and standards for the protection of the natural environment within the county. It includes restrictions on the use of land near certain rivers and streams, within groundwater recharge areas susceptible to pollution and in wetlands. The objective of this Code is to protect the drinking water quality of the aquifers that supply water to the residents of the jurisdiction and the state, protect the natural habitat of animal and plant life relative to water resources, and protect valuable water-related and other natural resources.

3.10.3 Existing Conditions

The ROI for natural resources and energy supply would include local and municipal sources of water and electricity, which would be supplied by providers and sources in Camden County. Resources such as building materials, aggregate, and fuel supplies required for the construction and operation of Spaceport Camden would be transported to the site from suppliers within the broader southeastern Georgia and northeastern Florida region. Other fuel and fuel-related materials could be provided by suppliers in the southeastern and eastern United States.

3.10.3.1 Natural Resources

Due to the lack of improvements and limited infrastructure available at the proposed project site, all facilities and much of the infrastructure would be newly constructed. Natural resources required for the construction and operation of Spaceport Camden would include fuels, industrial gases, building materials, and water (aggregate [concrete] and asphalt supply are discussed in Section 3.10.3.2, *Aggregate and Asphalt Supply*). Wood is expected to be a minor material used during spaceport construction. Natural gas/propane may be utilized for portable heaters during construction and operation of the spaceport.

Building materials are readily available from multiple suppliers in southeastern Georgia and northeastern Florida. All building materials would be purchased from these suppliers and then transported to the proposed project site. Suppliers of building materials for the construction of Spaceport Camden would include, but are not limited to:

- Pre-engineered metal
  - Pre-Engineered Steel Inc., Jacksonville, Florida (39 miles from the site)
  - American Eagle Steel Buildings, Jacksonville, Florida (67 miles from the site)
- Metal roofing and siding
  - Century Metal, Waverly, Georgia (32 miles from the site)
  - Metal Sales Manufacturing Corporation, Jacksonville, Florida (52 miles from the site)

As discussed in Section 3.14, *Water Resources*, the major sources of usable groundwater in Camden County are: the Floridan, the Brunswick, and an unnamed surficial aquifer. There is currently no potable or other water supply available at the proposed site of Spaceport Camden. The nearest municipal water supplies are located in the cities of Woodbine and Kingsland. The nearest available water comes in the form of two existing deep wells located on the Bayer CropScience portion of the site. These wells could be used to provide both potable water (well water would be treated onsite prior to entry into distribution system) and any water required for operational needs via pipelines. Although not in use at this time, the wells have been authorized to withdraw a combined 1.7 million gallons of water daily from the Floridan Aquifer and would be ready for use when project activities begin.

There are no sewage disposal utilities/septic systems currently available at the proposed project site. The nearest active septic system is located at the main gate building that provides access to the current Union Carbide Corporation and Bayer CropScience site.

3.10.3.2 Aggregate and Asphalt Supply

Construction of new facilities and infrastructure on Spaceport Camden would require large amounts of concrete (sand and gravel [aggregate]) and asphalt. There are currently a number of aggregate and asphalt suppliers in the vicinity of Camden County, some of which include:

- Seaboard Construction – Brunswick, Georgia (44 miles from the site)
- Duval Asphalt Products – Jacksonville, Florida (55 miles from the site)
- Preferred Materials – Jacksonville, Florida (45 miles from the site)

3.10.3.3 Energy Supply

Resources required for the supply of energy include electricity and fuels. No electrical power is currently available on the proposed Spaceport Camden site. Power is supplied to Camden County by Georgia Power, which serves over 2.6 million customers, with approximately 358,000 customers in the southeast region, where Camden County is located. Georgia Power generates power using oil and gas (46 percent), coal (25 percent), nuclear sources (22 percent), renewable sources (3 percent), and hydroelectric sources (2 percent) (Georgia Power, 2019).

The existing electrical infrastructure nearest to the Spaceport Camden site is a dedicated Georgia Power 115 kV transmission line routed from U.S. 17 through Harrietts Bluff/Union Carbide Road to the power substation on the property currently owned by Bayer CropScience. The primary electrical distribution nearest to the Spaceport Camden site is an aerial construction using wood poles and, while the line is currently unused, it is in good condition and ready for use (Mcdill, 2016). Electric power is available at the main gate building for the Union Carbide Corporation and Bayer CropScience properties and would be provided by the installation of power lines on wooden poles and connected to existing offsite power lines to each of the proposed new facilities.

The operation of Spaceport Camden would require the use of various fuels, propellants, and pressurants for launch vehicles. Small quantities of diesel fuel and gasoline would be needed during the construction of Spaceport Camden and could be provided by any of multiple local suppliers (less than 50 miles from the site). Diesel fuel and kerosene required for the operation of the spaceport are available from multiple regional suppliers in Southeastern Georgia and northeastern Florida. Industrial gases are available from regional suppliers in Georgia and Florida. Pressurants and other propellants could be provided by regional suppliers in Florida, Alabama, and Texas. Payload fuels are typically specialized materials and could be provided by suppliers some distance from the site (New York and Illinois). Suppliers of fuels and other resources for spaceport operation include, but are not limited to:

- Kerosene (RP-1)
  - Ocean Petroleum, Inc., Brunswick, Georgia (41 miles from site)
  - Paul Murray Oil Company, Inc. Jacksonville, Florida (48 miles from site)
- Diesel fuel
  - J D Moore, Inc, Brunswick, Georgia (40 miles from site)
  - Ocean Petroleum, Inc., Brunswick, Georgia (41 miles from site)
- Industrial gases (pressurants) and liquid oxygen
  - Compressed Gas Solutions, Orlando, Florida (185 miles from site)
  - Praxair, Augusta, Georgia (230 miles from site)
  - Air Liquide, Houston, Texas (920 miles from site)
- Payload fuels (e.g., UDMH, MMH, NTO)
  - BOC Sciences, Shirey, New York (970 miles from site)

  - Ox-Chem Corporation, Wood Dale, Illinois (1,075 miles from site)

- Hydrazine
  - Alchem Laboratories Co., Alachua, Florida (135 miles from site)
  - Laysan Bio, Inc., Arab, Alabama (505 miles from site)

3.11 Noise and Noise-Compatible Land Use

3.11.1 Definition and Description

Noise is considered unwanted, extraneous, or annoying sound that interferes with or disrupts normal human activities. Although exposure to very high noise levels can cause hearing loss, the principal human response to noise is annoyance. The response of different individuals to similar noise events is diverse and is influenced by the type of noise, perceived importance of the noise, its appropriateness in the setting, time of day, type of activity during which the noise occurs, and sensitivity of the individual. Because noise affects several resource areas, it is discussed in several sections of this EIS. This section concentrates on general noise impacts to humans and structures. Noise impacts on biological resources are discussed in Section 4.2, *Biological Resources*. Impacts on historical, architectural, and cultural resources are discussed in Section 4.8, *Historical, Architectural, Archaeological, and Cultural Resources*. Impacts on socioeconomics, environmental justice, and children's environmental health and safety risks are discussed in Section 4.12, *Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks*.

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air or water, and are sensed by the human ear. Sound is all around us. The perception and evaluation of sound involves three basic physical characteristics:

- **Duration**—the length of time the sound can be detected
- **Magnitude**—the acoustic energy, which is expressed in terms of sound pressure, in decibels (dB)
- **Frequency**—the number of cycles per second the air vibrates, in hertz

The duration of a noise source can be continuous (constant), transient (short-duration), or impulsive (typically less than 1 second) (USACHPPM, 2005). Launch noise and sonic booms (i.e., shock waves created from supersonic flight when a launch vehicle travels faster than the speed of sound) are classified as transient noise events. A transient noise event has a beginning and an end where the sound temporarily rises above the background and then fades away. Transient sounds are typically associated with a sound source that moves, such as, an aircraft overflight (USACHPPM, 2005).

The loudest sounds that can be detected comfortably by the human ear have intensities that are a trillion times higher than those of sounds that can barely be detected. This vast range means that using a linear scale to represent sound level is not feasible. The dB is a logarithmic unit used to represent the magnitude of a sound, also referred to as the sound level.

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 non-linear 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 (dB) in order to identify that the measurement has been made with this filtering

process (dBA). Exhibit 3.11-1 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.

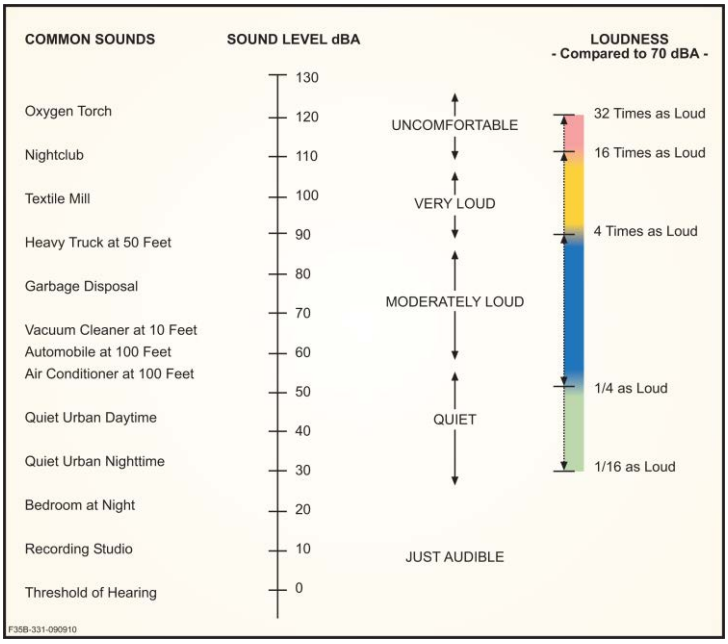


Exhibit 3.11-1. Typical A-Weighted Levels of Common Sounds
Source: (Harris, 1979)

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 noise metrics discussed below are discussed in greater detail in Appendix C, *Noise Study*.

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 (FICON, 1992). OASPL can be presented as either unweighted or A-weighted.

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.

Sound Exposure Level (SEL). The SEL represents both the magnitude of a sound and its duration. SEL provides a measure of the cumulative noise exposure of the entire acoustic event, but it does not directly represent the sound level heard at any given time. Mathematically, it represents the sound level of a

constant sound that would, in 1 second, generate the same acoustic energy as the actual time-varying noise event. For sound generated by rocket launches, which last more than 1 second, the SEL is greater than the L_{max} because an individual launch can take minutes and the L_{max} occurs instantaneously.

Time Above A-weighted OASPL Threshold. During times when OASPL is above 66 dBA, normal conversation becomes difficult. Specifically, studies have shown that background sound levels must remain below 66 dBA to maintain a sentence intelligibility of 95 percent for two people standing outside approximately 3 feet apart (USEPA, 1974). Sentence intelligibility of 95 percent usually permits reliable communication because of the redundancy in normal conversation.

Day-Night Average Sound Level (DNL). The DNL metric represents an average sound level over the course of an average annual day. In order to account for increased human sensitivity to noise at night, a 10-dB penalty is applied to events occurring between the hours of 10:00 p.m. and 7:00 a.m.

Peak Particle Velocity (PPV). High sound levels—particularly at low frequencies—can cause structures to vibrate. The highest speed at which a structural element, such as a pane of glass, moves as a result of a noise is used to assess the potential for structural damage. PPV, measured in millimeters per second, is the metric for noise-induced vibration and is calculated for specific structure categories in specific frequency bands.

Sonic Boom Overpressure. 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 pounds per square foot (psf).

3.11.2 Regulatory Setting

The following laws, executive orders, agency regulations, and other guidance apply to the Proposed Action. Noise criteria have been developed in order to protect the public health and welfare of surrounding communities. The following paragraphs describe noise criteria that address human annoyance, hearing conservation, and structural damage.

FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*

Human Annoyance. The DNL metric has been found to correlate well with the human annoyance for regularly occurring transportation noise (Schultz, 1978; Finegold, 1994). Several Federal agencies have adopted DNL as the primary noise metric for prediction of community reaction to noise (FICAN, 1997; FAA, 2015a; FICON, 1992). FAA Order 1050.1F states that, in most locations, a significant noise impact would occur if the Proposed Action would cause noise-sensitive areas to experience a 1.5 dBA DNL increase when compared to the No Action Alternative during the same time frame and the end-state noise level would be at or above 65 dBA DNL. FAA Order 1050.1F notes that the 65 dB DNL threshold does not fully address the effects of noise on visitors to areas such as national parks or designated wilderness areas where a quiet setting is a generally recognized purpose and attribute. In wilderness areas in particular, there is a strong expectation that anthropogenic noise intrusions will be infrequent. In this EIS, supplemental noise metrics are used in the evaluation of the significance of noise impacts within national parks, national wildlife refuges, and historic sites including traditional cultural properties (see Section 3.5, *Department of Transportation Act, Section 4(f)*, and Section 3.8, *Historical, Architectural, Archaeological, and Cultural Resources*).

The correlation between DNL and human annoyance has only been thoroughly studied for regularly occurring transportation noise sources including highways, rail corridors, and airports. Studies used to develop DNL annoyance dose-response relationships have not included rocket noise, which has historically been an irregularly occurring event. Thus, it is acknowledged that the suitability of DNL for the prediction of impacts associated with infrequent rocket and sonic boom events is uncertain. DNL contours are provided in the impacts analysis of this EIS to estimate the potential annoyance, as FAA considers DNL to be the best available metric for prediction of long-term human annoyance.

Because the ROI includes noise-sensitive areas where existing noise levels are very low and where a quiet setting is a generally recognized purpose and attribute, DNL analysis is supplemented in this EIS with additional noise level metrics that predict activity interference. Activity interference, including interference with speech (or listening to the radio, television, or natural sounds) and sleep, is often the direct cause of annoyance.

When background noise levels increase to above 66 dBA, sentence intelligibility between people conversing in normal voices at a distance of 3 feet drops below 95 percent, making continued communication difficult. Although speakers could theoretically raise their voices to continue communicating, the amount of time during which noise levels are above 66 dBA is an indicator of the prevalence of speech interference.

The likelihood of sleep disturbance depends on several factors that are specific to the sleeper such as depth of sleep. It is impossible to accurately predict whether any given individual will be awakened by any particular noise event.

Sleep disturbance estimates presented in this EIS are rough estimates, reflecting the limitations of currently available dose-response relationships. An American National Standard Institute (ANSI) dose-response relationship between indoor A-weighted SEL and the average probability of awakening was recently withdrawn after the results of several studies called into question the generalizability of sleep disturbance predictions to different situations (Acoustical Society of America, 2018). ANSI has not published a new sleep disturbance dose-response relationship. For this EIS, sleep disturbance probabilities were estimated based on a dose-response relationship published by the Federal Interagency Committee on Aviation Noise (FICAN) in 1997 (FICAN, 1997). The FICAN dose-response relationship was derived based on the results of several sleep studies involving individuals in a laboratory setting and is thought to represent the high end of potential sleep disturbance for individuals sleeping in an unfamiliar setting and exposed to unfamiliar sounds.

Structural Damage. FAA Order 1050.1F does not give specific instructions on the assessment of potential structural damage caused by noise. For this EIS, potential impacts were assessed by comparing calculated noise-induced structural vibration levels at sensitive locations against widely used structural impact criteria contained in the German Institute of Standardization (Deutsches Institut für Normung) DIN 4150 (Exhibit 3.11-2). The likelihood of damage is unique to the characteristics of the sound experienced (e.g., intensity, duration, and frequency), the materials of which the structure is built, and the condition of the structure. For this EIS, noise-induced motion was calculated for the floor of a building constructed primarily of wood (e.g., a typical residence). Heavier construction materials, such as stone, move less than lighter-weight materials in response to vibrations.

Sonic booms are also commonly associated with structural damage. Table 3.11-1 summarizes the types of damage that may be expected at various overpressures. A large degree of variability exists in the possible effects of a sonic boom. For example, the probability of a window breaking when exposed to a sonic boom of 1 psf ranges from one in a billion to one in a million (Sutherland, 1990) with much of the variability depending on the condition of the glass. At 10 psf, the probability of glass breaking is between 1 in 100 and 1 in 1,000. Laboratory tests involving glass have shown that properly installed glass will not

break at overpressures below 10 psf, even when exposed to repeated sonic booms (White, 1972). Damage to plaster has the potential to occur in the same range of overpressures as damage to glass. Plaster often cracks due to shrinkage over time or due to structural settling. Sonic boom damage to plaster often occurs when internal stresses are already high as a result of these processes. In general, for well-maintained structures, the threshold for damage from sonic booms is 2 psf, below which damage is unlikely (Haber & Nakaki, 1989).

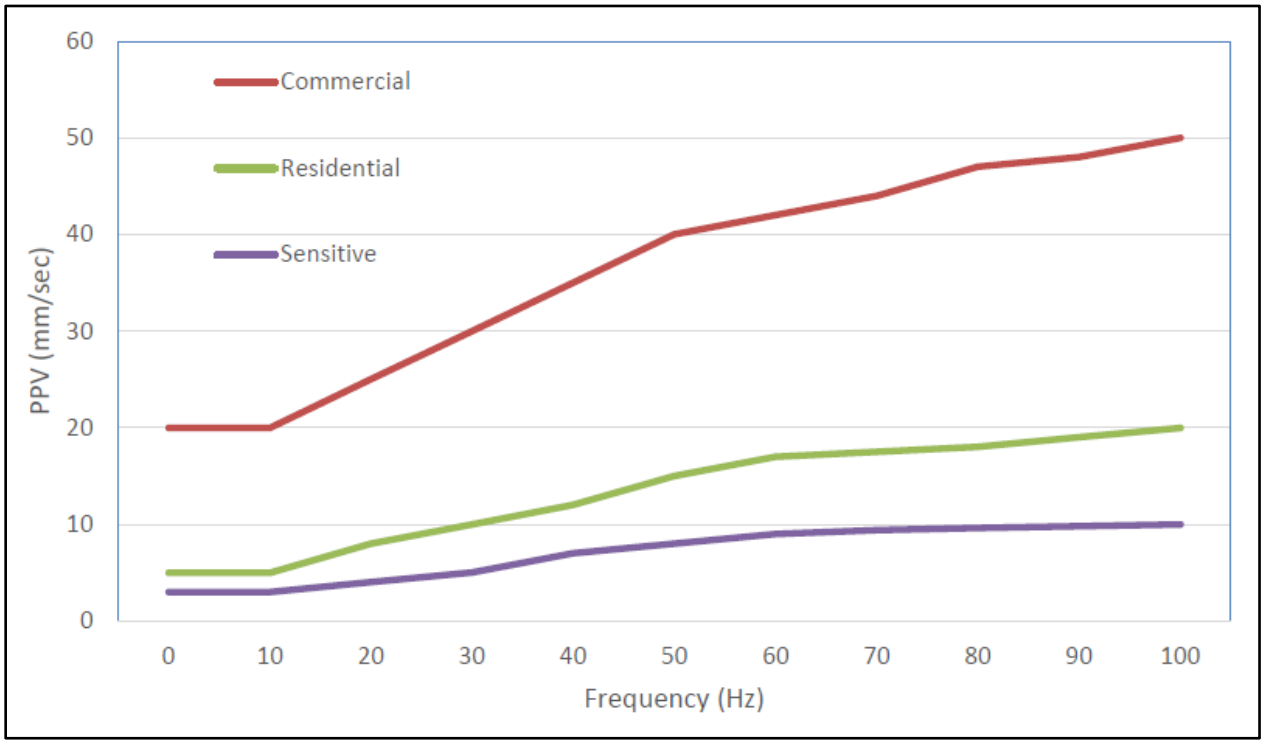


Exhibit 3.11-2. DIN 4150 Building Vibration Standards

Table 3.11-1. Possible Damage to Structures from Sonic Booms

Sonic Boom Overpressure Nominal (psf)	Type of Damage	Item Affected
0.5–2	Plaster	Fine cracks; extension of existing cracks; more in ceilings; over door frames; between some plaster boards
	Glass	Rarely shattered; either partial or extension of existing
	Roof	Slippage of existing loose tiles/slates; sometimes new cracking of old slates at nail hole
	Damage to outside walls	Existing cracks in stucco extended
	Bric-a-brac	Those carefully balanced or on edges can fall; fine glass, such as large goblets, can fall and break
	Other	Dust falls in chimneys

Table 3.11-1. Possible Damage to Structures from Sonic Booms (Continued)

Sonic Boom Overpressure Nominal (psf)	Type of Damage	Item Affected
2–4	Glass, plaster, roofs, ceilings	Failures show that would have been difficult to forecast in terms of their existing localized condition; nominally in good condition
4–10	Glass	Regular failures within a population of well-installed glass; industrial as well as domestic greenhouses
	Plaster	Partial ceiling collapse of good plaster; complete collapse of very new, incompletely cured, or very old plaster
	Roofs	High probability rate of failure in nominally good state, slurry-wash; some chance of failures in tiles on modern roofs; light roofs (bungalow) or large area can move bodily
	Walls (out)	Old, free standing, in fairly good condition can collapse
	Walls (in)	Inside ("party") walls known to move at 10 psf
Greater than 10	Glass	Some good glass will fail regularly to sonic booms from the same direction; glass with existing faults could shatter and fly; large window frames move
	Plaster	Most plaster affected
	Ceilings	Plaster boards displaced by nail popping
	Roofs	Most slate/slurry roofs affected, some badly; large roofs having good tile can be affected; some roofs bodily displaced causing gale-end and will-plate cracks; domestic chimneys dislodged if not in good condition
	Walls	Internal party walls can move even if carrying fittings such as hand basins or taps; secondary damage due to water leakage
	Bric-a-brac	Some nominally secure items can fall (e.g., large pictures), especially if fixed to party walls

Notes: psf = pounds per square feet.
Source: (Haber & Nakaki, 1989)

14 CFR Part 150: Appendix A

Land Use Compatibility. FAA land use compatibility guidelines published in 14 CFR Part 150: Appendix A, indicate that all of the listed land use categories are compatible at noise levels below 65 dB DNL. However, FAA Order 1050.1F states that special consideration needs to be given to noise-sensitive areas within Section 4(f) properties where the land use compatibility guidelines in 14 CFR Part 150 are not relevant to the value, significance, and enjoyment of the area in question. In this EIS, land use compatibility considerations will recognize areas in which a quiet setting is a recognized attribute and part of the purpose of the area.

Occupational Safety and Health Administration and National Institute for Occupational Safety and Health Standards

Hearing Conservation. Multiple Federal government agencies have provided guidelines on permissible noise exposure limits to protect human hearing. The most conservative workplace noise level limit has been set by the Occupational Safety and Health Administration (OSHA) at 115 dBA for non-impulsive noise over an allowable exposure duration of 15 minutes (OSHA, 2008). The National Institute for Occupational Safety and Health (NIOSH) limits for non-impulsive noise are less conservative (NIOSH, 1998). For impulsive noise, such as sonic booms, OSHA and NIOSH have both established maximum allowable peak noise levels of 140 dB, which equates to an overpressure of about 4 psf. Workplace noise level recommendations are designed such that, even with steady near-daily exposures over the course of an entire career, the excess risk of developing occupational noise–induced hearing loss is minimized.

3.11.3 Existing Conditions

The property that would become Spaceport Camden is located in an unincorporated area of Camden County approximately 11.5 miles due east of Woodbine, Georgia. Until 2012, the proposed spaceport site was an active pesticide manufacturing plant and industrial site, but is currently under-utilized after approximately 3 years of demolition (until 2015); discussions of current and historical land use for both the launch site and adjacent land areas are provided in Section 3.9, *Land Use*. Anthropogenic noise sources include vehicles and equipment associated with silvicultural operations and vehicular traffic. Aircraft, including those associated with nearby NSB Kings Bay are an occasional noise source. Daytime background noise levels on Cumberland Island National Seashore range from 35 to 70 dBA depending on the exact location and time of day (the durations of the noise-level measurements were not specified) (NPS, 2009b). The NPS estimates, based on long-term measurements in parks as well as urban and rural areas across the country, that median sound levels in the area are between 36 and 38 dBA (NPS, 2016). A separate set of measurements corroborates this estimate, finding that noise levels in rural areas are typically in the range of 30 to 40 dBA (Harris, 1979; USEPA, 1974).

3.12 Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks

3.12.1 Socioeconomics

3.12.1.1 Definition and Description

Socioeconomics refers to features or characteristics of the social and economic environment. This section describes the elements of the human environment (e.g., population, employment, income, housing, public services, and finances) that could be affected by the Proposed Action.

3.12.1.2 Regulatory Setting

The following laws, executive orders, agency regulations, and other guidance apply to the Proposed Action.

Uniform Relocation Assistance and Real Property Acquisitions Policy Act of 1970

Uniform Relocation Assistance and Real Property Acquisitions Policy Act of 1970 (49 CFR Part 24) ensures the fair treatment of those displaced by federally funded programs, federally assisted programs, or state and local agencies receiving Federal funds.

3.12.1.3 Existing Conditions

The majority of potential socioeconomic impacts resulting from construction and operation of Spaceport Camden and launch activities would be expected to occur throughout Camden County, particularly in the area in and around Little Cumberland Island and Cumberland Island National Seashore. Therefore, the ROI for this socioeconomic analysis is Camden County, Georgia, with emphasis on Little Cumberland Island and Cumberland Island National Seashore. The State of Georgia and the United States serve as the geographic regions for comparative analysis where applicable.

Employment and Income

In 2018, the total employment (number of jobs) in Camden County was 23,672 (BEA, 2018). Of the industries with employment numbers available, the largest industries in terms of employment in Camden County were the government and government enterprises industry (38.26 percent), the retail trade industry (10.94 percent), and the accommodation and food services industry (8.8 percent) (BEA, 2018) (see Table 3.12-1)

Table 3.12-1. Employment by Industry in Camden County, 2018

Industry	Number of Employees	Percent of Total Employment
Farm employment	65	0.27%
Mining, quarrying, and oil and gas extraction	28	0.12%
Manufacturing	1,001	4.23%
Wholesale trade	359	1.52%
Retail trade	2,590	10.94%
Information	149	0.63%
Finance and Insurance	763	3.22%
Real estate and rental and leasing	758	3.20%
Professional, scientific, and technical services	857	3.62%
Management of companies and enterprises	63	0.27%
Administrative and support and waste management remediation services	1,183	5.00%
Educational services	193	0.82%
Health care and social assistance	1,373	5.80%
Arts, entertainment, and recreation	281	1.19%
Accommodation and food services	2,084	8.80%
Other services (except public administration)	1,302	5.50%
Government and government enterprises	9,057	38.26%
Total Employment	**23,672**	**100.0%**

Notes: % = percent.
[1] The number of jobs for several industries, including forestry, fishing, and related activities; utilities; construction; and transportation and warehousing, were not available from the Bureau of Economic Analysis.
Source: (BEA, 2016)

Table 3.12-2 displays the annual average unemployment rates for Camden County, Georgia, and the nation between 2010 and 2019. Unemployment rates in the county spiked to over 10 percent during 2010, as a result of the recession. As of 2019, unemployment rates were less than 4 percent in the county, state, and nation.

Table 3.12-2. Unemployment Rates (%)

Location	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Camden County	9.9	9.6	8.6	7.8	6.6	5.6	5.8	5.0	4.2	3.6
Georgia	10.5	10.2	9.2	8.2	7.1	5.9	5.4	4.7	3.9	3.4
United States	9.6	8.9	8.1	7.4	6.2	5.3	4.9	4.4	3.9	3.7

Notes: % = percent.
[1] Unemployment rates shown are annual averages.
Sources: (BLS, 2016; BLS, 2020a; BLS, 2020b)

During the 2014–2018 American Community Survey (ACS) survey period, Camden County had a lower per capita income and median family income than both the state and the nation (Table 3.12-4).

Table 3.12-3. Largest Employers in Camden County

Employer
Naval Submarine Base Kings Bay
Camden County School System
Express Scripts
Lockheed Martin
Camden County Government
Walmart Supercenter
Southeast Georgia Health System Camden Campus
Kings Bay Support Services
Winn Dixie
Publix
Georgia Pacific
BAE Systems

Source: (Camden County Chamber of Commerce, 2020)

Table 3.12-4. Per Capita Income and Median Household Income

Location	Per Capita Income	Median Family Income
Camden County	$28,509	$63,589
Georgia	$29,523	$67,405
United States	$32,621	$73,965

Source: (USCB, 2018a)

Economic Activity

Tourism/Ecotourism

Cumberland Island National Seashore is a popular tourist destination and an important economic contributor to the local city of St. Marys and to Camden County. Estimates suggest that Cumberland Island National Seashore contributes several million dollars per year to the economy (Jackson, 2015). The maximum number of visitors allowed access to Cumberland Island National Seashore is 300 people per day. The total annual number of visitors to Cumberland Island National Seashore varies each year, but has been on an upward trend since 1976 (see Exhibit 3.12-1). Prior to 2007, visitor counts were determined by the number of people going to Cumberland Island National Seashore, whereas at the beginning of 2007, visitor counts were determined by the number of people who visited the mainland (i.e., visitor center and museum) in addition to those going to Cumberland Island National Seashore (NPS, 2018d). The most popular months for visitors to Cumberland Island National Seashore are typically March, April, and July. The least popular months for visitors are January, December, and August.

Public access to Cumberland Island National Seashore is by a concession-operated passenger ferryboat or by private boat. The ferryboat to the island runs 7 days per week during the spring, summer, and fall, with two departure times and three return times each day. During the winter, the ferryboat runs 5 days per week (there is no scheduled service on Tuesday and Wednesday), with two departure times and two return times on those days. Reservations for the ferryboat and campgrounds can be made up to 6 months in advance.

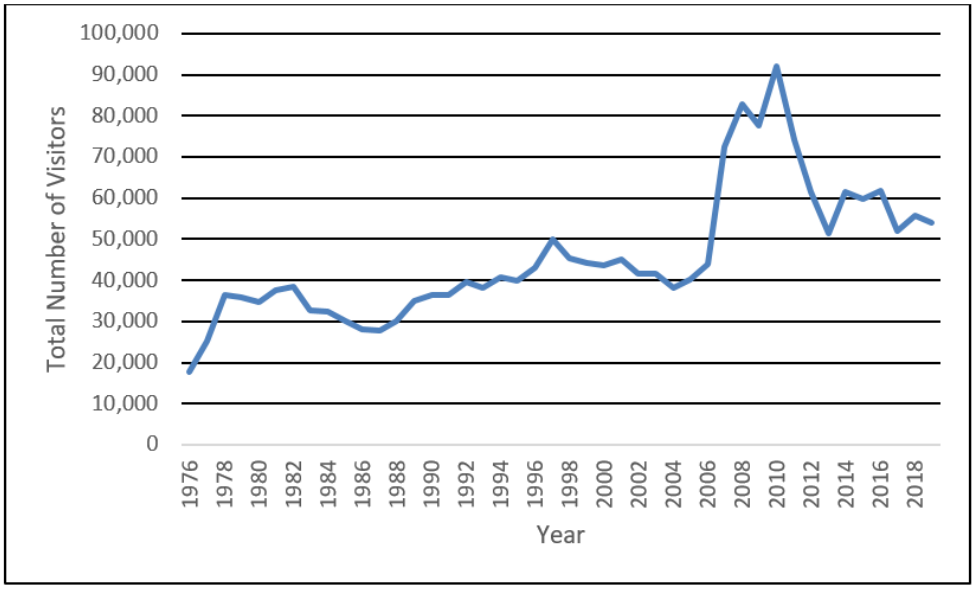


Exhibit 3.12-1. Annual Recreation Visitors to Cumberland Island National Seashore, 1976–2019
Source: (NPS, 2019b)

Recreational activities on and surrounding Cumberland Island include hiking, camping, hunting, fishing, stargazing, site tours, photography, bird watching, beach combing, wildlife viewing, swimming, private boating, and biking. There are 50 miles of hiking trails throughout Cumberland Island National Seashore and more than 9,800 acres of congressionally designated wilderness. There are five campground sites available at Cumberland Island. These include two designated campsites at Sea Camp Campground and Stafford Beach Campground and three wilderness campsites at Hickory Hill, Yankee Paradise, and Brickhill Bluff. Current camping capacity at Sea Camp is 96 with an additional 20 people at each of the two group sites there. Camping capacity at each of the other four campsites is 24. Reservations for campsites can be made up to 6 months in advance. Brickhill Bluff is the only campsite located within the composite USCG LAA, with the Yankee Paradise campground just outside the outer edge of the LAA (described in Section 2.1.2.5, *Pre-Launch Activities*).

Cumberland Island hosts six managed hunts each year from October through January. Hunts are scheduled up to 2 years in advance. Each hunt lasts for 2 to 3 days. Hunters are required to camp at Hunt Camp near Plum Orchard Historic District or Brickhill Bluff Campground.

The Lands and Legacies Tour is a guided tour of cultural and natural landmarks of Cumberland Island. The tour lasts 5 to 6 hours and begins at Sea Camp Ranger Station. The NPS, through a concessioner, currently offers daily Lands and Legacies Tours, carrying 12 visitors on each trip. The NPS is authorized to provide as many as eight of these tours daily. The tours include stops at Plum Orchard, the Cumberland Wharf, and the Settlement. Tour reservations can be made up to 6 months in advance. As detailed online, refunds for purchased tickets will be made up to 10 days prior to the tour. The tour will not run on Christmas Day or Tuesdays and Wednesdays between December 1 and February 28 and may be canceled during extreme conditions on the island (Cumberland Island Ferry, 2020).

Other recreational opportunities on and around Cumberland Island National Seashore include the following:

- **Colonial Coast Birding Trail.** The Colonial Coast Birding Trail includes 18 birding trail sites throughout several counties along Georgia's coastline (GDNR, 2020e; GDNR, 2020f).
- **Education field trips.** Self-guided, ranger-led activities, or activities facilitated by teachers and chaperones on Cumberland Island National Seashore are available, but require advance planning.
- **Georgia Coast Saltwater Paddling Trail.** The Georgia Coast Saltwater Paddling Trail is a trail along the State's coastline and is approximately 100 linear miles, beginning at St. Marys and going north toward Savannah (Southeast Coast Saltwater Paddling Trail, 2020). The main paddling route runs along and through portions of Cumberland Island National Seashore.
- **Gullah Geechee Cultural Heritage Corridor.** The corridor is a 12,000-square mile Federal National Heritage Area, which extends along the coastal areas and sea islands of North Carolina, Georgia, and Florida. The Gullah Geechee Cultural Heritage Corridor is composed of historical and cultural places of significance to the Gullah Geechee people (Gullah Geechee Cultural Heritage Corridor Commission, 2020).
- **Western Hemispheric Shorebird Reserve Network (WHSRN).** Little Cumberland Island and Cumberland Island National Seashore is part of the Georgia Barrier Islands WHSRN Landscape. The site was designated in October 2017 due to holding more than 30 percent of the biogeographic population of the *rufa* red knot (*Calidris canutus*) and of the Great Lakes breeding population of piping plover (*Charadrius melodus circumcinctus*) (WHSRN, 2020). A description of these terrestrial animals is provided in Section 3.2.3.2, *Terrestrial Animals*.

Commercial and Recreational Fishing

Commercial and recreational fishing opportunities in Camden County promote tourism to the area and contribute to the local economy. During the 5-year period between 2013 and 2017, recreational anglers made an average of 2.5 million fishing trips per year to Camden and Glynn Counties. The top eight species caught recreationally, along with the average number of fish caught annually during the same period, are shown in Table 3.12-5.

Table 3.12-5. Top Eight Species Caught Recreationally, Glynn and Camden Counties, 2013–2017

Species Name	Average Total Harvest (number of fish)
Southern kingfish	1,459,112
Spotted seatrout	592,570
Silver perch	549,961
Atlantic menhaden	421,587
Atlantic croaker	333,201
White mullet	237,101
Striped mullet	197,455
Red drum	108,803

Source: (GDNR, 2019)

Data from the 2017 Saltwater Information Program Annual Report indicates that approximately 70 percent of saltwater recreational angler trips (averaged from 2013 to 2017) were inshore (rivers and sounds), 27 percent were to ocean areas within 3 miles from shore, and 3 percent of were to ocean areas

more than 3 miles from shore (GDNR, 2018). Most of the saltwater recreational anglers (averaged from 2012 to 2016) were coastal residents (42 percent), followed by non-coastal residents (34 percent) and out-of-state residents (24 percent). The most popular time of the year for saltwater recreational angler trips was July/August, followed by March/April. During the 2011–2015 period, average expenditures from marine recreational anglers in Georgia had a $238 million impact to the state's economy (GDNR, 2018).

Data on available commercial seafood landings recorded for the state of Georgia in pounds and dollars during 2018 are shown in Table 3.12-6. As shown in Table 3.12-6, northern white shrimp had the highest total dollar value, followed by blue crabs and clams, quahog, and mercenaria. Penaeid shrimp were the most valuable at $9.64 per pound, followed by clams, quahog, and mercenaria at $6.65 per pound and eastern oysters at $6.46 per pound (NMFS, 2020). Exhibit 3.2-5 displays the locations of EFH in relation to Spaceport Camden and the composite USCG LAA (see Section 3.2.3.3, *Marine Vegetation and Habitats*). Exhibit 3.6-1 in Section 3.6, *Farmlands*, identifies commercial and recreational shellfish leased areas within the composite USCG LAA. Approximately 1,658 acres of recreational shellfish harvest areas, 3,000 acres of inactive commercial shellfish leased areas, and 8,724 acres of shellfish growing areas are within the composite USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*).

Table 3.12-6. Commercial Seafood Landings, Georgia, 2018

NMFS Name	Pounds	Dollars	Dollar per Pound
Clams, quahog, mercenaria	337,612	2,246,769	6.65
Crab, blue	4,519,327	5,956,419	1.32
Flatfishes	1,612	4,346	2.70
Kingfishes	11,852	18,893	1.59
Oyster, eastern	19,508	126,118	6.46
Shad, American	26,836	35,985	1.34
Shad, hickory	5,752	6,976	1.21
Shrimp, northern brown	225,757	442,011	1.96
Shrimp, northern white	2,340,208	6,923,687	2.96
Shrimp, Penaeoid	68,017	655,923	9.64
Unidentified species	105,826	235,187	2.22
Vertebrates, jawed	13,044	22,619	1.73
Whelks	513	1,208	2.35

Notes: NMFS = National Marine Fisheries Service.
Source: (NMFS, 2020)

Artificial reefs enhance biodiversity in the areas that support commercial and recreational fish species and provide economic benefits to the region. There are several offshore artificial reefs established in Georgia, with several located offshore near Little Cumberland Island and Cumberland Island National Seashore (GDNR, 2020g). The names, location, and structures in the offshore artificial reefs of Georgia near Little Cumberland Island and Cumberland Island National Seashore are detailed in Table 3.12-7.

In addition to the several offshore artificial reefs near Little Cumberland Island and Cumberland Island National Seashore, there are two inshore artificial reefs referred to as Mud Creek and Stafford Island. Inshore artificial reefs were established to support the growing inshore recreational fishery (GDNR, 2020h). Boat ramps near the Mud Creek inshore reef are located at Crooked River State Park, Jekyll Island, and Harriets Bluff. The Cooked River State Park, Harriets Bluff, and North River St. Marys have boat ramps and are near the Stafford Island inshore artificial reef. Artificial reefs and nearby boat ramps in relation to the composite USCG LAA are shown on Exhibit 3.12-2.

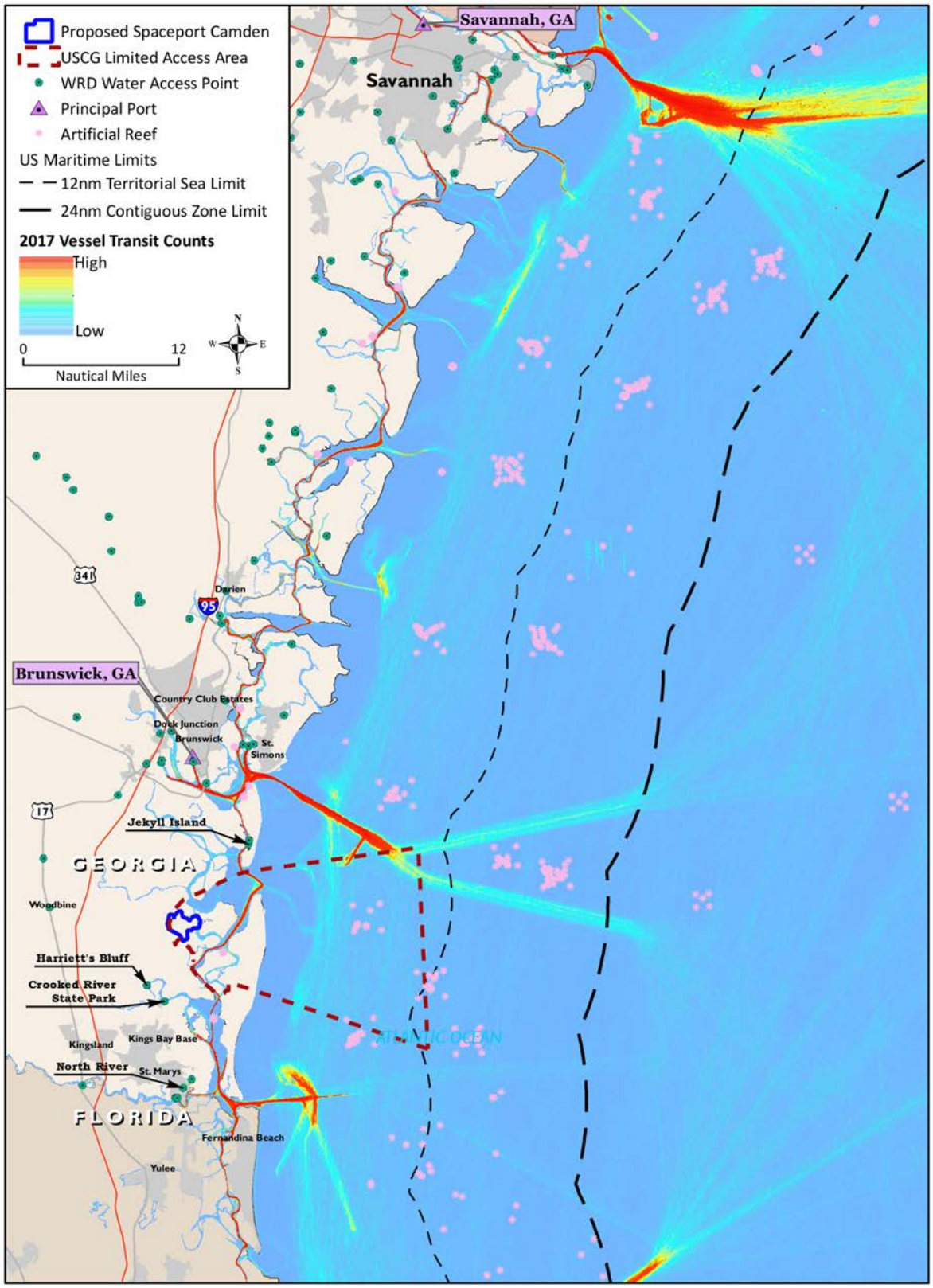


Exhibit 3.12-2. Maritime Transportation in the Region of Influence

Table 3.12-7. Artificial Reefs in Georgia near Little Cumberland Island and Cumberland Island

Reef Name	Type	Location	Reef Structure(s)
A	Offshore	7 NM east of Little Cumberland Island	Rubble and concrete poles
KBY	Offshore	8 NM east of Cumberland Island National Seashore	Rubble and barges
CDH (formerly "C")	Offshore	13.5 NM east of Cumberland Island National Seashore	Rubble, M60 battle tanks, tugboats, and other vessels
MRY	Offshore	18 NM east of Cumberland Island National Seashore	Reef Balls
SFC	Offshore	18 NM east of Little Cumberland Island	M60 battle tanks, rubble, Reef Balls, and landing craft
HLHA	Offshore	23 NM east of Little Cumberland Island	Subway cars, M60 battle tanks, rubble, Reef Balls, barges, a Liberty ship, and other vessels
R5	Offshore	34 NM east of Cumberland Island National Seashore	Navy tower
R4	Offshore	59 NM east of Cumberland Island National Seashore	Navy tower
Mud Creek	Inshore	St. Andres Sound Junction of Mud, Cumberland, and Brickhill Rivers, Camden County, Intertidal Site; approximately 13.7 miles to St. Marys	Concrete culvert, concrete box, and concrete tetrahedron
Stafford Island	Inshore	Cumberland Sound near Intracoastal Waterway marker G"71," Camden County, Intertidal Site; approximately 7.6 miles to St. Marys	Concrete culvert, concrete poles, and fish aggregating devices

Notes: NM = nautical miles.
Source: (GDNR, 2020g; GDNR, 2020h)

Forestry

Georgia's forests supply a variety of benefits throughout the state. Georgia has more than 23.9 million acres of timberland, which makes Georgia the number one state in the nation for forestland that is commercially available with no timber harvesting restrictions. Georgia's forest industry contributes an estimated $35.9 billion annually to the state's economy, supports 147,380 jobs and $8.7 billion in wages and salaries, and generates $970 million in gross tax revenue for the state (Georgia Forestry Commission, 2019). In addition to traditional timber products, forestry provides significant benefits to communities throughout the state from ecological services, such as water filtration, clean air, erosion control, aesthetics, wildlife habitat, and soil formation. These ecological benefits, outside of traditional economic impacts (i.e., carbon sequestration, water quality, and wildlife habitat), are valued at more than $37.6 billion annually. Ecological services provided by forests, in turn, enhance the quality of life and generate revenue from outdoor recreation and ecotourism (Georgia Forestry Commission, 2019).

Timber mills and forested land are located in the western part of Camden County, west of U.S. Highway 17. Forested land is also abundant east of U.S. Highway 17. See Section 3.9, *Land Use*, for details on agriculture-forested areas in the vicinity of the Proposed Action.

Maritime Transportation

There are two deepwater ports in Georgia, including the Port of Savannah and the Port of Brunswick. Both deepwater ports along with two inland ports in Bainbridge and Columbus make up the Georgia Port Authority. The deepwater ports combined had supported 1,307 full-time and part-time jobs in Camden County (Georgia Port Authority, 2018). Both port terminals are located more than 15 miles north of the proposed Spaceport Camden site. Exhibit 3.12-2 shows the location of the Port of Savannah and the Port of Brunswick in relation to the proposed site of Spaceport Camden and the composite USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*). Vessel traffic counts for 2017 presented on Exhibit 3.12-2 include cargo, fishing, passenger, pleasure craft and sailing, tanker, and tug and towing vessel transits.

Military

NSB Kings Bay was established in Camden County in 1978 and has a significant economic impact on the county and the surrounding region. The total economic impact of NSB Kings Bay in direct revenues is estimated at $855 million (Camden Partnership, 2017). When considering the direct revenue with indirect purchases and induced transactions, the total economic output of NSB Kings Bay is estimated at $1.142 billion. The total direct and indirect workforce at NSB Kings Bay is estimated at 8,882 (Camden Partnership, 2017). NSB Kings Bay is located south of the proposed construction site and outside the composite USCG LAA (see Exhibit 3.12-2).

Aerospace

The Georgia Center of Innovation for Aerospace refers to "aerospace" as "an inclusive term covering the full range of life cycle activities for vehicles that fly in the air or in space" (Georgia Institute of Technology, 2017). In 2015, the aerospace industry supported approximately 6.5 percent of the state's total employment (268,232 jobs) and contributed 6 percent (approximately $29.3 billion) to the state's gross domestic product (Georgia Institute of Technology, 2017). Throughout the coastal region of Georgia (which includes Bryan, Bulloch, Camden, Chatham, Effingham, Glynn, Liberty, Long, McIntosh, and Screven Counties), the aerospace industry supported 12,166 direct jobs, which generated $1.4 billion in direct wages and salaries and $9 billion in direct output. Total direct impacts combined with indirect and induced impacts totaled approximately 28,367 jobs, $2.1 billion in wages and salaries, and $11.2 billion in output (Georgia Institute of Technology, 2017).

Space companies are an important part of the overall aerospace industry in Georgia. In 2015, there were 12 companies with activities in the space sector throughout the state, which directly supported 915 jobs and generated approximately $122 million in wages and $333 million in output. The total direct, indirect, and induced impact of the space companies was 2,463 total jobs that generated $196.2 million in wages and salaries and $555.8 million in output (Georgia Institute of Technology, 2017).

Population and Housing

Camden County, Georgia

The most recent 5-year population estimate from the 2014–2018 ACS from the U.S. Census Bureau (USCB) for Camden County was 52,714 people (USCB, 2018b). This number represents an average annual increase of 0.5 percent, since 2010 Census estimates. There are three incorporated cities in the county, including Woodbine, St. Marys, and Kingsland. Woodbine is the county seat of Camden County. In 2018, the population in Woodbine was estimated at 1,585. The largest city in terms of population in Camden

County is St. Marys. In 2018, St. Marys had a total population of 17,921, while Kingsland had a total population of 16,784 (see Table 3.12-8).

Table 3.12-8. Population Estimates in the Region of Influence

Location	2010 Census Estimates	2018 Estimates	Average Annual Change
Kingsland	15,946	16,784	0.6%
St. Marys	17,121	17,921	0.6%
Woodbine	1,412	1,585	1.5%
Camden County	50,513	52,714	0.5%
Georgia	9,687,653	10,297,484	0.8%
United States	308,745,538	322,903,030	0.6%

Source: (AMEC, 2014; USCB, 2015a)

The number of housing units in the ROI totaled approximately 21,366 units in 2015 (see Table 3.12-9). The rental vacancy rate in Camden County is higher than the state and the nation. Kingsland had the lowest rental vacancy rate in Camden County, while Woodbine had the highest.

Table 3.12-9. Housing in the Region of Influence[1]

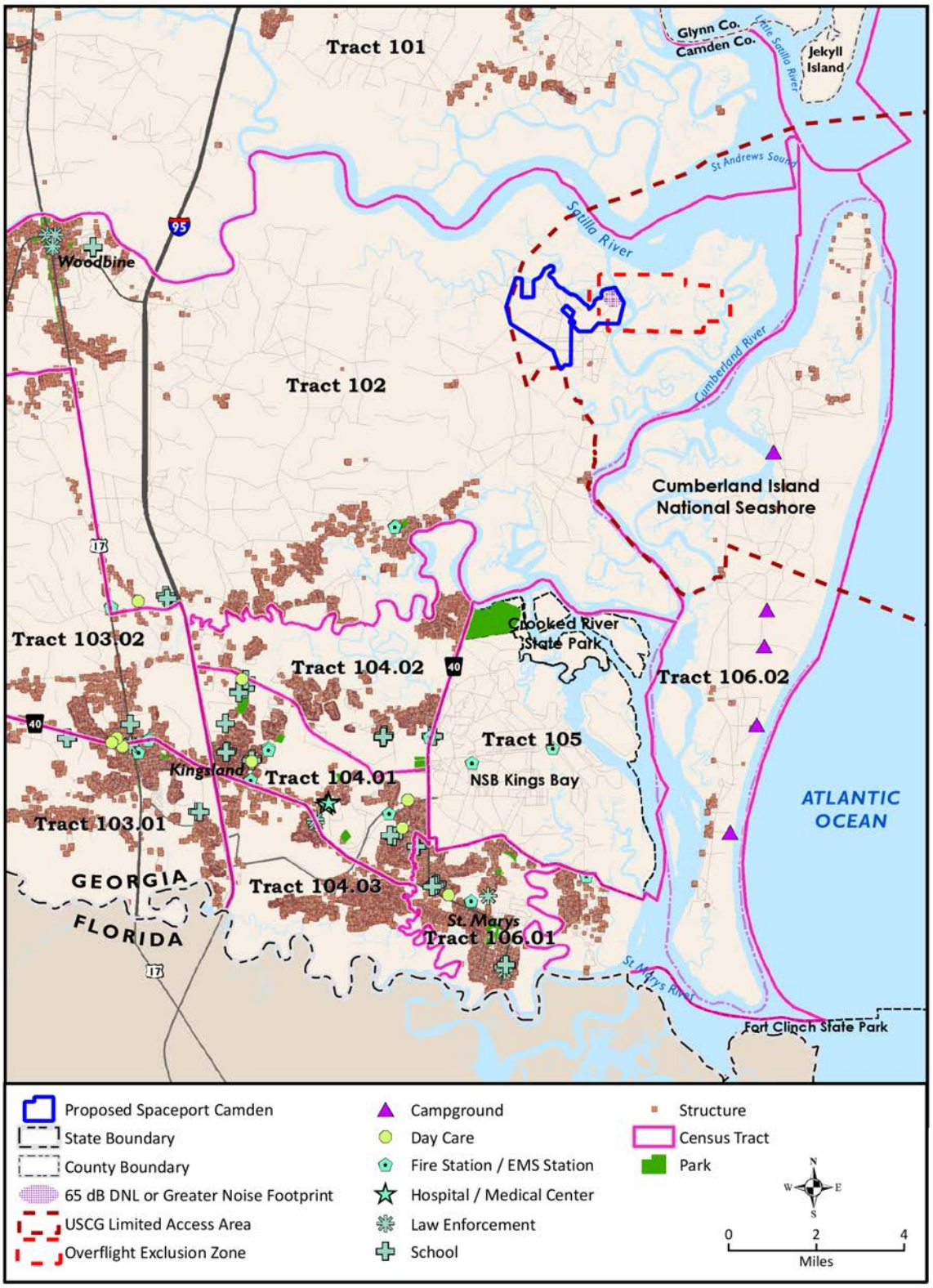
Location	Total Housing Units	Total Vacant Units	Homeowner Vacancy Rate	Rental Vacancy Rate	Median Value of Owner-Occupied Units	Median Rent[2]
Kingsland	6,544	529	0.0	7.5	$147,500	$960
St. Marys	7,904	851	1.0	12.1	$180,100	$955
Woodbine	613	113	5.6	16.5	$116,700	$713
Camden County	21,837	2,510	1.0	10.5	$159,800	$954
Georgia	4,241,003	531,515	2.0	7.0	$166,800	$968
United States	136,384,292	16,654,164	1.7	6.0	$204,900	$1,023

Notes:
[1] Based on American Community Survey 5-Year Estimates from 2014 to 2018
[2] Median rent for occupied units paying rent
Source: (USCB, 2018c)

The proposed launch site is located in the unincorporated area of Woodbine, approximately 11.5 miles east of the city. The closest residence is located approximately 2.5 miles due west from the western edge of the proposed spaceport site. There are structures associated with the Lodge at Cabin Bluff, a resort facility located approximately 2.5 miles due south of the main gate. There are no residential properties located on the proposed Spaceport Camden launch site or within the 65 dB DNL or greater noise footprint, as shown in Exhibit 3.12-3.

Cumberland Island and Little Cumberland Island

Both Little Cumberland Island and Cumberland Island National Seashore are located on a portion of Block Group (BG) 1 of Census Tract 106.02 in Camden County, Georgia. There is only one block group in the census tract. As of the most recent ACS 5-year estimates, the total population in Census Tract 106.02 is 1,057 people (USCB, 2018b).



*Due to the magnification used to show the entire area, it is possible that structures are overlapped and do not appear to be distinct.

Exhibit 3.12-3. Public Services in the Region of Influence

As shown in Exhibit 2.1-4, the 100-degree trajectory goes over part of Little Cumberland Island, a 2,400-acre island that is separated by Christmas and Brockington Creeks. The island is owned by a private homeowners association and not open to visitors without an invitation. Structures on Little Cumberland Island that are owned by the Little Cumberland Island Homes Association include cottages, a shop, a tractor shed, an archive building, trike sheds, boats, docks, and a lighthouse. There are 48 homes on Little Cumberland Island (Zee, 2018). Several owners have multiple living structures on a single lot. There are also 11 homes at High Point on Cumberland and 3 other private homes at the north end of Cumberland Island (Zee, 2018).

A total of 55 addresses are located on Little Cumberland Island and Cumberland Island National Seashore within the composite USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*). None of the homes are directly under the 100-degree trajectory. The nearest structure to the trajectory is a tenth of a mile north of the trajectory line.

Public Services and Social Conditions

Emergency response services in Camden County include the Camden County Sheriff's Office, the Kingsland Police Department, the St. Marys Police Department, the Georgia State Patrol, Camden County Fire Rescue Department, Kingsland Fire Rescue, St. Marys Fire Department, Georgia Forestry Commission, Camden County Animal Control, and Camden County Search and Rescue. The Kingsland Police Department provides law enforcement services to citizens and visitors of the city of Kingsland and employs 42 people, including 40 sworn law enforcement professionals and 2 nonsworn clerical employees (Kingsland, 2016). The St. Marys Police Department serves the city of St. Marys and employs 35 sworn law enforcement professionals and 4 non-sworn personnel (St. Marys, 2016). The Camden County Fire Rescue Department provides advanced life support and fire services to Camden County. There are 12 fire stations (including Station 14 in Kingsland, which is closed) throughout Camden County that the Fire Rescue Department utilizes (Camden County, 2017a). Station 20 is located at the Greyfield Inn on Cumberland Island and is made up of volunteer staff (Camden County, 2017b).

Fire protection responsibilities for the private tracts located on Little Cumberland Island and Cumberland Island are shared by the Georgia Forestry Commission and the Camden County Fire Rescue Department. The Cumberland Island National Seashore is required to have an approved Fire Management Plan, which is available online (https://www.nps.gov/cuis/learn/nature/wildlandfire.htm). As detailed in the fire management plan, fire response times vary for each incident at the seashore. In addition to a limited number of qualified fire fighters, logistical issues, and the need for boat transportation for personnel and equipment, emergency and fire response times can vary between 2 to 4 hours, depending on the location of the incident, availability of firefighters, tide tables, and availability of boat operators (NPS, 2015). As discussed previously, emergency response teams would be standing by during launches to minimize response time delays.

Emergency response services are discussed in Section 2.1.2.7, *Launch Failures: Emergency Response*. The Southeast Georgia Health Systems Hospital's Camden Campus is approximately 12 miles southwest of the proposed spaceport site. The Camden Campus is a 40-bed acute-care hospital located in St. Marys (Southeast Georgia Health System, 2016). There is also a five-bed intensive care unit located on the second floor of the hospital (Southeast Georgia Health System, 2014). Additional medical services are offered at Amelia Medical Care Urgent Care, located approximately 30 miles southwest of the site in Kingsland. Section 2.1.2.7, *Launch Failures*, provides a discussion on emergency responses and plans as part of the Proposed Action, including a Fire Mitigation Plan.

The Camden County School District is the public school district in Camden County. There are nine elementary schools, two middle schools, and one high school in the district. The total student enrollment for all schools was 9,203 as of March 5, 2020 (Georgia Department of Education, 2020a). The

student-teacher ratio in the Camden County public school district is approximately 16:1, compared to the Georgia public school average of 15:1 (Public School Review, 2020). The closest school to the site is the Crooked River Elementary located 9 miles from the site. There are no schools located within the composite USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*).

3.12.2 Environmental Justice

3.12.2.1 Definition and Description

Environmental justice is defined by USEPA as, "the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies" (USEPA, 2017c). The terms "fair treatment" and "meaningful involvement" are further defined as follows:

- Fair treatment means that no group of people should bear a disproportionate share of the negative environment consequences result from industrial, governmental, and commercial operations or policies.
- Meaningful involvement means potentially affected populations have an appropriate opportunity to participate in decisions about a proposed activity that will affect their environment and/or health; the public's contribution can influence the regulatory agency's decision; the concerns of all participants will be considered in the decision-making process; and the rule writers and decision makers seek out and facilitate the involvement of those potentially affected.

3.12.2.2 Regulatory Setting

The following laws, executive orders, agency regulations, and other guidance apply to the Proposed Action.

- Title VI of the Civil Rights Act of 1964 as amended
- EO 12898, *Federal Actions to Address Environmental Justice in Minority and Low-Income Populations (Environmental Justice)*
- Memorandum of Understanding on Environmental Justice and EO 12898 (August 4, 2011)
- DOT Order 5610.2(a), *Environmental Justice in Minority and Low-Income Populations*
- CEQ Guidance: *Environmental Justice: Guidance Under the National Environmental Policy Act* (December 10, 1997)
- Revised DOT Environmental Justice Strategy

3.12.2.3 Existing Conditions

The construction ROI is contained to the proposed Spaceport Camden site. The Spaceport Camden site is located in BG 3 in Census Tract 102.00 (see Exhibit 3.12-4). There are no residential populations on the Spaceport Camden site. Table 3.12-10 provides a summary of the percent minority and low-income population in the affected environment. The operational ROI, or affected environment, for the environmental justice analysis includes BG 1 in Census Tract 106.02, BG 3 in Census Tract 102.00, and BG 2 in Census Tract 101.00. All census tracts are located in Camden County, Georgia. These block groups were identified as the operational ROI for environmental justice analysis because some portion of the geographical unit are within the composite USCG LAA, as shown in Exhibit 2.1-10. The geographic units in the ROI are compared to the census tract in which each block group is located. Camden County, the state of Georgia, and the United States are also shown for reference.

There is only one block group in Census Tract 106.02 and, therefore, the demographics for the block group is equal to the entire census tract (see Table 3.12-10). According to the 2018 ACS 5-year estimates, approximately 24.5 percent (259 people) of the total population in BG 1 of Census Tract 106.02 identified themselves as minority, and 4.2 percent (44 people) of the total population were identified as low-income. The percent of minority and low-income individuals in this block group are less than the county and the adjacent Census Tracts 102.00 and 101.00. Census Tract 106.02 encompasses all of Cumberland Island National Seashore, in addition to a portion of the county south of NSB Kings Bay (see Exhibit 3.12-4). A total of 55 addresses are located on Little Cumberland Island and Cumberland Island within the composite USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*). None of the homes are located under the trajectory. The nearest structure to the trajectory is a tenth of a mile north of the trajectory line.

Approximately 10.5 percent (283 people) of the total population in BG 3 of Census Tract 102.00 identified themselves as minority, and 7.7 percent (206 people) of the total population were identified as low-income. The percent of minority and low-income individuals in BG 3 of Census Tract 102.00 is less than the percent of minority population and low-income population of Census Tract 102.00 as a whole, in which 29.1 percent (1,538 people) of the total population identified themselves as minority and 16.2 percent (829 people) of the total population were identified as low-income. There are no residential populations located on the portion of BG 3 of Census Tract 102.00 that is within the composite USCG LAA (see Exhibit 3.12-4).

BG 2 of Census Tract 101.00 has approximately 25 percent (508 people) of the total population that identified themselves as minority, compared to the whole census tract that has approximately 24.1 percent (650 people) of the total population that has identified themselves as minority. Approximately 5.4 percent (110 people) of the total population in BG 2 of Census Tract 101.00 is identified as low-income compared to 8.2 percent (220 people) in the entire census tract. There are no residential populations located on the portion of BG 2 in Census Tract 101.00 within the composite USCG LAA (see Exhibit 3.12-4).

Table 3.12-10. Environmental Justice Communities

Location	Total Population	Minority		Low Income		
		Number	Percent	Population for Whom Poverty Status is Determined[1]	Number	Percent
United States	322,903,030	125,721,853	38.9%	314,943,184	44,257,979	14.1%
Georgia	10,297,484	4,551,043	44.2%	10,024,689	1,607,704	16.0%
Camden County	52,714	15,856	30.1%	50,749	6,546	12.9%
Census Tract 106.02	1,057	259	24.5%	1,050	44	4.2%
BG 1	1,057	259	24.5%	1,050	44	4.2%
Census Tract 102.00	5,292	1,538	29.1%	5,132	829	16.2%
BG 3	2,695	283	10.5%	2,673	206	7.7%
Census Tract 101.00	2,693	650	24.1%	2,693	220	8.2%
BG 2	2,031	508	25.0%	2,031	110	5.4%

Notes: % = percent; BG = block group.

[1] The number of low-income individuals is based on the population for whom poverty status is determined, which does not take into consideration those individuals in the populations in which poverty status cannot be determined, including institutional group quarters, college dormitories, military barracks, living situations without conventional housing, and unrelated individuals under age 15 (USCB, 2020).

Source: (USCB, 2018b; USCB, 2018d)

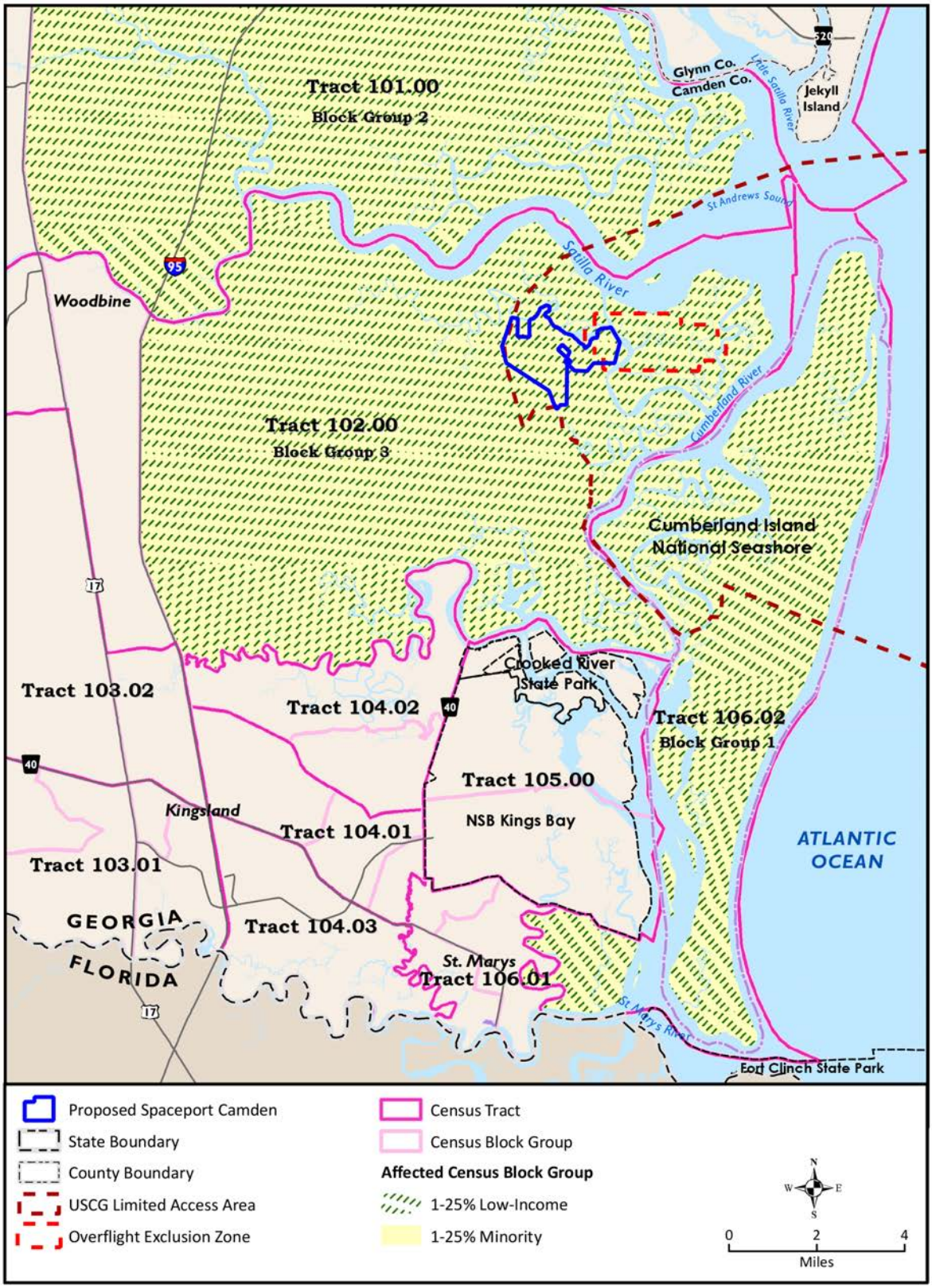


Exhibit 3.12-4. Environmental Justice Communities

3.12.3 Children's Environmental Health and Safety Risks

3.12.3.1 Definition and Description

Children's environmental health and safety risks include any risks to the health or safety that may disproportionately affect children that are attributable to products or substances that a child is likely to come in contact with or ingest, such as air, food, drinking water, recreational waters, soil, or products they might use or be exposed to.

3.12.3.2 Regulatory Setting

The following laws, executive orders, agency regulations, and other guidance apply to the Proposed Action.

- EO 13045, *Protection of Children From Environmental Health Risks and Safety Risks*, issued in 1997, requires that Federal agencies place a high priority on identifying and assessing environmental health and safety risks that may disproportionately affect children.

3.12.3.3 Existing Conditions

The construction ROI is contained to the proposed Spaceport Camden site. The Spaceport Camden site is located in BG 3 in Census Tract 102.00 (see Exhibit 3.12-4). There are no residential populations on the Spaceport Camden site. Table 3.12-11 provides a summary of the age distribution for the population in the operational ROI, or affected environment, which was defined in Section 3.12.2.3, *Environmental Justice, Existing Conditions*. As shown in Table 3.12-11, all block groups in the affected environment have a percent of the population under the age of 5, or 65 years of age or older, the same as or less than the census tracts they are in. BG 3 of Census Tract 102.00 and BG 2 of Census Tract 101.00 have a higher percent of the population under 18 years of age than the census tract in which they are located. As stated in Section 3.12.2.3, *Environmental Justice, Existing Conditions*, there are no residential populations located on the portion of BG 3 of Census Tract 102.00 or in BG 2 of Census Tract 101.00 that are within the composite USCG LAA (see Exhibit 3.12-4).

Table 3.12-11. Population Distribution by Age

Location	Total Population	Under 5 Years		Under 18 Years		65 Years and Older	
		Number	Percent	Number	Percent	Number	Percent
United States	322,903,030	19,836,850	6.1%	73,553,240	22.8%	49,238,581	15.2%
Georgia	10,297,484	655,810	6.4%	2,501,295	24.3%	1,352,289	13.1%
Camden County	52,714	3,892	7.4%	12,939	24.5%	6,436	12.2%
Census Tract 106.02	1,057	75	7.1%	229	21.7%	243	23.0%
BG 1	1,057	75	7.1%	229	21.7%	243	23.0%
Census Tract 102.00	5,292	357	6.7%	1,223	23.1%	787	14.9%
BG 3	2,695	170	6.3%	636	23.6%	272	10.1%
Census Tract 101.00	2,693	7	0.3%	414	15.4%	698	25.9%
BG 2	2,031	0	0.0%	351	17.3%	503	24.8%

Notes: % = percent; BG = Block Group.
Source: (USCB, 2018e)

The closest school to the proposed location of Spaceport Camden is Crooked River Elementary School in St. Marys, located 9 miles from the proposed site. As of March 5, 2020, the school had a total enrollment of 551 students enrolled in grades pre-kindergarten through fifth grade (Georgia Department of Education, 2020a). Approximately 43.05 percent of the students at Crooked River Elementary School enrolled as of October 1, 2019, are eligible for free and reduced-price meals, compared to the district average of 45.89 percent (Georgia Department of Education, 2020b). Schools, childcare centers, parks, and hospitals represent areas where there would be a high concentration of children and elderly populations. These areas located in the ROI are shown in Exhibit 3.12-3.

3.13 Visual Effects

3.13.1 Definition and Description

Visual resources are the natural and manmade features that give a particular environment its aesthetic qualities. In undeveloped areas, landforms, water surfaces, and vegetation are the primary components that characterize the landscape. In predominantly natural areas, manmade features (such as buildings, fences, power lines, piers, and wharves) can contrast with the forms and colors of natural landscape. In developed areas, the natural landscape is more likely to become a background for more obvious manmade features. Visual character refers to the overall visual makeup of the existing environment where a proposed action and alternative(s) would be located. Potential visual impacts are determined by estimating the degree of change to the visual character and attributes of a viewshed that would result from a proposed action. This considers the visual quality or value of the affected landscape or viewshed, as expressed by viewers, and any State and Federal visual management objectives for resources under their jurisdiction. The value of visual resources also reflects the intrinsic attributes of the landscape and its cultural and social relevance. Visual quality is a function of this intrinsic value and the level of current degradation, or lack thereof.

Light emissions include any light that emanates from a light source into the surrounding environment. Sources of light emissions include outdoor site lighting, employee/visitor parking lighting, airborne and ground-based vehicle operations, and roadway lighting. *Glare* is any strong or dazzling light and light emissions redirected off of a reflective surface, such as window glass in a facility. In recent years, diminishing darkness of the night sky has become a growing concern as expanding areas of urbanization cause sky glow (an overall glow in the sky). This results from dispersed light in the night sky that reflects off of atmospheric particles and water vapor and redirects back to the Earth's surface. *Sky glow* has been associated with ecological changes and human health effects, since natural circadian rhythms are driven by light patterns and are foundational for the functions of biota in any given context. Diminishing dark skies is a concern not just in developed areas but also in pristine areas where the absence of light is valued for the experience of darkness and higher visibility of the sky and stars.

Visual effects analysis considers the extent to which a proposed action or alternative(s) would either: (1) contrast with, or detract from, or change the visual resources and/or the visual character of the existing environment; or (2) produce light emissions that create annoyance or interfere with other (non-project) activities. Visually protected coastal areas, rivers protected under the Wild and Scenic Rivers Act, sensitive wildlife species, and Section 106 and Section 4(f) properties are discussed in detail under the appropriate environmental impact categories and cross-referenced in this section, as applicable.

3.13.2 Regulatory Setting

There are no Federal laws directly regulating visual impacts or light emissions. However, there are State and Federal laws governing the impact of visual changes on protected and valued resources. There are also Federal and State policies and procedures pertaining to visual resources and particularly for controlling light emissions. The following are the primary laws, executive orders, agency regulations, and other guidance that apply to visual resources and light emissions associated with the Proposed Action.

The Wilderness Act of 1964

Congress provided for a system of wilderness lands that shall be administered for the "use and enjoyment of the American people in such manner as will leave them unimpaired for future use and enjoyment as wilderness." The act also describes these areas as "places where the earth and its community of life are untrammeled by man"… and where "the imprint of man's work (is) substantially unnoticeable."

Section 106 of the National Historic Preservation Act, Section 4(f) of the Department of Transportation Act, the Wild and Scenic Rivers Act, National Historic Trails, and National Historic or Heritage Sites

These Acts address preservation of various protected resources. Physical changes to visual resources or the visual environment (including light emissions) can affect the context that is essential to protected resources under each of these Acts.

U.S. Forest Service, Bureau of Land Management Handbooks, and Federal Highway Administration

The U.S. Forest Service's Handbook 701, *Landscape Aesthetics: A Handbook for Scenery Management*, (U.S. Forest Service, 1995), BLM's Handbook H-8431-1, *Visual Resource Contrast Rating* (BLM, 1986), and the Federal Highway Administration (FHWA) *Guidelines for the Visual Impacts of Highway Projects* (FHWA, 2015) use descriptive and systematic rating systems to classify the existing character and value of the visual resources on their respective land. These handbooks provide approaches and methods for assessing the impact of actions that change the visual environment.

The Coastal Zone Management Act of 1972

This Act encourages coastal states to develop coastal zone management plans. Under the Georgia Coastal Zone Management program, major actions within the coastal counties (including Camden County) require a Consistency Determination that demonstrates that a proposal is consistent with (or would not impede) the Georgia Coastal Management program goals (see Sections 3.4 and 4.4, *Coastal Resources*). Retaining the aesthetic qualities of coastal areas are one of the management goals.

The National Park Service Management Policies (2006)

This policy document provides specific guidance on lightscape management and protection of wilderness resources within areas of their jurisdiction. These policies also address the need and use of cooperative conservation beyond park boundaries in order to manage and protect park resources pertaining to lightscape management.

FAA Order 1050.1F, Environmental Impacts; Policies and Procedures, and the associated Desk Reference

These complementary documents provide guidance for considering the effects of actions on visual resources and visual character, with particular concern for light emissions. Evaluations should consider how light and visual impacts can affect other activities (including aviation) and visually sensitive land uses. The Order and the Desk Reference state that visual resources are inherently difficult to define because of the subjectivity involved. Aesthetic impacts deal with the extent that a new project or undertaking

contrasts with the existing environment and whether the jurisdictional agency or public consider this contrast objectionable. The Order specifically states that annoyance from lighting and measures to minimize the effects should be documented in the EIS. These documents outline the concepts for evaluating light emissions and visual impacts. FAA considers how light emissions may affect the visual character of the area, particularly for important or sensitive visual resources.

National Wild and Scenic Rivers Act (1968)

This Act protects rivers with outstanding scenic, wild, and/or recreational qualities. It also protects rivers that are listed on the Nationwide Rivers Inventory (NRI) but have not gained congressional designation. Rivers on the NRI require protection and consultation with the NPS for any actions that could impair outstanding qualities.

National Park Service, Cumberland Island National Seashore General Management Plan, 1984

This plan identifies several zones within the park and describes suitable activities, development, and general management directions to support the values and purpose of each zone. Even though this plan is relatively old, the concept of zones with specific purposes implies a practical and reasonable approach to land management based on varied attributes over an entire park.

Camden County Unified Development Code, Article 2, Use of Land and Structures; Article 4, Buffers, Landscaping and Tree Conservation; Article 9, Environmental Protection

The referenced UDC articles have the purpose of improving aesthetic qualities in Camden County and of protecting and preserving the appearance, character, and value of neighborhoods, business areas, and sensitive environments. The UDC establishes clear requirements for buffers, landscaping, and tree conservation, depending on land use and zoning. These are focused on interactions between residential, office and institutional, commercial, and industrial uses. Specific limitations apply to river corridors, wetlands, and conservation areas.

3.13.3 Existing Conditions

This section provides a description of the existing visual character of the proposed Spaceport Camden site and the surrounding areas and viewsheds. It also provides an overall value of these visual resources using a basic assessment of visual attributes. Section 3.13.3.2, *Light Emissions*, provides a description of the current light emissions at the proposed spaceport site and surrounding areas.

To support the narrative for Section 3.13.2, *Regulatory Setting*, and Section 4.13.1, *Proposed Action*, Exhibit 3.13-1 shows a series of photographs of the site and surrounding areas that illustrate the prevalent views and visual character. Most of the photographs (excluding M and O) were taken during a site visit for the EIS in September 2015. Exhibit 3.13-2 illustrates the points in the region and direction of the viewer for all the photographs presented in Exhibit 3.13-1.

The proposed Spaceport Camden site is located in a low-lying area in southern Georgia along the coast with a mixture of salt marsh, wetlands, and forest. Offsite areas to the west and south of the proposed Spaceport Camden site are forested and gradually transition from wetland and to upland characteristics as the terrain trends gently upwards to the west (inland from the coast). Roads, small pockets of residential land, and small communities have developed in the surrounding area. To the north of the site are the Satilla River delta and smaller waterways, small estuarine islands, freshwater wetlands and tidal salt marsh. To the east are water channels winding through the salt marsh along the coastal islands (photographs J, L, N, and O). The main channel is the Intracoastal Waterway. The Cumberland Island National Seashore and Little Cumberland Island are situated to the east and exhibit a mixture of coastal forest and salt marsh (photographs O and P). Sections 3.4, *Coastal Resources*, 3.5, *Department of Transportation Act, Section 4(f)*, and 3.9, *Land Use*, address the multiple values of the Cumberland Island National Seashore.

Exhibit 3.13-1. Photographs of the Proposed Spaceport Camden Site and Surrounding Area

A-Existing structures near proposed main gate location

B-Site Deep Water dock

C-Existing footprints of former industrial buildings on Bayer CropScience site

D-Former rocket silo sit with forest background

E-Typical view of existing road through forest vegetation on site

F-Existing power lines and road corridor

G-Historic relics of Anchor House

H-Fairfield Cemetery

(continued on the next page)

Exhibit 3.13-1. Photographs of the Proposed Spaceport Camden Site and Surrounding Area (Continued)

I-Planted pine forest on Union Carbide site

J-Typical coastal marsh and forest background

K-Mixed Oak and Hardwood forest with palmetto and wax myrtle understory

L-Proposed Vertical Launch Vehicle site looking east

M-10th Street Overcrossing of Interstate 95 looking east

N-Floyd Basin

O-Typical Salt Marsh view from Coastal Waterway near Cumberland Island

P-North end of Cumberland Island looking south

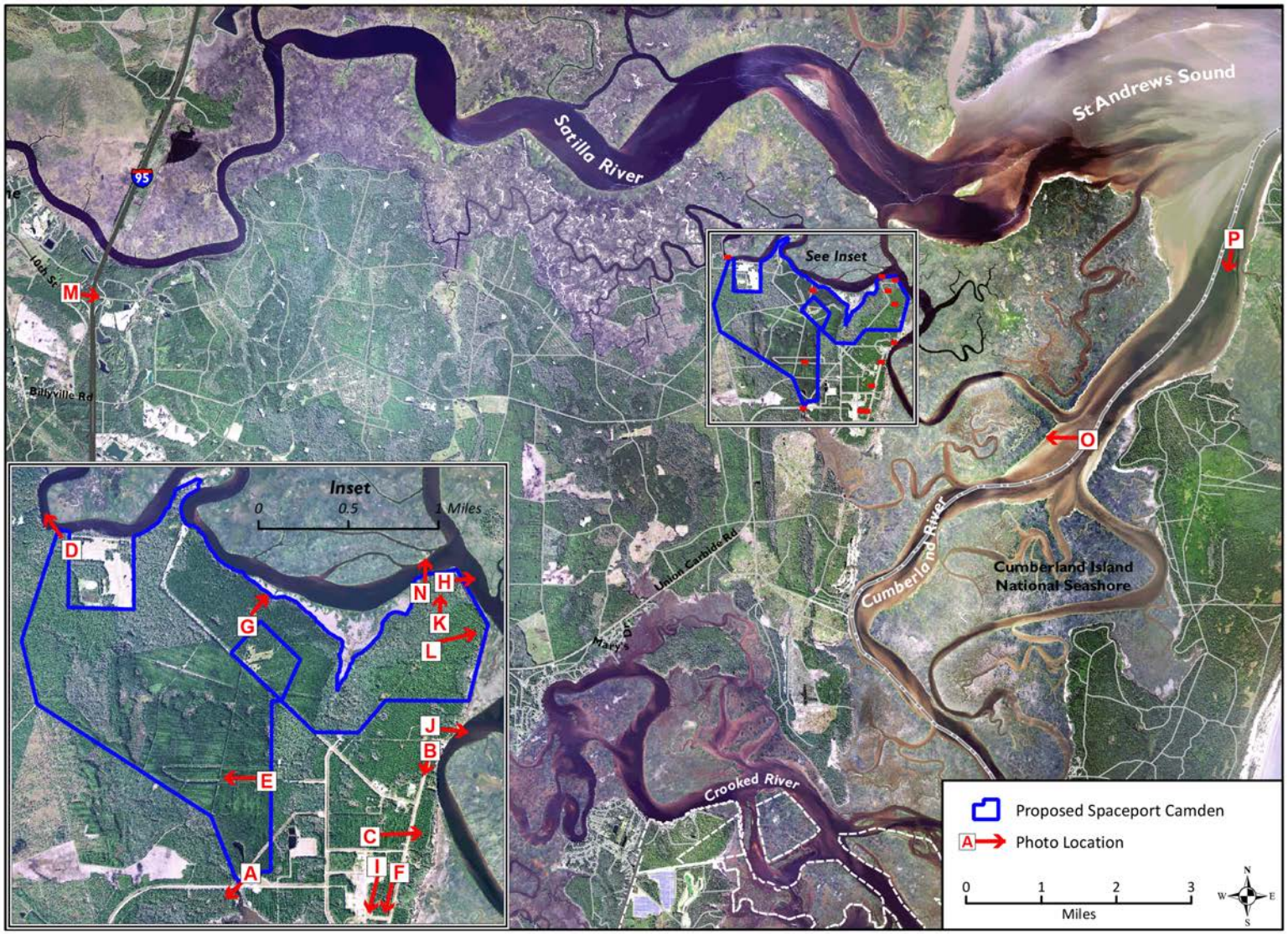


Exhibit 3.13-2. Location and Direction of Viewer for Photographs of Proposed Spaceport Camden Site and Surrounding Area

3.13.3.1 Visual Resources

Project Site Visual Character. The primary sources for describing current visual conditions at the site are derived from photographs, supplemented by information in previous studies and reports for the Bayer CropScience and Union Carbide Corporation properties and by examination of Google Earth satellite imagery (CH2M Hill, 2015; Tetra Tech, 2013). The dominant visual character of the site is defined by vegetation and anthropogenic modifications. The land is generally flat with only minor elevation changes. The proposed site (including its potential buffer parcels) is predominantly vegetated with the imprint of industrial uses, infrastructure, forestry, and silviculture punctuating the landscape. Landforms are not the primary defining component of the landscape. Viewsheds are dominated by vegetation, water, and sky, depending upon the viewer's location.

Vegetation types on the site are delineated in Exhibit 3.2-1 and described in Section 3.2.3.1, *Terrestrial Vegetation and Habitats*. There are two broad types of vegetative environments: wetland/tidal marsh and upland. These are briefly described below:

- **Wetland/tidal marsh.** Most of the proposed site outside of the land under current option to purchase (see Exhibit 3.2-1) falls within the wetland category. These are low-lying areas of wetland vegetation types consisting of the following:
    - Low salt marsh with a canopy density of 10 to 80 percent and vegetation height up to 10 feet (Exhibit 3.13-1, photograph N, shows typical low-lying salt marsh.)
    - Freshwater wetlands with both cypress/hardwood trees dominated by gum trees and red maples with wax myrtle and ferns in the understory with canopy height up to 80 or 90 feet
    - Non-forested emergent wetlands with dominant ground-cover vegetation of maidencane, yell-eyed grass, piperwort, and some wax myrtle along the waterway edges up to about 5 to 10 feet in height (CH2M Hill, 2015) (Exhibit 3.13-1, photograph J, shows low-lying emergent wetlands.)
- **Upland.** Most of the land with a current purchase option and the former industrial portion of the Bayer CropScience land are categorized as upland. These areas are relatively flat but slightly higher than the low lying tidal marsh. Vegetation in the upland areas is composed of the following:
    - Mixed oak/hardwood natural forest with high canopies of live oak and red cedar trees (ranging from about 60 to 80 feet high) with dense saw palmetto and wax myrtle in the understory
    - Pine forest of loblolly and slash pines
        - Upland areas now predominantly support planted pine forest of loblolly and slash pines, where the understory has been cleared. The trees are planted in rows and blocks of trees have uniformity in size reflecting planting in the same year. These vary in height depending on the age of the stands, but can achieve heights of up to about 100 feet tall at maturity. In Exhibit 3.13-1, photographs G, H, I, K, and L exhibit upland vegetation and pine forests, with some anthropogenic features.
    - Interspersed small pockets that were cleared for agriculture and pasture in the past but later abandoned
        - These areas now have weedy herbaceous and woody species and more open habitat (CH2M Hill, 2015).

- Scrubby flatwood communities, found along the edges of Floyd and Todd Creeks, with high open canopies of oaks and longleaf pines, and understory of low oaks, saw palmetto and diverse grassy ground cover

Although the site is mostly forested, areas have been cleared to support previous industrial development, access roads, and utility easements. These anthropogenic features are mostly found interspersed in the upland areas and modify the natural visual character of the site. Overall, these elements cover a small portion of the total acreage and are generally clustered in discrete locations that are cleared of forest vegetation. Most facilities have been demolished so that only concrete footprints remain. The Bayer CropScience facilities included over 20 buildings, a water treatment facility, and various roads, overhead electrical and communications services, and in ground water distribution lines (see Exhibit 3.13-1, photograph C). The primary features of the property were the central Temik manufacturing facility, associated conveyors, and related structures. The principal building rose above 300 feet and was well lit for safety and security purposes. It was a prominent feature on the Camden County skyline in the direction of the proposed site, visible both in the day and at night.

These structures were removed by the year 2012 and are not part of the current viewshed towards the proposed site (see Exhibit 3.13-1, photographs A, B, C, and D). The former industrial facilities are essentially abandoned and not generally open to the public. Currently, the number of viewers onsite is low and their purpose is usually for site maintenance, study, monitoring, or restoration.

Beyond these clusters of development on the site, the photographs show how corridors have been cleared through the forest (for infrastructure such as roadways and power lines) and traverse the site (see Exhibit 3.13-1, photographs E and F). Most of these features are largely unnoticeable to offsite viewers due to intervening trees and understory vegetation, except for viewers at the deep water dock and along Floyd Creek and at the site's main entry along Union Carbide Road, where limited views are possible for persons passing in boats, on foot, or in vehicles.

Site Visibility from Off-site Viewing Locations. Off-site viewing locations were selected to include a variety of middle ground and background viewing distances toward the site; a variety of viewer contexts (residential, park/protected area, recreation, roadway, shoreline); and locations with higher elevations than the surrounding area. Exhibit 3.13-3 shows the location of the 16 representative off-site viewing locations in the surrounding area. Table 3.13-1 provides a brief summary of the current view toward the proposed Spaceport Camden site at each of the locations considering the effects of existing vegetative screening and includes a brief assessment of the viewshed quality considering the intrinsic visual character and context. The following explains the parameters for ratings of low, moderate, and high for this analysis:

- **Low.** Natural context is noticeably modified by anthropogenic features. The viewshed is composed of non-distinctive landscape forms, lacking contrast or variation in color, texture, or shapes. The wildlife and ecological setting is not distinctive. The visual character is typical and pervasive in the surrounding region.
- **Moderate.** Natural context has some evident anthropogenic features but is subordinate to the overall viewshed. The viewshed has some variation in landscape form, texture, color, and shapes. The views of wildlife and ecology provide some visual interest. The visual character is generally pleasing but not distinctive.
- **High.** The natural context is dominant with few or unnoticeable anthropogenic intrusions. The viewshed offers high contrasts, variations in form, texture, and color and is very pleasing to most viewers. Natural surroundings provide excellent opportunities for viewing wildlife and ecology. The visual character is exceptional to most viewers and is regionally important.

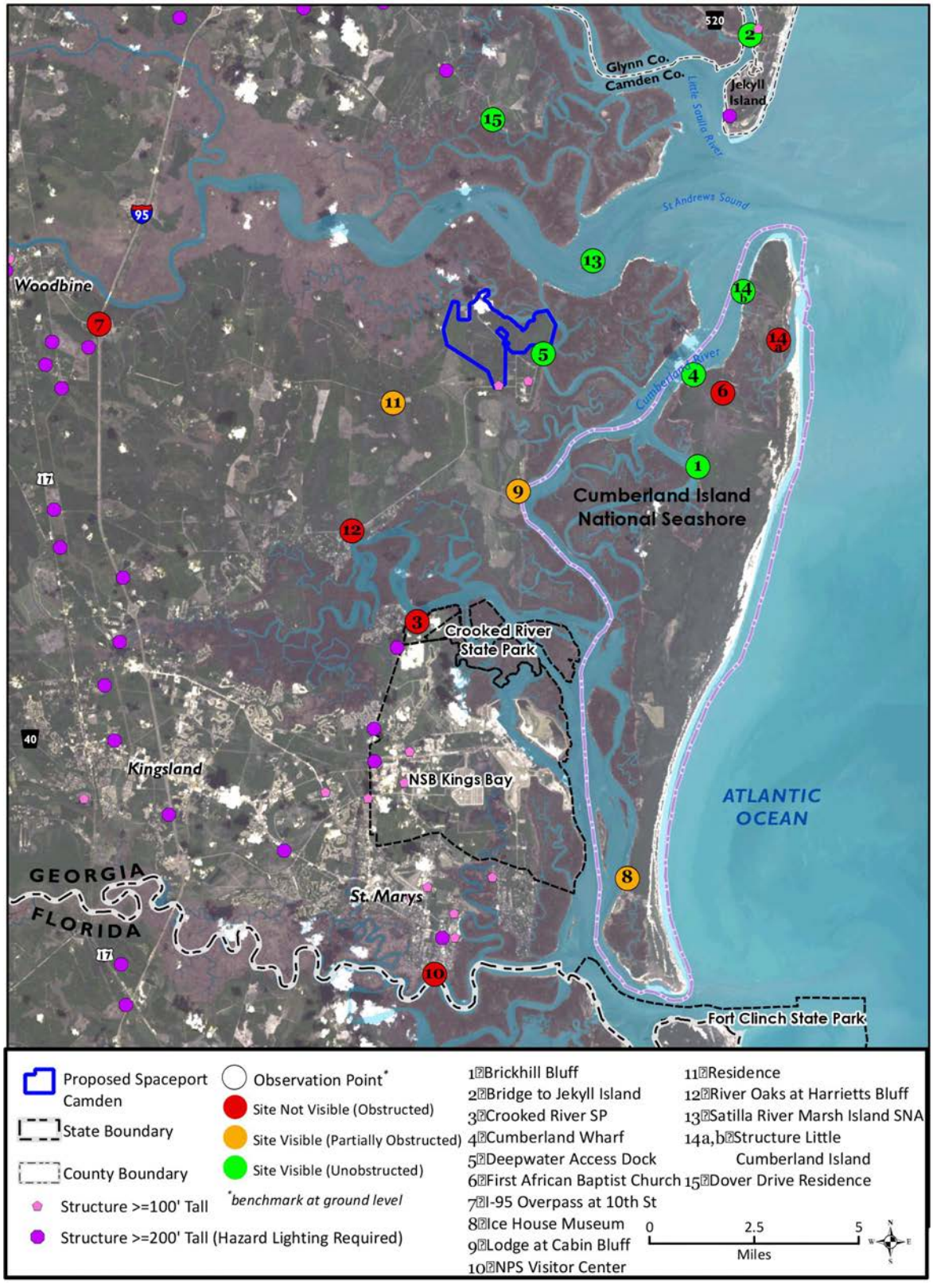


Exhibit 3.13-3. Representative Observation Points in the Area Surrounding Proposed Spaceport Camden

Exhibit 3.13-3 shows the locations of existing towers in the region surrounding the proposed spaceport site. These towers range from 100 feet to above 500 feet and would be visible from some locations in the near ground or distance depending on intervening vegetation and terrain. From most viewing locations, towers are not currently considered a dominant visual feature in the viewshed even though they are visible from some locations. Most viewers consider the surrounding views as dominated by natural settings. A tower may dominate a view when in close proximity (less than 0.5 mile) and the view is unobstructed. Taller towers on the proposed spaceport site (above 200 feet high) would have requisite safety lighting, which can be noticeable at night. Vegetation, terrain, and atmospheric conditions limit how far most viewers can perceive specific elements in the immediate and distant surroundings.

Each location shown in Exhibit 3.13-3 was analyzed to determine whether the proposed spaceport site is potentially visible at the ground level. Also included in the analysis was two notional building heights of 45 feet and 250 feet above ground level (representing potential structures constructed as part of the proposed spaceport). The analysis used geographic information system visibility analysis tools and a digital elevation model for the Earth's surface. The digital elevation model includes data on ground height only and does not depict vegetation and structures. Therefore, this visibility analysis served as a screening tool. It is considered a "bare earth" line-of-sight analysis and identified whether the representative locations have line-of-sight to the proposed Spaceport Camden site, accounting for terrain but not vegetation. Exhibit 3.13-3 indicates which locations have unobstructed, partially obstructed, and wholly obstructed line-of-sight to the proposed site. For observation points where visibility is not interrupted by ground height, real world conditions, including the added height of vegetation and structures, could prevent visibility. Table 3.13-1 describes each of the representative observation points as well as the anticipated effect of vegetation and structures in the current visual environment.

Table 3.13-1. Representative Observation Points in Area Surrounding Proposed Spaceport Camden

ID/Observation Point	Distance (miles)[1]	Current Viewshed Conditions
1. Brickhill Bluff	5.1	From Cumberland Island west shoreline, unobstructed line-of-sight to east side of proposed Spaceport Camden site. View of foreground salt marsh and waterways with low strip of dark forest canopy in middle-distance with large sky area above. Wide viewshed includes small housing enclaves, Cabin Bluff resort, and Jekyll Island community. These locations are only visible at night, and visibility is low. Visible artificial lights are not glaring. Viewshed quality: Views westward moderate to high, mostly natural but lacking distinctive landforms.
2. Bridge to Jekyll Island	8.8	From vantage points along the bridge, Spaceport Camden site visible but not distinguishable from surrounding forest for most viewers; power line corridors form noticeable lines through natural and planted forests, but are subordinate to the overall view. Viewshed includes middle-ground waterways and salt marsh vegetation. Viewshed quality: Moderate to high due to panorama vantage point, but highly modified in fore and middle-ground, with natural character in distant views to north, west, and south, and views to ocean to east.
3. Crooked River residences and State Park	7.7	Line-of-sight to Spaceport Camden site interrupted by intervening land and vegetation. Narrow views north from the State Park may have visual connection to east side of the proposed Spaceport site, mostly over salt marsh and pine forest of the proposed Vertical Launch Facility. These views to the site are distant and appear as bands of vegetation and water in the distance. The context also includes low-density rural residential housing along the shorelines.

Table 3.13-1. Representative Observation Points in Area Surrounding Proposed Spaceport Camden (Continued)

ID/Observation Point	Distance (miles)[1]	Current Viewshed Conditions
		Viewshed quality: From shoreline, moderate to high views to surrounding waterways, with mostly natural settings dominated by marsh and sky, with distant treeline canopies.
4. Cumberland Wharf, CUIS	3.8	Open views to the east side of the proposed site visible as middle-ground salt marsh with band of darker forest canopy beyond the marsh. Sky and water are dominant elements of the view. Viewshed quality: Similar to observation point 1. Historic context of ruins.
5. Deep Water Access Dock	0.7	From the dock and Floyd Creek, former facilities and infrastructure directly visible. Areas cleared of vegetation with small buildings visible and former building concrete pads and power lines also visible. Forested background to west and north. Viewshed quality: Low to moderate due to industrial use and existing modifications in foreground. Surrounding waterways are natural with little intrusion from human-made features.
6. First African Baptist Church, CUIS	4.7	Views to the mainland and the Spaceport Camden site blocked by intervening terrain (remnant dune formations) and forest. Viewshed quality: The immediate viewshed is defined by naturalness and surrounding historic structures, but views are limited due to foreground vegetative screening and local terrain.
7. I-95 Overpass from 10th Street	10.5	Views to the spaceport site blocked by intervening terrain, trees, and distance. Viewshed quality: Low quality due to modification to landscape by roadway. Generally narrow views along area roadways due to bordering forests.
8. Ice House Museum, CUIS	13.4	To the northwest, view toward the east and southeast edge of the proposed Spaceport Camden site visible as low dark band of forest canopy and not distinguishable from other shoreline vegetation in the far distance. Land is narrow band, subordinate to the dominant water and salt marsh in fore- and middle-ground and overarching sky. Viewshed quality: Moderate due to modifications in the wide viewshed eastward that include closer built up areas including NSB Kings Bay and St. Marys.
9. Lodge at Cabin Bluff (resort)	3.5	Middle-distance views northward to the Spaceport Camden site screened by trees, landscaping and facilities at the Cabin Bluff. From open fairways on golf course, there may be line-of-sight to forest canopy on the Spaceport site in the middle-ground. Viewshed quality: Mostly pleasing natural views, altered by forestry and some anthropogenic features (roads, utility lines); moderate quality. Attractive landscaping in the foreground at the resort.
10. NPS CUIS Visitor Center, St. Marys	15.7	No view to the proposed Spaceport Camden site from the CUIS mainland Visitor Center. Viewshed quality: Mixture of small town urbanscape with views of natural waterways to south from the Visitor Center. Mostly pleasing visual character.
11. Residence west of proposed	3.9	Views to the Spaceport Camden site mostly blocked by surrounding forest at ground level and lower elevations of the site. Natural and planted forest surroundings modified by small scale rural residential

Table 3.13-1. Representative Observation Points in Area Surrounding Proposed Spaceport Camden (Continued)

ID/Observation Point	Distance (miles)[1]	Current Viewshed Conditions
Spaceport Camden site		development, fences, structures, back county roads, with relatively dark sky context. Viewshed quality: Moderate visual quality.
12. River Oaks residences and State Park at Harrietts Bluff	6.6	Views to the Spaceport Camden site mostly blocked by intervening forest and structures. Mixture of natural forest and small-scale rural enclaves, generally appealing and typical of surrounding inner shoreline and estuarine visual character; views over natural waterways from shoreline, pleasing quality. Park mostly forested with limited views except at the shoreline. Viewshed quality: Moderate visual quality, typical of inner coastal shore, with evident human modifications.
13. Satilla River Marsh Island SNA	2.0	Close views to south and southwest to proposed Spaceport Camden site dominated by sky and foreground water and marshland with forest canopy behind. Viewshed quality: High due to natural, quiet surroundings, riparian habitat and wetlands and tidal marsh.
14a. Structure Little Cumberland Island	5.7	Views to the Spaceport Camden site blocked by intervening forest and terrain. Views eastward over ocean, dominated by seascape, horizon and sky. Views south, west and north of surrounding foreground natural dunes and coastal island habitat. Few human intrusions except for home sites. Viewshed quality: Moderate to high due to naturalness.
14b. Northwest Shoreline of Little Cumberland Island	4.7	Open views to the east side of the proposed site visible as middle-ground salt marsh with band of darker forest canopy beyond the marsh. Sky and water are dominant elements of the view. Viewshed quality: Views westward moderate to high, mostly natural but lacking distinctive landforms.
15. Residence on Dover Drive	5.1	Residences along the shoreline (southern part of Piney Bluff and southern facing parts of Dover Bluff) have open views over Satilla River and marshland to the south in foreground and middle-ground towards the proposed Spaceport Camden site. Views dominated by water and marsh with darker band of middle distance forest, with sky above. Immediate foreground context modified by small-scale rural residential development. Similar to observation point 13, but further away from the proposed site. Viewshed quality: Moderate to high quality views towards the site, mostly natural with protected Satilla River corridor.

Notes: CUIS = Cumberland Island National Seashore; NSB = NSB; SNA = State Natural Area.
[1] Measured from observation point to proposed Vertical Launch Facility water tower site.

The model found that three points (observation points 6, 7, and 10) had no line-of-sight to a 45-foot elevation above the site and observation point 7 had no line-of-sight to a 250-foot feature. The analysis for this EIS found that existing views of the site from land-based observation points are generally limited due to intervening vegetation and lack of elevated vantage points in relations to the site. Several of the representative observation points have wholly obstructed views due to vegetation, structures, and terrain

(observation points 7, 10, 12, and 14), or partially obstructed (observation points 3, 6, 8, 9, 11, and 14). For example, most roadways are bordered by natural and planted forests so that views to the site are obstructed (see Exhibit 3.13-1, photograph M, and Exhibit 3.13-2, observation point 7).

Exceptions include elevated points with a vantage point, such as the bridge to Jekyll Island (observation point 2), and close-up and bordering locations, such as the current entry location to the site on Union Carbide Road, and along the bordering logging roads and bordering estuarine creeks (such as Todd Creek, Floyd Basin, and Floyd Creek). Viewing locations to the north and east of the site in the salt marsh and along the Satilla River delta and coastal waterways (Exhibit 3.13-2, observation points 5, 13, and 15) and intermittent spots on the west shore of Cumberland Island (observation points 1 and 4) have open views to the proposed site over the low salt marsh.

The privately owned historic Little Cumberland Island lighthouse is located on the northern tip of the island, about 6.6 miles from the proposed launch pad. Views around the lighthouse are unencumbered in most directions. To the north and east is open water with Jekyll Island about 4 miles to the north. The shoreline of Jekyll Island has intermittent ambient lighting, which would be slightly visible at night on clear nights. A communications tower over 300 feet high with warning lights (see Exhibit 3.13-3) is about 4.5 miles from the proposed launch pad. To the west is the St. Andrews estuary and marshland. To the south, vegetated dunes and forest are visible. The surroundings are dark at night, with individual lights on some distant tall objects visible. From this location, Brunswick and St. Simons generate noticeable sky glow depending on atmospheric and cloud conditions.

Exhibit 3.13-1, photographs J and O (also see Exhibit 3.13-2, observation points 1 and 4), show typical views from the Intracoastal Waterway of low-lying marshes and backgrounds of higher tree canopies formed by natural and planted forest. These locations have unobstructed middle-ground and distant views to the eastern side of the proposed site. The dominant elements of these views are water and sky with only a narrow horizon of vegetation. The dominant views on Cumberland Island and Little Cumberland Island are towards the ocean from the east shore and over the salt marsh from the west shoreline (Exhibit 3.13-2, observation points 1, 4, and 8). In many situations, views toward the site are intermittent through gaps in screening vegetation, depending on where the viewer is standing (as at Exhibit 3.13-2, observation points 8, 9 and 11).

Protected areas (including Cumberland Island National Seashore and the Satilla River) with views to the proposed site include observation points 1, 4, 8, 13, and 15. Observation points 4 and 8 have middle-ground and distant views, respectively. Observation point 13, in the Satilla River delta, has middle-distant views. Observation point 15, on the north side of the Satilla River, has a middle-distant view. Although some locations have no view or limited visual connection to the proposed Spaceport Camden site, all the representative locations would have visibility to rocket launches if viewers were oriented toward the flight path (see Section 4.13.1.2, *Operation*, and Table 4.13-1).

Current viewers at the proposed spaceport site are limited to only a few workers who perform maintenance, studies, monitoring, and restoration. The general public does not have access to the site and the deconstructed former industrial areas. From offsite, viewers can see some of the remnants of the former site development from bordering logging roads (with little traffic) and the main gate access point on Union Carbide Road. Boaters on Todd Creek, Floyd Basin, and Floyd Creek can directly observe the periphery of the site, but vegetation forms a visual barrier. Viewers include recreationists, sports fishers, tourists on the more distant Cumberland Island National Seashore west shoreline, a few residents on the west shore of Little Cumberland Island, and boaters on the Intracoastal Waterway, Satilla River,

and estuarine creeks. Some residents on the north side of the Satilla River have open views to the site, and also some residents to the south and southeast have partial views from local parks and housing enclaves (such as observation points 3, 9, and 11 on Exhibit 3.13-3). In all situations, views are limited by intervening vegetation, especially when in close proximity to the viewer.

Visual Resource Value. The proposed Spaceport Camden site's pre-existing industrial use and current and former infrastructure has modified the visual context. While most of the site is still vegetated, much of this vegetation is planted forest, with interspersed areas with natural vegetation. Away from the sites of former industrial facilities, the visual character is appealing. The Camden County UDC provides protection for the Satilla River corridor, wetlands, and designated conservation areas (see Exhibit 3.2-1 for location of salt and brackish tidal marsh), reflecting a community value for the visual surroundings and ecosystems in the county. The upland portion of the site (where former facilities and the proposed spaceport facilities would be located) is zoned for industrial use and was amended in 2014 to allow for spaceport development. The Camden County UDC Article 2, *Use of Land and Structures*; Article 4, *Buffers, Landscaping and Tree Conservation*; and Article 9, *Environmental Protection*, provide the local regulatory framework for new development on the site. The low-lying marsh areas of the site are defined as conservation areas. Similarly, the land bordering the Satilla River is a protected river corridor area where physical development is restricted in a 100-foot wide buffer zone along the river channel (Camden County, 2014).

The surrounding coastal area has moderate to high visual value, largely due to the relatively undisturbed natural landscape. The Cumberland Island National Seashore, which includes a designated wilderness area, is frequented by visitors, many with expectations of enjoying the natural setting. The visual quality of the viewshed from the shoreline and waterways of Cumberland Island National Seashore is an important attribute of this protected area. The Satilla River (on the NRI) possesses outstanding scenic, wild or recreational qualities. The tidal waterways and creeks bordering the proposed site on the north are part of the Satilla River delta. Although the river was never formally designated as a National Wild and Scenic River, its status on the NRI requires protection to preserve its values until a decision on its status is made. The quality of the natural environment and the interface between land and water make this area popular for outdoor recreation and sporting activities, vacationing, and appreciation of nature. The natural qualities of the visual environment and viewsheds are, therefore, a valuable regional resource. The visual setting of several historic sites both onsite and offsite in the local area is important due to the intrinsic values of the historic and cultural resources. Table 3.8-1 lists historic sites and indicates potential for visual effects, although vegetation and slight changes in terrain screen most of the offsite locations from direct visual line-of-sight to the proposed Spaceport Camden site. Additional information on recreational, historic, and natural value of these assets is found in Sections 3.4, *Coastal Resources*, 3.5, *Department of Transportation Act, Section 4(f)*, 3.8, *Historical, Architectural, Archaeological, and Cultural Resources*, and 3.14, *Water Resources*.

Little Cumberland Island is a part of the protected Cumberland Island National Seashore. Views to the mainland and to the project site are partially visible to residents and tourists from Little Cumberland Island, depending on vegetation and terrain near the viewer (which can block direct views). Water-based viewers and viewers on Cumberland Island trails and roads also have views to both the island and the mainland and project site. These views are also intermittent and dependent upon elevated terrain (such as dunes) and vegetation at the viewing location. The setting is predominantly natural. The island has some historic sites for which the visual setting is important, and the visual quality of the viewshed from the shoreline and waterways is an important attribute of the Cumberland Island National Seashore

protected area. There are a few residences along the western shoreline with unobstructed views across the Intracoastal Waterway to the mainland and the proposed site.

3.13.3.2 Light Emissions

Onsite Light Emissions. Currently, the proposed Spaceport Camden site is essentially unilluminated by artificial light sources. Any incidental lights near the main entry point on Union Carbide Road are minimal. This is reflected in Exhibit 3.13-4, where the site shows as very low on the radiance scale.

Light Emissions in Surrounding Areas. The immediate surrounding areas are also mostly unilluminated natural areas. Rural roadways near the site do not have overhead lights. Intermittent locations of isolated residences and small businesses, especially along the waterway shorelines, generate some light in an otherwise dark landscape. However, many local light sources are screened by trees and vegetation, or are low intensity due to low wattage and distance. Pockets of measurably noticeable night radiance are evident in Exhibit 3.13-4 at the Lodge at Cabin Bluffs (see location in Exhibit 3.13-3). Radiance levels increase around NSB Kings Bay and St. Marys. To the north of the Satilla River, light is detectable near Dover Drive (see observation point 15 on Exhibit 3.13-3) and on Piney Bluff, continuing to intensify towards Jekyll Island and Brunswick. To the west, light levels increase around Woodbine. The northern half of Cumberland Island and Little Cumberland Island exhibit no measurable nighttime radiance as shown in Exhibit 3.13-4. Cumberland Island National Seashore is not a "dark skies park" as designated by the IDA (2017). Nighttime radiance is affected by local weather conditions, with low cloud cover often radiating light back to the earth, increasing perceptible glow. Humidity, fog, low clouds, and rain can absorb and obscure nighttime radiance, depending on the distance of the viewer relative to light-emitting sources and the amount of moisture in the air.

Dark Skies Initiatives. There is growing awareness and concern over the global and local effects of the increasing amounts of light emanating from the earth surface at night. Effects may range from disruption to biota from changes in the annual and daily light patterns on the earth surface, to loss of visibility of the night sky, to potential health effects on humans from high nighttime light levels in urban areas. In a social context, the impact of unwanted light emissions ranges from annoyance to individuals (such as residents or visitors to isolated natural locales) to major incompatibility with specific uses (such as light in pristine settings or glare disrupting aviation or astronomical observation). Related concerns are the cost and waste of energy, particularly resulting from over-illumination and undesired light trespass. *Light pollution* is a term for excessive, misdirected, or obtrusive artificial light.

In recent years, several organizations and research institutions have been monitoring and tracking the degree of light in the night sky. Exhibit 3.13-4 is a map showing the agglomerated measurement of night radiance from the earth's surface in the region surrounding the proposed Spaceport Camden. This map, prepared by the NOAA, illustrates how radiance is focused around population centers in the greater region, including Brunswick, St. Simons, Kingsland, Woodbine, NSB Kings Bay, St. Marys, Fernandina Beach, and Yulee.

The IDA is one of the primary organizations leading efforts to study and improve nighttime lighting. IDA has developed educational material and sample ordinances to help communities define and implement measures for controlling light pollution in outdoor settings. The IDA also promulgates and adopts outdoor lighting standards to lead the construction industry and the public at large towards BMPs for conserving dark skies. The NPS Natural Sounds and Night Skies Division also specializes in night skies and quantifying sky glow, light pollution, and natural skies for national parks and surrounding areas.

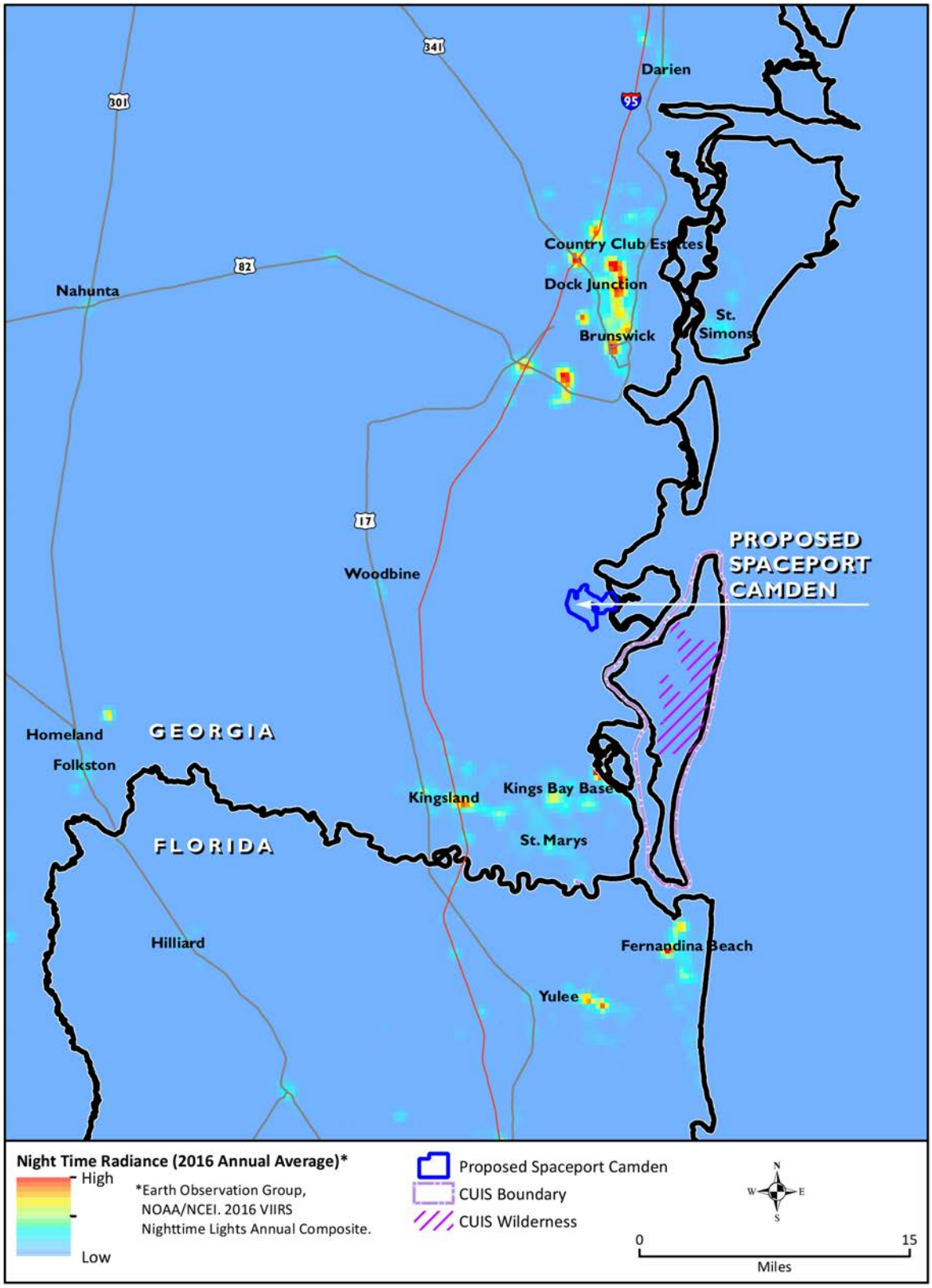


Exhibit 3.13-4. Distribution of Night Radiance in the Region Surrounding Proposed Spaceport Camden Site

3.14 Water Resources

3.14.1 Definition and Description

Water resources include wetlands, floodplains, surface waters, groundwater, and Wild and Scenic Rivers. Wetlands are areas of transition between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water (Mitsch & Gosselink, 2000). USACE defines wetlands (33 CFR §238.3(b)) as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." The definition excludes non-vegetated areas such as streams, ponds, and mudflats.

Floodplains are lowland areas adjacent to surface water bodies (i.e., lakes, rivers, oceans), where flooding events periodically cover areas with water. Floodplains provide value by serving as natural flood and erosion control, maintaining surface water quality by filtering nutrients and impurities, increasing biological productivity, and providing societal benefits such as open space for recreational opportunities and enhanced agricultural lands. Floodplains are often discussed in terms of the 100-year flood and 500-year flood. The 100-year flood (or base flood) is a flood having a 1 percent chance of occurring in a given year in areas where Federal floodplain development regulations are enforced. The 500-year flood is a flood that has a 0.2-percent chance of occurring in any given year.

Surface-water resources include streams, rivers, lakes, ponds, estuaries, and oceans and are important for a variety of reasons, including economic, ecological, recreational, and human health factors.

Groundwater is subsurface water that occupies the space between sand, clay, and rock formations. The term *aquifer* is used to describe the geologic layers that store or transmit groundwater, such as to wells, springs, and other water sources.

Wild and Scenic Rivers are rivers that have remarkable scenic, recreational, geologic, fish, wildlife, historic, or cultural values as defined by the Wild and Scenic Rivers Act.

3.14.2 Regulatory Setting

The following laws, executive orders, agency regulations, and other guidance apply to the Proposed Action.

Clean Water Act, Executive Order 11990, Protection of Wetlands, and DOT Order 5660.1A, Preservation of the Nation's Wetlands

The CWA of 1977 (33 U.S.C. §§1251 et seq.) was established to regulate discharges to surface waters, including wetlands. Pollutants regulated under the CWA are "priority" pollutants, including various toxic pollutants, such as biochemical oxygen demand, total suspended solids, fecal coliform, oil and grease, and pH. Section 404 of the CWA regulates development activities in jurisdictional surface waters[22] and wetlands. EO 11990, *Protection of Wetlands*, states that Federal actions must avoid to the extent possible the long- and short-term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative. DOT has implemented EO 11990 through policies and procedures documented in DOT Order 5660.1A, *Preservation of the Nation's Wetlands*. EO 11990 and DOT Order 5660.1A do not apply to

[22] Jurisdictional surface waters and wetlands are considered *Waters of the United States*, as defined by the USACE at 33 CFR §328.3 and USEPA at 40 CFR §230.3.

projects such as this one where FAA is issuing a license to a private party on non-Federal property (FAA, 2015a). Potential development actions that may affect streams and/or wetlands require a permit from USACE for dredging and filling in wetlands. In addition to USACE, USEPA and the states regulate dredge and fill operations and dredge material disposal. Section 303(d) of the CWA requires states, territories, and authorized tribes to develop a list of impaired waters. Waters are considered impaired when they do not meet water quality standards that the state, territories, and authorized tribes have set. States, territories, and authorized tribes are required to create a priority ranking system for these waters, as well as the development of total maximum daily loads. Section 402 of the CWA created the NPDES and Section 401 of the CWA includes requirements that a project does not violate State water quality standards.

Executive Order 11988, Floodplain Management, and DOT Order 5650.2, Floodplain Management and Protection: and the National Flood Insurance Act

EO 11988, *Floodplain Management*, requires Federal agencies to take action to reduce the risk of flood damage; minimize the impacts of floods on human safety, health, and welfare; and restore and preserve the natural and beneficial values served by floodplains. Federal agencies are directed to consider the proximity of their actions to or location within floodplains. DOT has implemented EO 11988 through policies and procedures documented in DOT Order 5650.2, *Floodplain Management and Protection*.

The National Flood Insurance Act established the National Flood Insurance Program, which is a voluntary floodplain management program for local communities. The National Flood Insurance Program is based on a mutual agreement between the Federal government and communities. Communities that participate agree to regulate floodplain development according to certain criteria and standards.

The Safe Drinking Water Act and other Federal Regulations for Water Resources

Other Federal regulations that may relate to water resources include the Safe Drinking Water Act, the Fish and Wildlife Coordination Act, the Rivers and Harbors Act, and the Wild and Scenic Rivers Act. The Safe Drinking Water Act protects public health through the regulation of the nation's public drinking water supply. This includes protecting sources of public water and setting national standards for pollutants that may be present within public drinking water. The Fish and Wildlife Coordination Act requires consultation with the USFWS when proposed projects may result in modification of water resources such as surface water bodies, stream, or wetlands. The Rivers and Harbors Act was established to protect the navigability of waters used for commerce.

The Wild and Scenic Rivers Act established the National Wild and Scenic Rivers System to preserve rivers with outstanding natural, cultural, and recreational values. Rivers that are designated to the system gain protection from certain alterations. The NPS also maintains the Nationwide Rivers Inventory (i.e., the NRI), which lists river segments that potentially qualify as wild, scenic, or recreational river areas but are not listed as a National Wild and Scenic River. A presidential directive issued in 1979 requires Federal agencies to consult with the NPS prior to taking actions that could effectively foreclose wild, scenic, or recreational status for rivers on the NRI. A river segment may be listed on the NRI if it is free-flowing and has one or more outstandingly remarkable values. Outstandingly remarkable values that can qualify a river for listing include: exceptional scenery, recreation, unusual geological formations, rare plant and animal life, and cultural or historical artifacts that are judged to be of more than local or regional significance.

Georgia's Coastal Marshland Protection Act

The State of Georgia regulates coastal wetlands through Georgia's Coastal Marshland Protection Act. This act applies to tidal wetlands and requires additional State permits to ensure the protection of these resources.

Chapter 391-3-6-.03 of the Rules and Regulations for Water Quality Control

Georgia's water quality standards are found in Chapter 391-3-6-.03 of the Rules and Regulations for Water Quality Control. These standards are used by the GDNR EPD to develop total maximum daily loads, issue water quality permits, and assess the water quality of State waters as part of the 303(d) listing process.

Georgia's Erosion and Sedimentation Act of 1975

Georgia's Erosion and Sedimentation Act complies with mandates in the CWA, strengthens erosion and sedimentation control activities in the Georgia, and implements a state-wide comprehensive soil and erosion control program.

Georgia's Scenic River Act of 1969

Georgia's Scenic River Act defines scenic rivers in the state and protects these rivers by preventing the construction of dams, reservoirs, or other structures that would impede the natural flow of the river.

Camden County Unified Development Code

Development projects within the 100-year flood zone are regulated under the Camden County UDC per Division 4-0: Flood Damage Prevention, Section 1130: Provisions for Flood Hazard Reduction.

3.14.3 Existing Conditions

The ROI for water resources includes the 11,800-acre industrial site currently owned by Bayer CropScience and Union Carbide Corporation (Exhibit 3.14-1). This area includes the areas proposed for construction or infrastructure improvements within the proposed Spaceport Camden and along existing roadways within the Bayer CropScience Property. The ROI for water resources also includes surface waters bordering the spaceport site boundary and surface water resources within the proposed launch trajectory (Exhibit 3.14-1). Waters bordering the spaceport site boundary are included in the ROI for consideration of indirect effects, and waters underneath the proposed trajectory are included for the consideration of effects should a launch failure occur.

Wetlands

Large areas of estuarine wetlands or tidal marshes are present in the portions of the site north and east of Todd Creek and the Floyd Creek. These wetlands areas, as mapped by the National Wetland Inventory, are shown on Exhibit 3.14-2 and are characterized by smooth cordgrass (*Spartina alterniflora*) and black needlerush (*Juncus roemerianus*).

Additional information was collected on wetlands within the proposed Spaceport Camden site, as this portion of the ROI has a greater potential for wetland impacts related to the construction of facilities.

Additional field surveys were conducted in 2016. These field survey areas (see Exhibit 3.14-2) were delineated in the summer of 2016 using the USACE methodology found in the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Atlantic and Gulf Coastal Plain Region* (USACE, 2010).

Wetland functions were assessed using the Wetland Rapid Assessment Procedure (WRAP). The WRAP is a rating index developed to assist in the regulatory evaluation of wetland sites that have been created, enhanced, preserved, or restored. This standardized rating index can be used in combination with

professional judgment to provide an accurate and consistent evaluation of wetland sites (Miller & Gunsalus, 1999).

The WRAP uses six variables to determine the functional condition of the wetland. These variables are wildlife utilization; wetland overstory/shrub canopy; wetland vegetative ground cover; adjacent upland support/wetland buffer; field indicators of wetland hydrology; and water quality input and treatment systems evaluation. These variables are assigned a score from 0 to 3 and then the variables are summed and divided by the maximum potential score for each variable to result in a WRAP index score. The WRAP index score ranges from 0 to 1, with a higher score representing higher functionality and a lower score representing poorer functionality. Wetlands delineated in the proposed Spaceport Camden site have WRAP scores ranging from 0.48 to 0.72, with most wetlands falling in the 0.60 and 0.72 range.

The delineation's field survey focused on those areas proposed for facility construction and roadway improvements (Exhibit 3.14-2). Twenty-one wetlands (ID #3 through #21 in Exhibit 3.14-2) totaling approximately 3.61 acres were delineated in the field survey areas. These wetlands are composed of non-tidal, freshwater (palustrine) habitat types including palustrine forested (PFO), palustrine emergent (PEM), palustrine scrub-shrub (PSS), and palustrine unconsolidated bottom (PUB). Five surface water features were also mapped during the wetland delineation. These surface water features are discussed more in the *Surface Water* section. The complete wetland delineation, including an assessment of function and values for wetlands within the proposed Spaceport Camden site, is included in Appendix H, *Wetland Delineation*.

Floodplains

The FEMA Flood Insurance Rate Maps categorize floodplains into different flood zones based on the levels of flood risk. Flood zones derived from the latest FEMA Flood Insurance Rate Maps (FEMA, 2017b) are shown in Exhibit 3.14-1.

The zones in the map are based on the base flood elevation, which is the surface elevation of a flood event having a 1-percent chance of occurring in any given year (the 100-year flood) and flood events having a 0.2-percent chance of occurring in any given year (the 500-year flood). The 500-year flood zone can also include an area of 1-percent-annual chance of flooding, with an average depth less than 1 foot or with drainage areas of less than 1 square mile.

"Zone AE" areas are subject to inundation by the 1-percent-annual-chance flood event determined by detailed methods. Maps with AE Zones have base flood elevations shown. "Zone VE" areas are subject to inundation by the 1-percent-annual-chance flood event with additional hazards due to storm-induced velocity wave action. Base flood elevations derived from detailed hydraulic analyses are shown.

Exhibit 3.14-1 also shows the limit of moderate wave action in the ROI. This linear demarcation defines the inland limit of the areas affected by waves greater than 1.5 feet. Research and post disaster damage assessments have demonstrated that waves 1.5 feet or greater can induce significant structural damage. All proposed facilities at the proposed Spaceport Camden site are outside of the limit of moderate wave action.

Portions of the proposed Spaceport Camden site are located within the 100-year and 500-year flood zones. The primary benefit provided by flood plains at the proposed Spaceport Camden is the storage and moderation of flood events from the Satilla River and its tributaries. Floodplains in the ROI also provide some benefits to plant and animal habitat and water quality maintenance.

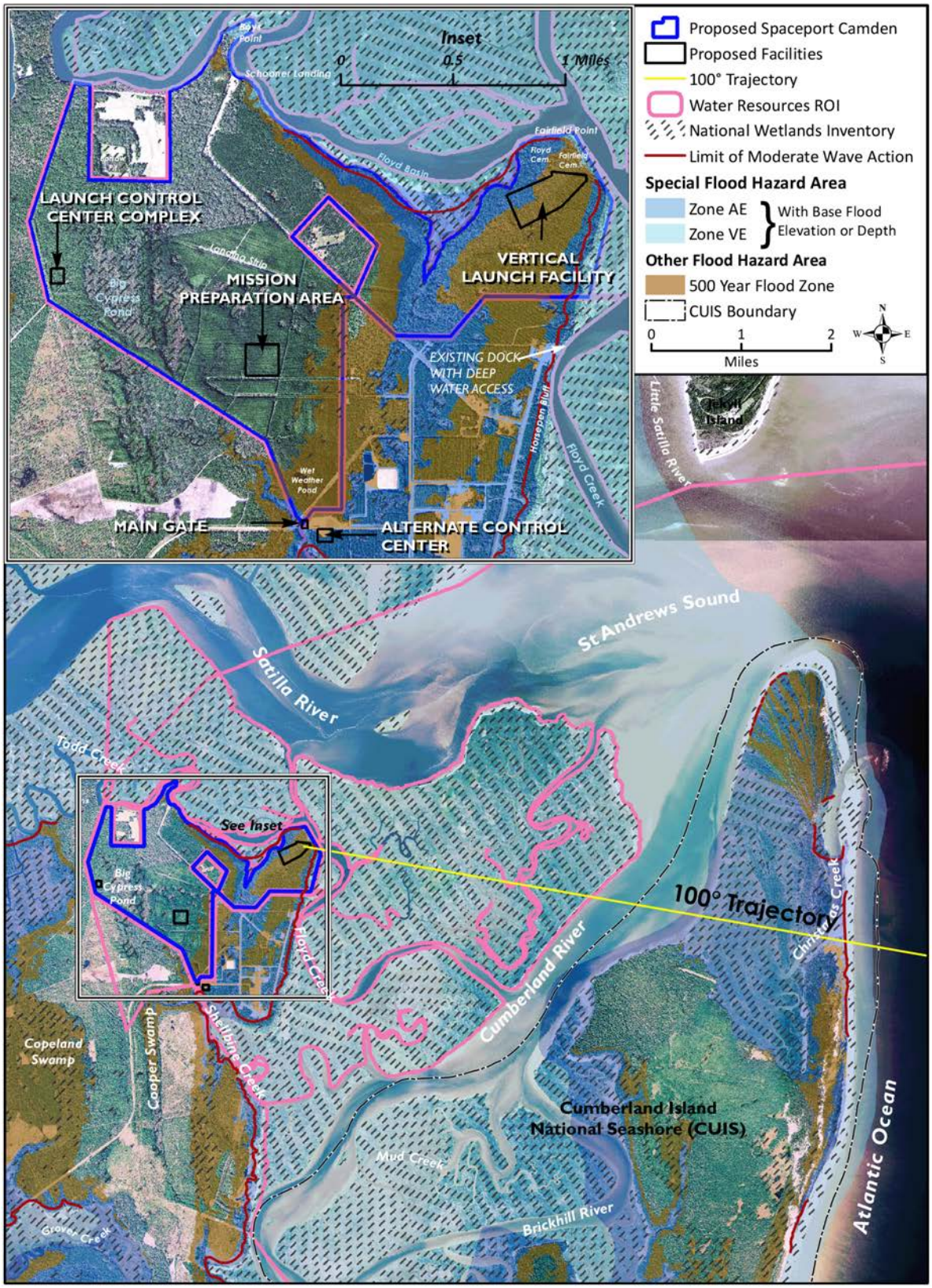
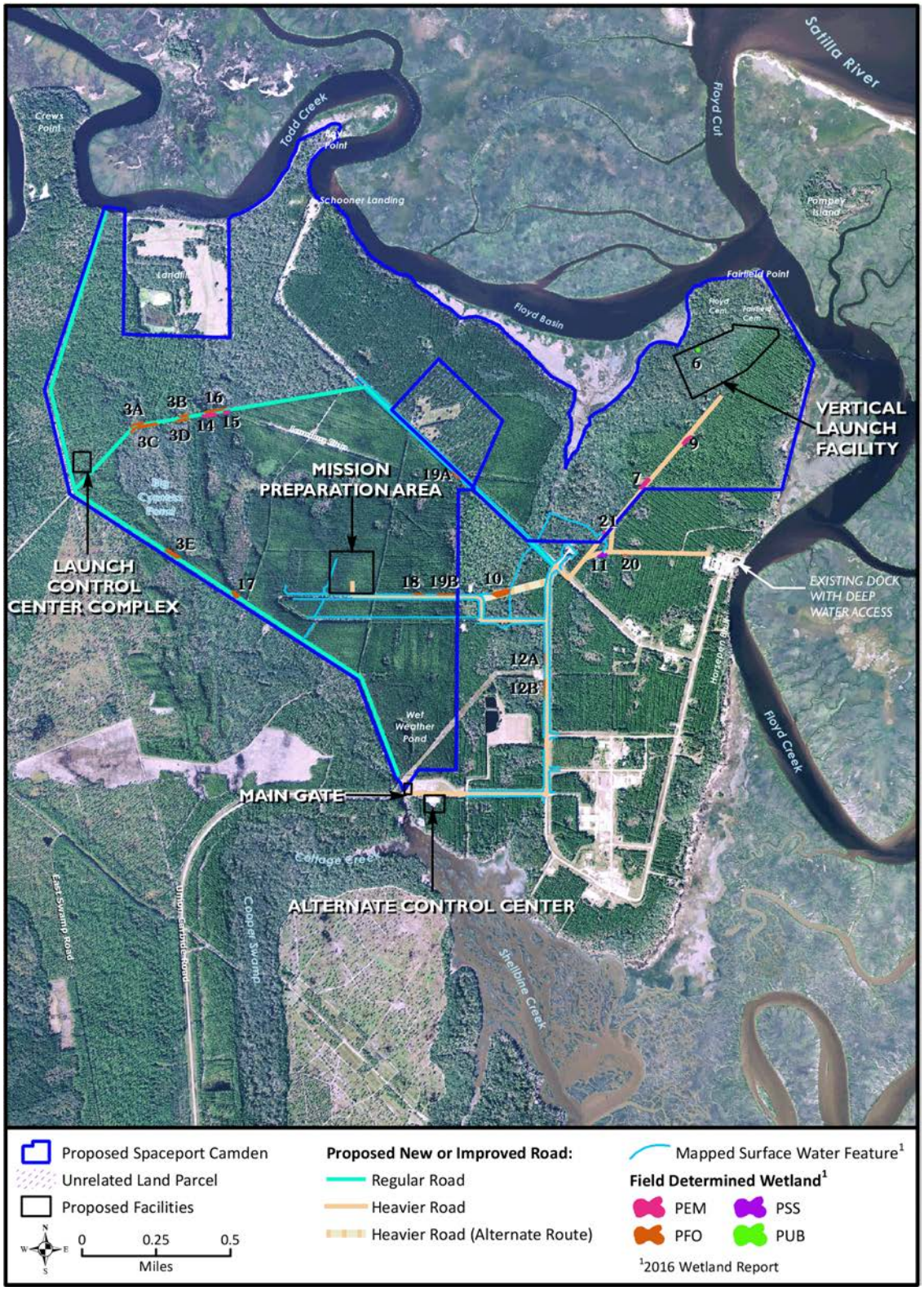


Exhibit 3.14-1. Floodplains and Regional Surface Water Resources



Notes: PEM = palustrine emergent; PFO = palustrine forested; PSS = palustrine scrub-shrub; PUB = palustrine unconsolidated bottom. [1]Source: (Leidos, 2016)

Exhibit 3.14-2. Wetland and Other Surface Water Resources at Proposed Spaceport Camden

Surface Waters

The ROI for surface waters is located within the Cumberland-St. Simons (HUC 3070203) watershed. The Atlantic Ocean is located to the east under the proposed trajectory. The ROI around the proposed Spaceport Camden is bordered by two major rivers, the Satilla River along the ROI's northern boundary and the Cumberland River along the eastern boundary (Exhibit 3.14-1). The Satilla River is a blackwater river (a deep, slow-moving river with darkly stained acidic water). The river is tidally influenced with limited fish species diversity due to extreme variations in flow and the relatively homogenous habitat within the river system. The river does support fisheries for redbreast sunfish and catfish (Coastal Council, 2011). The Cumberland River is part of the Intracoastal Waterway. The 15-mile long Cumberland River connects Cumberland Sound to the south with the Satilla River to the north (Exhibit 3.14-1).

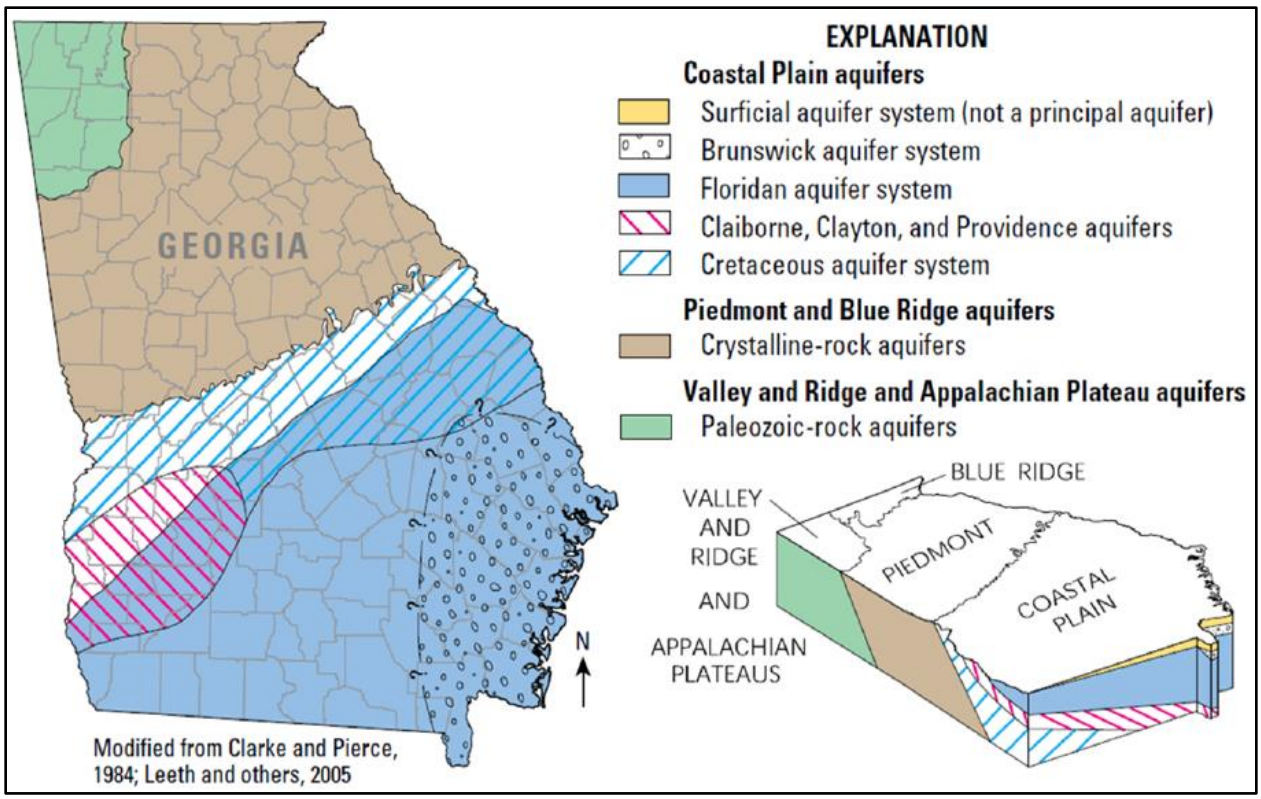
Christmas Creek, which flows into the Atlantic Ocean, is located on Little Cumberland Island in the ROI under the proposed trajectory (Exhibit 3.14-1). A section of the Cumberland River is also located in the ROI under the proposed trajectory. Smaller resources located immediately adjacent to the proposed Spaceport Camden include two tidal creeks, Todd Creek/Floyd Basin located on the spaceport's northern site boundary and Floyd Creek located along the proposed spaceport's eastern boundary. Shellbine Creek is located near the southwestern spaceport site boundary of the proposed Spaceport Camden. Other significant surface water features located within the proposed spaceport site boundary include Big Cypress Pond and the wet weather pond located near the main gate (Exhibit 3.14-2). In addition to these features, five jurisdictional surface water features were mapped within the field survey areas (Exhibit 3.14-2). These features were mapped as part of the 2016 wetland delineation and were classified as ephemeral streams (see Appendix H).

Section 305(b) of the CWA requires States to assess the quality of its waters every 2 years and summarize that assessment in a report called the 305(b) report. Section 303(d) of the CWA requires States to submit a list of all of the waters that have impaired water quality and cannot meet their designated uses (fishing, recreation, industrial, etc.). There are no Section 303(d) impaired waters in the project ROI (GDNR EPD, 2020b).

Groundwater

Three aquifers are located in Camden County. In order of depth below the ground surface these are the surficial, the Brunswick, and Floridan aquifers (Exhibit 3.14-3) (Gordon & Painter, 2017). Only the Brunswick and Floridan aquifers are considered primary sources for potable groundwater in the ROI (Clark et al., 1990). The U.S. Geological Survey estimates that 5.3 million gallons of water per day is withdrawn from groundwater in Camden County (U.S. Geological Survey, 2018).

The surficial aquifer is composed of unconsolidated sand, clayey sand, shell, and thin limestone beds (Clark et al., 1990; Gordon & Painter, 2017). Typical depths range from 11 to 300 feet below ground surface with project areas in the ROI having a depth of approximately 300 feet below the ground surface and having yields of 2 to 15 gallons per minute. The lower portion of this aquifer is confined within the ROI by an overlying layer of low permeability (Clark et al., 1990). The surficial aquifer has the highest potential to be contaminated by past historical activities within the ROI (see Section 3.7, *Hazardous Materials, Solid Waste, and Pollution Prevention*) due to potential interactions with contaminated soil.



Source: (Coastal Council, 2017)

Exhibit 3.14-3. Georgia Aquifers

Monitoring conducted at the sites in the ROI (MRA-2/SWMU 9, Empty Drums Area, SWMU 6, MRA-1/SWMU 8, Loop Road Sit) and described in Section 3.7, *Hazardous Materials, Solid Waste, and Pollution Prevention*, has shown the presence of metals such as barium, chromium, lead, and arsenic in groundwater at some of these locations. A risk assessment conducted for these sites concluded that the levels of metals observed in the groundwater did not pose unacceptable risk to human or ecological receptors (CH2M Hill, 2008). Ten additional potentially contaminated sites are also described in Section 3.7, *Hazardous Materials, Solid Waste, and Pollution Prevention*. No formal investigation or survey of these sites has occurred, and detailed information on the presence of hazardous constituents in the groundwater is unavailable. A deed restriction currently prohibits groundwater use from the site.

Once the land is acquired by the County, the potentially contaminated sites could continue to be managed under the existing hazardous waste facility permit. It is also possible that another state program, such as the Georgia Brownfields Program, could be utilized once the hazardous waste facility permit has been modified or rescinded by the GDNR EPD. Additionally, the County, as the owner of the site, would be responsible for any restrictions placed on the site, as part of state-approved corrective actions for the historical sites.

The Brunswick aquifer is composed of phosphate and dolomitic quartz sand with depths ranging from 85 to 390 feet below ground surface. Depths in southeastern Camden County (i.e., the ROI) are approximately 340 feet. Yields in this confined aquifer range from 10 to 30 gallons per minute. Recharge areas for the Brunswick aquifers are located outside of the ROI to the north and west (Clark et al., 1990; Gordon & Painter, 2017).

The Floridan aquifer is composed of limestone, dolomite, and calcareous sand with depths ranging from 40 to 900 feet below ground surface. Depth to this aquifer at Kings Bay in Camden County is approximately 530 feet. The aquifer is artesian (confined) in the ROI, and average yields range from 1,000 to 5,000 gallons per minute, with some areas having a yield as high as 11,000 gallons per minute (Clark et al., 1990; Gordon & Painter, 2017). Recharge to the confined ground-water-flow system is from precipitation in and near parts of the outcrop areas of the confined aquifers. The recharge area for the Floridan aquifer system is northwest and west of the ROI (Clark et al., 1990; Gordon & Painter, 2017).

The amount of groundwater available in aquifers varies according to how much water flows back into the aquifer from sources such as precipitation and surface water infiltration and how much water is withdrawn from the aquifer from natural flow to streams, springs, leakage into adjacent aquifers, and withdrawals from wells.

Groundwater from the Floridan aquifer is an important resource for the Georgia coastal region (Coastal Council, 2011). The groundwater availability resource assessment (GDNR EPD, 2010) analyzed groundwater resources in the Georgia coastal region and estimated the amount of water that can be safely pumped from the region's aquifers. This amount of water or the sustainable yield is greater in most regions of the coast than the forecasted demands on water resources. The study recognized that in a few regions, saltwater intrusion into groundwater aquifers can result from withdrawing water from the aquifer. The GDNR EPD recommended that no additional withdrawal beyond current permitted levels should occur in Chatham County, portions of Effingham County, and portions of Glynn County. Bryan and Liberty Counties have limited withdrawals and the other counties in the region, including Camden County, have no limitation on groundwater withdrawal (see Exhibit 3.14-4). These recommendations were the result of the Coastal Georgia Water and Wastewater Permitting Plan for Managing Salt Water Intrusion, which indicated that regions outside of the five counties listed above did not have a significant risk for saltwater intrusion (GDNR EPD, 2006).

None of the aquifers located in Camden County are considered USEPA sole source aquifers. A sole source aquifer is a unique aquifer that supplies at least 50 percent of the drinking water for its service area and for which there is no reasonably available alternative drinking water source should the aquifer become contaminated. The nearest sole source aquifer is located approximately 80 miles south of the proposed Spaceport Camden near Daytona Beach, Florida.

Wild and Scenic Rivers

The Wekiva River, approximately 150 miles south of the proposed Spaceport Camden, is the closest Wild and Scenic River to the area. In addition to maintaining a list of Wild and Scenic Rivers, the NPS also maintains the Nationwide River Inventory. This list includes rivers or segments of rivers that may meet Wild and Scenic River Act eligibility but have not been categorized as a Wild and Scenic River. Section 7 of the Wild and Scenic Rivers Act does not apply to these rivers, but Federal agencies are directed to avoid or mitigate actions that adversely impact these rivers. The Satilla River is the only river in the water resources ROI that is listed on the Nationwide River Inventory. The Satilla River was listed in 1982 for scenery, recreational opportunities, geologic features, fish and wildlife, and historical and cultural values. No Georgia Scenic Rivers are located in the project ROI.

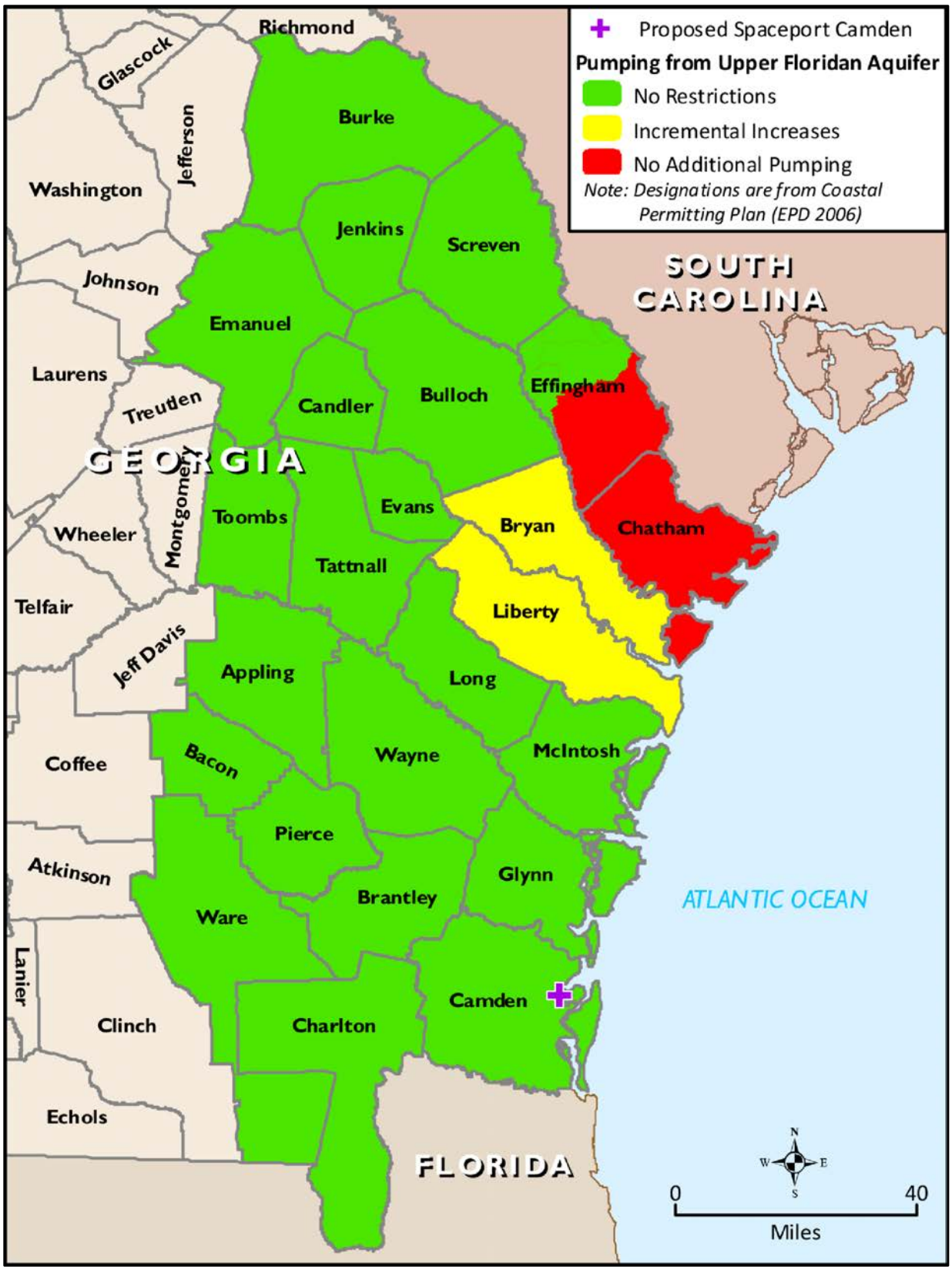


Exhibit 3.14-4. Groundwater Availability in the Georgia Coastal Region

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4 ENVIRONMENTAL CONSEQUENCES

This chapter presents the environmental consequences associated with the Proposed Action. Potential impacts on the existing environmental conditions (as defined in Chapter 3, *Affected Environment*) are assessed for both the construction and operational phases of the Proposed Action and the No Action Alternative. The analyses of potential impacts considered scope, context, and intensity (as per 40 CFR Parts 1500–1508 and FAA Order 1050.1F), and effects determinations were conducted according to guidance provided for each resource area in the FAA Order 1050.1F Desk Reference (FAA, 2020a).

Environmental management plans and permits identified in this chapter are not "mitigations" in the NEPA sense, but standard operational controls/practices (SOPs) that are typical of operations and/or required by law to be implemented as part of construction activities or operations. In many cases these SOPs and permits do serve to avoid or minimize impacts, but are inherent to the Proposed Action (i.e., part of the Proposed Action) and serve to inform the analysis in this chapter. As an example, if an NPDES permit is required for construction covering more than an acre of land and is, therefore, inherent in the Proposed Action (that is, the Proposed Action cannot occur without the permit), the typical BMPs/requirements of an NPDES permit (such as use of silt fencing and development of a stormwater management plan) inform the analysis. If any additional impacts are identified over and above implementation of NPDES permit requirements, then mitigations are identified to avoid or minimize identified impacts.

4.1 Air Quality

Potential impacts to air quality could result from the proposed construction and operation of the new facilities within the proposed spaceport. Potential impacts were determined by estimating emissions generated from the proposed activities and assessing their impacts on air quality. Potential impacts were evaluated based on calculated, direct and indirect emissions associated with implementation of the Proposed Action and the No Action Alternative. For criteria pollutant emissions, the emissions associated with the Proposed Action were compared to the 2017 NEI data for Camden County and the Jacksonville-Brunswick Interstate Air Quality Control Region (USEPA, 2020a) to assess how large of a percentage contribution to the regional air emissions the operational activities would represent.

Air quality impacts are assessed to determine if implementation of any of the alternatives would directly or indirectly result in the exceedance of one or more of the NAAQS for any of the timeframes analyzed, increase the frequency or severity of any such existing violations, or result in a negative change in the attainment status of the ROI for air quality.

4.1.1 Proposed Action

Under the Proposed Action, launch facilities would be constructed as described in Section 2.1, *Proposed Action*, and operations would consist of up to 12 launches per year.

4.1.1.1 Construction

This potential impact analysis addresses emissions from construction activities, including construction equipment and operations, as well as emissions from worker vehicles commuting to and from the area during construction. USEPA's Motor Vehicle Emission Simulator (MOVES) is a state-of-the-science emission modeling system that estimates emissions for mobile sources at the national, county, and project level for criteria air pollutants, GHGs, and air toxics. The current version of the software is MOVES 2014b. Equipment-specific emission factors and operational parameters from MOVES were used to calculate mobile source emissions. More detailed description and discussion of air quality analysis methodology can be found in Appendix E, *Air Quality*.

To evaluate the potential impacts of air emissions, the estimated emissions from project construction activities are compared with the total ROI emissions on a pollutant-by-pollutant basis for the region's 2017 NEI data. If the proposed activities would result in emissions representing a large portion of ROI emissions for any of the NAAQS pollutants, the impacts on air quality could be significant. The analysis also determines whether any exceedance of the NAAQS or State standards could be anticipated.

Since Camden County is currently in attainment for all NAAQS, a General Conformity assessment and determination is not necessary and is not included in the environmental consequences discussion.

Calculated construction emissions are provided in Table 4.1-1.

Table 4.1-1. Proposed Action Construction Air Emissions Compared with Region of Influence Baseline Emissions

Category	Pollutant Emissions (tpy)						
	Carbon Monoxide	Nitrogen Oxides	PM_{10}	$PM_{2.5}$	Sulfur Dioxide	VOCs	CO_2e
Construction emissions (Year 1)	38.17	39.85	314.73	1.76	0.10	10.19	9,423
Construction emissions (Year 2)	2.70	3.07	41.01	0.13	0.01	0.47	763
Camden County[1]	**18,749**	**3,629**	**2,706**	**709**	**120**	**24,474**	**600,890**
ROI baseline total [1]	**1,097,630**	**144,865**	**305,754**	**84,295**	**54,323**	**1,031,948**	**29,660,362**
Percentage of baseline	**0.00%**	**0.04%**	**0.26%**	**0.00%**	**0.00%**	**0.00%**	**0.02%**

Notes: % = percent; CO_2e = carbon dioxide equivalent; PM_{10} and $PM_{2.5}$ = particulate matter equal to or less than 10 microns or 2.5 microns; ROI = region of influence; VOC = volatile organic compound; tpy = tons per year.
[1] Source: (USEPA, 2020a)

The estimated emissions from construction of the Launch Control Center Complex, Vertical Launch Facility, Alternate Control Center and Visitor Center, and facility roads/infrastructure represent small percentages of the Camden County and regional emissions and would not cause an exceedance of any NAAQS. In conclusion, the construction impacts on air quality would not be significant. Although the General Conformity Rule is not applicable because the area is in attainment, it is worth noting, for context of the relative magnitude of the impacts, that criteria pollutant emissions would be below the respective *de minimis* levels for all pollutants, except for PM_{10}. However, actual PM_{10} emissions would likely be lower, as it was conservatively assumed that the entire project area would be cleared and graded. In reality, only a portion of the project area would require clearing and grading. Furthermore, PM_{10} emissions could be reduced by employing standard management measures for construction, such as watering of graded areas, covering of soil stockpiles, and contour grading (if necessary), to minimize temporary generation of dust and particulate matter.

4.1.1.2 Operation

This analysis addresses emissions from launches and associated launch activities (launches, security vessel operations, and static fire engine tests), routine activities at the site between launches, commuting employees and site visitors, delivery vehicles, and associated activities on an annual basis.

The spaceport would comply with applicable permit requirements under the PSD program per 40 CFR §51.166. No new major stationary sources are anticipated at the facility, so no new source review or PSD permit would be required. Although no major stationary sources are anticipated at the facility, the aggregate of many smaller sources may have the potential to emit more than the major source threshold

of 100 tons per year. Once the final construction plan is determined and facilities are constructed, an emissions inventory should be prepared in order to accurately determine if the facility will be required to obtain a SIP Construction and Operating Permit and/or a Title V operating permit.

Calculated emissions from 12 launches are compared to the total ROI emissions on a pollutant-by-pollutant basis based on the region's NEI data (Table 4.1-2). Data used to calculate emissions from launch operations were obtained from the *Final Environmental Impact Statement for the SpaceX Texas Launch Site* (FAA, 2014). Commute vehicle and delivery truck emissions were calculated using MOVES 2014b. Generator emissions were calculated using data from AP-42 Section 3.4, *Large Stationary Diesel and All Stationary Dual-Fuel Engines* (USEPA, 1996). Support vessel and barge operations were calculated using emission factors from USEPA's *Current Methodologies in Preparing Mobile Source Port-Related Emission Inventories* (USEPA, 2009) and *Exhaust Emission Factors for Nonroad Engine Modeling - Spark-Ignition* (USEPA, 2010). If the activities result in emissions representing a large portion of the ROI emissions for any of the NAAQS pollutants, the impacts on air quality could be significant. If exceedances of the NAAQS would be anticipated, the impacts would be determined to be significant.

Table 4.1-2. Projected Annual Operational Air Emissions (Tons per Year)

Operational Activity	Proposed Action Emissions (tpy)						
	Carbon Monoxide	Nitrogen Oxides	PM_{10}	$PM_{2.5}$	Sulfur Dioxide	VOCs	CO_2e
Launch vehicle launches	2,057.16	0.00	0.00	0.00	0.00	0.00	1,193
Static engine tests	514.3	0.00	0.00	0.00	0.00	0.00	297.76
Generator operations	3.99	17.43	0.51	0.51	5.87	0.51	842
Security vessel operations	158.96	1,882.84	34.33	31.01	200.46	66.84	76,438
Staff commutes	12.69	1.12	0.03	0.02	0.01	1.12	1,133
Supply deliveries	0.00	0.01	0.00	0.00	0.00	0.00	7.24
Total emissions	**2,747.10**	**1,901.40**	**34.87**	**31.54**	**206.34**	**68.47**	**79,911**
Camden County	**18,775**	**2,339**	**1,316**	**590**	**33**	**22,809**	**687,708**
ROI baseline total	**795,035**	**95,460**	**123,081**	**56,892**	**16,549**	**790,167**	**50,236,387**
Percentage of baseline	**0.35%**	**1.99%**	**0.03%**	**0.06%**	**1.25%**	**0.01%**	**0.16%**

Notes: % = percent; CO_2e = carbon dioxide equivalent; PM_{10} and $PM_{2.5}$ = particulate matter equal to or less than 10 or 2.5 microns; ROI = region of influence; VOC = volatile organic compound; tpy = tons per year.

Only a small proportion of the emissions associated with each launch would have the potential to affect ambient air quality, which is defined as the area below the mixing height and typically defined as 3,000 feet AGL. The launched rockets would be expected to reach the mixing height within a few seconds. To estimate the amount of carbon monoxide that would be released below the mixing height, an estimate of 20 percent of total emissions was used. Furthermore, for the purpose of estimating carbon monoxide emissions, it was assumed that none of the carbon monoxide would be oxidized to carbon dioxide. This represents a conservative estimation of the potential carbon monoxide produced. Emissions of potentially more hazardous satellite and special fuels (e.g., hydrazine, MMH, UDMH, and NTO) are not anticipated to be expended below the mixing height and, therefore, would not affect ambient air quality or human health. Section 4.1.1.3, *Launch Failures*, further discusses these chemicals with respect to launch failures.

The operational emissions for the proposed vertical launch and the control center areas represent small percentages of the Air Quality Control Region's regional emissions and would not cause an exceedance of any NAAQS. This area is in attainment; therefore, the General Conformity Rule does not apply. In conclusion, the operational impacts from the Proposed Action on air quality would not be significant.

The proposed fuel for use in rockets at Spaceport Camden is RP-1 (a refined form of kerosene). Emissions from RP-1 combustion have been previously characterized as comprising carbon dioxide, carbon monoxide, water vapor, nitrogen oxides, and carbon particulates (NASA, 2020). Most carbon monoxide emitted by the liquid fuel engines is oxidized to carbon dioxide during afterburning in the exhaust plume. Thus, carbon dioxide, a GHG, is the primary emission from the actual launch vehicles; these emissions are presented in Table 4.1-2. Because there are currently no regulatory thresholds for carbon dioxide, the assumption was made that carbon monoxide would not be oxidized to carbon dioxide, in order to present a conservative estimate of carbon monoxide emissions. However, oxidation of carbon monoxide to carbon dioxide could result in up to an additional 3,232 tons of carbon dioxide emissions annually. Furthermore, emissions were not calculated for tank transfers of RP-1, because of the low volatility of kerosene. The remaining onsite storage tanks would contain liquid oxygen, helium, and nitrogen, none of which pose an air quality issue. The impacts from GHG emissions associated with operations are discussed in Section 4.3, *Climate*.

4.1.1.3 Launch Failures

Types of launch failures and their likelihood of occurrence are discussed in Section 2.1.2.7, *Launch Failures*. Launch failures have the potential to generate emissions not normally generated during operations (from additional fuels, including satellite fuels). Additionally, the distribution of emissions (at the altitude of the emission) would be different than from a successful launch. The potential for adverse impacts associated with launch failures is discussed qualitatively since these impacts are not planned as part of the operations and would be unlikely. Furthermore, insufficient data exist to estimate impacts quantitatively, and substantial resources would be needed to do a launch failure chemical dispersion study specific to Camden County.

A launch failure could occur on the launch pad or after the launch vehicle has traveled several miles into the atmosphere. A failure on the launch pad may result in formation of a ground cloud, which would disperse downwind with potential air quality impacts to the local area. Partial combustion of fuels would result in a portion of the emissions listed in Table 4.1-2. Other scenarios could occur, including the launch vehicle's onboard propellants being dispersed in a "destruct action" during flight. In this case, the launch vehicle would be fractured into pieces in the destruct action, with residual propellant dispersing and vaporizing into an airborne cloud. Other propellants such as UDMH (also known as 1,1-dimethyl hydrazine), MMH, and NTO may also be released into the environment as a result of a launch failure. UDMH is highly reactive and degrades readily in environmental media and is not likely to produce significant exposure impacts to humans or the environment. Both MMH and NTO are toxic to humans and pose environmental hazards if released in sufficient quantity to the environment. MMH is highly reactive as well, and is listed by the International Agency for Research on Cancer as a possible human carcinogen.

Because of these potential hazards, all reasonable and feasible measures would be taken by Spaceport Camden operators and FAA to minimize accidents and to protect human health and the environment. To minimize the risk of accidents, Spaceport Camden would fully comply with safety requirements set forth in 14 CFR Parts 400–450, for both ground safety and flight safety, and any other applicable regulations or guidance from FAA. In addition, Spaceport Camden would prepare and implement a Hazardous Materials Emergency Response Plan to ensure that adequate and appropriate guidance, policies, and protocols regarding hazardous material incidents and associated emergency response are available to and followed

by all personnel. Emergency and contingency planning and response measures would serve to minimize potential adverse impacts, and emergency consultation with regulatory agencies (e.g., USFWS, Georgia SHPO, USACE, etc.) would be required should a launch failure result in impacts to sensitive resources.

4.1.1.4 Summary

Because the Proposed Action would not cause pollutant concentrations to exceed one or more of the NAAQS, as established by USEPA under the CAA, for any of the time periods analyzed, nor would it increase the frequency or severity of any such existing violations, FAA has determined that the Proposed Action would not result in significant adverse air quality impacts.

4.1.2 No Action Alternative

Under the No Action Alternative, FAA would not issue a Launch Site Operator License for operation of Spaceport Camden and no spaceport facilities would be constructed. The site use would not change and the proposed construction and operations would not take place. The No Action Alternative is, essentially, the baseline condition, and air quality impacts under the No Action Alternative would consist of those generated by ongoing activities within the ROI as described in Section 3.1, *Air Quality*.

4.2 Biological Resources

4.2.1 Proposed Action

The following section provides an assessment of potential impacts from the implementation of the Proposed Action to the biological resources described in Section 3.1, *Biological Resources*. The analysis considers direct and indirect impacts of construction and operations to animals and plants/vegetation. Potential impacts on biological resources from construction and operations are analyzed both quantitatively (e.g., removal of habitat) and qualitatively within the following categories:

- Terrestrial vegetation and habitats
- Terrestrial animals
- Marine and estuarine vegetation and habitats
- Marine and estuarine animals

The analysis of biological resources considers potential impacts to vegetation (individual plants and vegetation/habitat communities) and animals, including special status species. The plant and animal resources potentially affected are identified based on habitat type and previously documented occurrence. The analysis includes an assessment of impacts resulting from direct physical impacts, habitat alteration, noise and other disturbance, and chemical materials. Where appropriate, projected conditions were compared with baseline conditions and a determination was made as to whether impacts would be adverse.

The methodologies used to analyze these impacts include examination of acres of habitat type affected (e.g., permanent removal for the construction of infrastructure) and the species associated with that habitat. Studies from similar actions were reviewed, with pertinent findings included in this section. Direct and indirect impacts are included in the analysis. Proposed measures to avoid, minimize, or mitigate impacts are included in this section as applicable and are summarized in Section 6.2, *Biological Resources*.

The analysis discusses the results of consultations required by the laws listed in Section 3.2.2, *Regulatory Setting* (i.e., ESA, MMPA, and the MSA), as well as compliance with the other laws and executive orders listed in Section 3.2.2.

4.2.1.1 Construction

Construction activities that may impact biological resources include vehicle and equipment operation, land clearing, earth moving, lighting, pile driving, stormwater runoff, and potential introduction of invasive species. These activities may result in injury, mortality, alterations to behavior and reproduction, water quality alterations causing physiological impacts, and increased competition from invasive species.

Terrestrial Vegetation and Habitats

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; the remainder of the site would remain in its current state (Table 4.2-1; Exhibit 3.2-1). The vegetation to be removed is a small percentage of the vegetation communities in the area and would not affect local or regional plant diversity. Up to 0.78 acre of the 3.61 acres of the wetland delineated in the vicinity of proposed construction areas may be directly impacted as a result of the Proposed Action, assuming all optional/alternate roadways and sites are constructed as initially envisioned (Leidos, 2016).

Table 4.2-1. Acres of Habitat Types to Be Cleared

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**
Mission Preparation Area	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**

Note: 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 right-of-ways for the roads. The analysis includes the entire disturbed area from land-clearing activities.

The Proposed Action would result in direct impacts to wetlands at the Vertical Launch Facility and along certain roads (see Section 4.14, *Water Resources*). In some circumstances, stormwater runoff may lead to alterations of habitats and the hydrology of wetlands and waterways. In other circumstances, erosion associated with construction could result in sedimentation of wetlands, resulting in increased turbidity (tidal creeks and marshes are addressed under the *Marine and Estuarine Vegetation and Habitats*

subsection). However, as the area is relatively flat, the site has a low erosion potential, and erosion control BMPs and stormwater controls would be implemented to avoid such impacts (see Section 4.14, *Water Resources*).

The introduction of invasive nonnative species from construction 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 and only weed-free landscaping materials would be used. 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.

No federally listed plant species have been documented at the Spaceport Camden site, although the federally endangered hairy rattle weed (*Baptismal arachnifera*) does occur north of the Satilla River. State-listed plant species that are potentially at the site, but have not been observed, include Morzenti's spleenwort (*Asplenium heteroresiliens*), ciliate-leaf tickseed (*Coreopsis integrifolia*), Godfrey's wild privet (*Forestiera godfreyi*), corkwood (*Leitneria floridana*), wild coco (*Pteroglossaspis ecristata*), and climbing buckthorn (*Sageretia minutiflora*). Prior to construction, the spaceport operator (i.e., the County) would conduct surveys for protected plant species. In the unlikely event that protected plant species are found within the 122 acres to be cleared, these areas would be marked and avoided, if possible. Georgia State law does not prohibit the taking of State-listed plants on private land (Rules and Regulations of the State of Georgia, Rule 391-4-10-.06).

Summary

Based on the overall acreage of the site and pre-construction surveys for special status plants, construction activities are not expected to result in significant impacts.

Terrestrial Animals

General Impacts to All Terrestrial Animals

Direct Physical Impacts

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, 6 days per week. During the 7 months of infrastructure construction, an additional 20 workers would commute to and from the site. This would result in increased traffic on Harrietts Bluff Road/Union Carbide Road. There also would be delivery of construction materials for roads, parking lots, concrete pads at the Launch Facility, Mission Preparation Area, 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, but the majority of animals would move away from the construction sites into surrounding areas. Similar habitats surround the construction sites where the species could relocate. Vehicles driving on Harrietts Bluff Road or Union Carbide Road would transit at lawful speeds and avoid direct strike to animals on the road to maximum extent possible while ensuring the safety of the construction crew.

Bird collisions would be possible with the four lightning towers (250 feet tall) and aboveground power lines (approximately 4 miles). Specific impacts from these towers and power lines are discussed in the Migratory Birds subsection.

The accidental spill of chemical materials have a low potential to affect animal species, the effects of which could result in respiratory, reproductive, and other physiological impacts. Hazardous materials and hazardous wastes would be handled in accordance with protocols detailed in Section 4.7, *Hazardous Materials, Solid Waste, and Pollution Prevention*, 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.

Noise and Human Presence

Noise and human presence associated with construction may affect local wildlife by disturbing foraging, breeding, migration, and wintering activities. 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.

Section 4.11, *Noise and Noise-Compatible Land Use*, presents results of the noise analysis conducted for the Proposed Action. 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 (Table 4.11-1). The results from the noise modeling are presented in dBA, which refers to A-weighted decibels as a measure of in-air noise as it relates to the hearing threshold of the human ear. While this frequency weighting may not be applicable to wildlife in the ROI, it was used in the noise analysis and was also applied in the biological resources analysis to generally describe the relative loudness of various components of the Proposed Action. Potential impacts to terrestrial animals were considered from a qualitative perspective based on noise-modeling results. Noise levels for construction activities range from 73 dBA L_{max} (for a generator) to 101 dBA L_{max} (for a pile driver) at 50 feet from the activities. As most of the proposed 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 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 mission preparation structures). Pile driving will 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.

Habitat Loss/Degradation

Habitat loss and degradation may involve changes in vegetation, water quality, and artificial lighting, with resulting impacts to animal feeding, reproduction, resting, movement patterns, and physiological functions. As discussed in the *Terrestrial Vegetation and Habitats* subsection, land clearing and construction associated with Spaceport Camden facilities and infrastructure will result in the direct

permanent loss of 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 4.2-1). The total amount of habitat affected by the Proposed Action is 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 have access to many acres of suitable adjacent habitat. Although most development would take place in areas that are not considered suitable or optimal wildlife habitat (i.e., developed areas, pine plantations), clearing of maritime forest areas would result in a loss of quality habitat. Increased traffic on existing roads, the development of new roads and utility corridors, and fencing installation would fragment habitat for some wildlife species; however, the facilities and infrastructure footprints do not block any known major terrestrial migration corridors.

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 BMPs and stormwater controls would be implemented to avoid such impacts (see Section 4.14, *Water Resources*).

As discussed previously, 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.

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 were completed. Exterior lighting could interfere with normal resting or hunting behaviors for wildlife and may disorient bird species (see additional information on tower lighting in the *Migratory Birds* subsection). Lighting for buildings and infrastructure would comply with the Lighting Management Plan, which will address seasonality, what times lights may be on, and safety measures for animals. Lighting systems would be designed and operated to reduce light pollution (refer to Section 6.13, *Visual Effects*, and the USFWS consultation in Appendix A, *Public Involvement/Agency Coordination and Consultation*, for lighting requirements). The Lighting Management Plan 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.

Special Status Animal Species

Migratory Birds, Seabirds, and Wading Birds

Migratory birds, seabirds, and wading birds are likely to forage and roost on portions of the Spaceport Camden site, and some species may use the area for nesting. Construction activities may disturb migratory bird species and may destroy or degrade habitat used by these species. Birds may be vulnerable to injury or mortality due to collisions with construction equipment such as cranes and pile drivers. This type of equipment would only be used during the construction phase of the Proposed Action and would be removed once construction is completed. Collision risks and associated direct physical impacts are not considered likely, and cranes and pile drivers would be in place temporarily. Once the facilities are constructed, the collision risk associated with construction equipment would be eliminated, and it is possible that birds would avoid or fly away from construction equipment.

As discussed in the *Habitat Loss/Degradation* subsection, there would be a permanent loss of habitat at the four facility sites and in the areas cleared for infrastructure. Birds using the construction sites would likely use similar adjacent habitats; however, they may be subject to increased predation or competition pressures in these areas. To minimize the potential for having migratory bird nests within the areas to be cleared, to the greatest extent possible, vegetation removal would be scheduled outside of peak migratory bird breeding season. The spaceport operator (i.e., the County) would conduct nest surveys within 5 days of any clearing or construction activities. If an active nest is found, then a buffer zone would be established around the nest where no activities would occur until the young fledge from the nest; thus, there would be no direct impacts to active nests.

As discussed in the *Noise and Human Presence* subsection, noise from construction activities could disturb normal behaviors temporarily or, in some cases, animals may permanently avoid the area. Nonauditory injury to birds from barotrauma is not likely. *Barotrauma* refers to physical damage to body tissues or gas-filled organs, such as the lungs, caused by rapid or excessive pressure change. The risk of barotrauma would be associated with high-amplitude impulses, such as pile driving. However, acoustic energy from in-air sources would dissipate rapidly at close range to the source. Additionally, birds have compact, rigid lungs with strong pulmonary capillaries that do not change much in diameter when exposed to extreme pressure changes (West et al., 2007), reducing the risk for noise-induced barotrauma. At the onset of these activities, once birds in the vicinity are exposed to noise from construction, individuals may be startled and move to adjacent habitat, causing extra caloric expenditures and temporary stress, but these impacts would be short term. Other physiological impacts, such as hearing loss, would only occur to individuals close to an intense noise source for a sufficient duration to cause hearing loss. Therefore, bird movement away from construction would limit the potential for noise-related injuries. However, increased noise exposure during critical life cycle activities (i.e., nesting, rearing of young) is of the most concern. For any birds nesting in the area, noise from construction could lead to abandonment of nesting activities and the stranding of young. It would be preferable to conduct pile-driving activities outside of migratory bird breeding season (late February to early August) and minimize the loudest construction operations during this period. However, FAA cannot require the applicant to conduct pile-driving outside the breeding season. It is the spaceport operator's (i.e., the County's) responsibility to comply with the MBTA.

Birds are vulnerable to injury or mortality due to collisions with power lines and towers. Although there are existing power lines in the area, about 3 miles of overhead power lines would be installed within the Spaceport Camden site to connect the onsite power lines to the offsite power grid. Once power lines reach a facility boundary, they would be installed underground. Four lightning towers (250 feet tall) would be built at the Vertical Launch Facility. These towers would be in close proximity to wetlands, which serve as feeding, nesting, and/or roosting grounds, which are the conditions when the frequency of collisions is highest (APLIC and USFWS, 2005). To reduce the risk of electrocution and collision mortality, Spaceport Camden would follow the guidelines for the Georgia Power Avian Protection Plan developed in coordination with the Avian Power Line Interaction Committee (APLIC) and USFWS to minimize impacts from power lines, unless structural or human safety would be compromised (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, 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 unless structural or human safety would be compromised (USFWS, 2016). 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.

Given the project's avoidance and minimization measures mentioned above that the spaceport operator (i.e., the County) would have to implement, construction is not expected to result in significant impacts on migratory birds, seabirds, and wading birds.

State-Listed Species

The gopher frog is the only State-listed species without a Federal listing status that is known to occur within the proposed spaceport site (Exhibit 3.2-2). All other State-listed species that occur within the ROI are federally listed either under the ESA, MBTA, or the Bald and Golden Eagle Protection Act; therefore, potential effects to these species have been addressed in the corresponding sections. Potential impacts to gopher frogs from direct physical impacts and disturbance from human presence and noise would be similar to those previously described for other terrestrial species and are expected to be minor and short term. Less than 1 acre of gopher frog breeding habitat would be impacted by construction activities, specifically by roadway improvements. This area corresponds to potential breeding locations within wetlands on the site where gopher frogs would seasonally occur. Refer to Section 4.14, *Water Resources,* for discussion of impacts to wetlands. The amount of upland pine habitat and wetland breeding habitat affected by the Proposed Action is relatively small compared with other similar habitat areas available to gopher frogs in the vicinity. Permanent loss of small areas of habitat would be adverse but minor because it would not result in population level impacts to gopher frogs. Based on analyses results presented for migratory birds, seabirds, wading birds, ESA-listed and candidate species, and bald eagles combined with short-term and minor impacts to gopher frogs, construction activities would not have significant impacts to State-listed species.

ESA-Listed and Candidate Species

FAA has completed consultation with the USFWS by submitting a Biological Assessment to the USFWS (October 31, 2017) in accordance with Section 7 of the ESA (see Appendix A). The Biological Assessment addresses potential effects of the Proposed Action on federally listed threatened and endangered species, candidate species, and critical habitat under USFWS jurisdiction. Table 4.2-2 summarizes the potential for direct physical impacts, harassment impacts, and habitat impacts to federally listed species within the construction ROI; refer to the Biological Assessment in Appendix A for the complete analysis. FAA determined the Proposed Action "may affect, but would not likely adversely affect," the striped newt, eastern indigo snake, gopher tortoise, wood stork, red-cockaded woodpecker, red knot, piping plover, West Indian manatee, and loggerhead, green, and leatherback sea turtles. All potential effects were determined to be insignificant or discountable. FAA determined the Proposed Action would have no effect on piping plover, red knot, and loggerhead sea turtle critical habitat. Refer to the Biological Assessment in Appendix A for the complete analysis. On February 12, 2018, the USFWS provided concurrence on FAA determinations, provided that conservation measures identified in the consultation are implemented. In July 2020, FAA submitted revised consultation documentation reaffirming its determinations of "no effect" and "may affect but not likely to adversely affect" based on the modified Proposed Action as described in this Final EIS. The USFWS concurred again with this determination in September 2020 (see Appendix A, *Public Involvement/Agency Coordination and Consultation*). Appropriate pass-throughs for endangered and/or protected species (e.g., tortoises and snakes) in/under fencing would be installed pursuant to USFWS and GDNR recommended mitigation measures (see Appendix A). Some examples of designs to support wildlife movement at a boundary fence include leaving small gaps at the base of the fence, installing small culverts that burrow beneath fencing, using gauged

wire to support passage along the base of the fence, and installing the fence with a 4- to 6-inch gap between it and the ground to allow wildlife passage.

Table 4.2-2. Federally List Species[1] Potentially Affected Within Construction Region of Influence

Stressor	Striped newt[2]	Eastern Indigo Snake	Gopher Tortoise	Red-cockaded Woodpecker	Wood Stork	Atlantic and Shortnose Sturgeon	Atlantic Sturgeon Critical Habitat
Buildings, infrastructure, lights	H, Hb	H, Hb	H, Hb	H, Hb	H, Hb	NI	NI
Construction equipment	DPI	DPI	DPI	H	H	NI	NI
Disturbance of soil contaminants	Hb	Hb	Hb	Hb	Hb	NI	NI
Ground vibrations	H	H	H	H	H	NI	NI
Invasive species	Hb	Hb	Hb	Hb	Hb	NI	NI
Land clearing	DPI, H	DPI, H	DPI, H	H	H	NI	NI
Pile driving	H	H	H	H	H	NI	NI
Spills	Hb	Hb	Hb	NI	NI	Hb	Hb
Stormwater runoff	Hb	Hb	Hb	Hb	Hb	Hb	Hb
Utility lines	DPI, H	DPI, H	DPI, H	DPI, H	DPI, H	NI	NI
Vehicles	DPI, H	DPI, H	DPI, H	DPI, H	DPI, H	NI	NI
Wetland fill	DPI, H	DPI, H	DPI, H	DPI, H	DPI, H	NI	NI

Notes: DPI = Direct Physical Impact; ESA = Endangered Species Act; H = Harassment; Hb = Habitat Impacts; NI = No Impact; USFWS = U.S. Fish and Wildlife Service.

[1] Species potentially affected by these stressors were determined through discussions with the Federal Aviation Administration, the USFWS, the National Marine Fisheries Service, and Leidos, Inc.

[2] On December 19, 2018, the USFWS announced 12-month findings on petitions to list multiple species under the ESA and determined that listing the striped newt was not warranted (*Federal Register* 83[243]: 65127 – 65134). While the Biological Assessment and subsequent USFWS concurrence included the striped newt, currently it is not considered a candidate species.

Bald Eagle

Eagles feed in the estuarine areas near the construction ROI and may establish nests in tall trees along the water's edge. As discussed in the *Habitat Loss/Degradation* subsection, there would be a permanent loss of habitat at the four facility sites and in the areas cleared for infrastructure. Two eagle nests (one active and one inactive) occur within or near the construction ROI. Nest locations provided by GDNR are presented in Exhibit 3.2-2 (GDNR, 2020a). The spaceport operator (i.e., the County) would be required to conduct a bald eagle nesting survey prior to construction. If an active nest (i.e., nest with eggs or chicks) occurs within the construction ROI, the nest would be protected until the chicks have fledged. Inactive nests would be left in place during construction activities. However, if an active or inactive nest was required to be removed, it would be considered "take" under the Bald and Golden Eagle Protection Act. In this scenario, the County would coordinate with the USFWS regarding nest removal and obtain a take permit from the USFWS prior to nest removal.

Construction activities have the potential to disturb feeding, roosting, and nesting activities. Noise and human presence may cause a startle response or cause adults to temporarily or permanently abandon a nest or feeding area. To avoid or minimize impacts during nesting season (October 1 to May 15), construction activities would follow the National Bald Eagle Management Guidelines (USFWS, 2007), which include the following measures:

- Maintain a 660-foot buffer between clearing and construction areas and the nest.

- Avoid off-road vehicle usage within 330 feet of the nest.
- Avoid pile driving within 0.5 mile of active nests.

As discussed in the *Migratory Birds* subsection, there would be the potential for collisions with power lines, lightning towers, cranes, and pile drivers; however, permanent structures would be designed per the *Recommended Best Practices for Communication Tower Design, Siting, Construction, Operation, Maintenance, and Decommissioning* (USFWS, 2016) and the guidelines for Avian Protection Plans (APLIC and USFWS, 2005) to the greatest extent possible. Cranes and pile drivers would be removed once construction is completed; therefore, collision risks with this type of equipment would be temporary and subsequently eliminated at the conclusion of construction activities.

In summary, construction activities are not expected to result in a take of a bald eagle. However, destruction of an eagle nest (active or inactive) would require an eagle take permit from the USFWS.

Summary

While the construction of Spaceport Camden facilities and infrastructure may result in adverse effects to individual terrestrial animal species, adverse effects to special status species and critical habitat are not expected. Therefore, construction would not result in significant impacts on biological resources.

Marine and Estuarine Vegetation and Habitats

To the extent practicable, a vegetated upland buffer of up to 75 feet will be developed and maintained between wetlands and developed areas to minimize impacts from construction (per NMFS EFH consultation [see Appendix A]), and a minimum vegetated buffer of at least 25 feet along all creeks and tidal marshes would be maintained (per O.C.G.A. 12-7-6[b]15[A] and 12-7-6[b][16] and 12-7-6[b][17][A]). However, there is the potential for impacts to marine and estuarine vegetation, habitats, and EFH from stormwater runoff (Exhibit 3.2-1). Increased turbidity, pollutants, salinity, or temperatures could affect the health of estuarine/marine vegetation and the quality of habitats. However, as described in the *Terrestrial Animals* subsection above, erosion control BMPs and stormwater controls would be implemented to prevent these impacts from occurring (see Section 4.14, *Water Resources*). Additionally, the implementation of spill prevention and containment procedures would prevent chemical materials from harming marine resources.

EFH potentially occurring within the operational ROI is listed in Table 3.2-3. All these areas consist of waters and substrate necessary for spawning, breeding, or growth to maturity for federally managed fisheries. No in-water construction activities are proposed to occur; therefore, impacts to substrate or marine sediments are not anticipated. Section 4.14.1.1, *Water Resources, Proposed Action, Construction*, analyzes the potential impacts to water resources from sedimentation and pollutants associated with the Proposed Action. Based on that analysis, impacts to the water column are not considered significant. The largest potential stressor on EFH would result from increased turbidity associated with increased runoff during construction activities, which would be reduced by the implementation of construction BMPs and installation of stormwater retention ponds (refer to Section 6.14, *Water Resources*). The implementation of spill prevention and containment procedures would prevent chemical materials from harming marine resources.

The potential effects of increased turbidity on federally managed species include avoidance of the impacted area, minor physiological effects, such as interference with respiratory functions, and indirect effects related to light reduction. Reduced light penetration could impact the photosynthetic ability of phytoplankton and submerged vegetation. Reduced photosynthesis could lead to a decreased amount of dissolved oxygen released into the water column during the day. However, turbidity would be temporary

and localized to a small area relative to the amount of similar habitat available in the action area. Implementation of BMPs would reduce the potential for impacts. Due to the localized and temporary nature of turbidity-producing activities and the implementation of BMPs, effects to the water column are not expected to be significant or long term and would only result in minor, temporary impacts to EFH or federally managed species.

Construction would not result in significant impacts to marine/estuarine vegetation and habitats. Furthermore, the Proposed Action would not adversely affect EFH.

Marine and Estuarine Animals

Although there would be a vegetated buffer of at least 25 feet along all creeks, there is the potential for impacts to marine and estuarine animals from stormwater runoff. Increased turbidity, pollutants, salinity, or temperatures in estuarine and marine habitats could impair respiration, reproductive success, and feeding for fish, amphibians, reptiles, and marine invertebrates that occupy marshes or estuaries adjacent to construction areas. It is not anticipated that impacts would spread to the marine environment of the Atlantic Ocean. As described in the *Terrestrial Animals* subsection above, erosion control BMPs and stormwater controls would be implemented to prevent these impacts from occurring within water areas surrounding the spaceport (see Section 4.14, *Water Resources*). Additionally, the implementation of spill prevention and containment procedures would prevent chemical materials from entering marshes and estuaries that could harm marine and estuarine species.

FAA submitted an ESA consultation letter to NMFS (October 2020) in accordance with Section 7 of the ESA (see Appendix A). The letter addresses potential effects of the Proposed Action on federally listed threatened and endangered marine species and critical habitat under NMFS jurisdiction. Table 4.2-2 summarizes the potential for direct physical impacts, harassment impacts, and habitat impacts to federally listed species within the construction ROI (refer to the Biological Assessment in Appendix A for the complete analysis). FAA determined the Proposed Action "may affect, but would not likely adversely affect," Atlantic sturgeon, shortnose sturgeon, North Atlantic right whale, and green, hawksbill, Kemp's ridley, loggerhead, and leatherback sea turtles. FAA determined the Proposed Action would have no effect on Atlantic sturgeon, loggerhead sea turtle, and North Atlantic right whale critical habitat. Refer to Appendix A for the complete analysis. In October 2020, NMFS concurred with all of FAA's conclusions that the proposed action is not likely to adversely affect NMFS ESA-listed species and/or designated critical habitat and is extremely unlikely to affect Atlantic surgeon designated critical habitat (South Atlantic DPS, Unit 6 Satilla River). Further, NMFS also concluded that the proposed action is not likely to adversely affect giant manta ray and oceanic whitetip shark (see Appendix A).

Summary

The construction of Spaceport Camden facilities and infrastructure would not result in significant impacts to marine/estuarine vegetation and habitat and animal species, including special status animal species, and would have no effect on critical habitat.

4.2.1.2 Operation

Spaceport operations include activities described in Section 2.1.2, *Representative Launch Vehicle and Operational Activities*, which would consist of up to 12 launches, wet dress rehearsals, and static firings. The potential impacts from operational activities include increased vehicular traffic, increased human presence from daily use of facilities, increased impervious surface (stormwater runoff), use of the dock during operations, and associated noise, lights, chemical materials, and debris from launch activities as well as daily operational activities. These activities may result in injury, mortality, alterations to

reproductive success, startle responses, and water quality alterations. ESA Section 7 consultation with the USFWS is complete, and NMFS consultation is ongoing in accordance with the ESA. In September 2020, the USFWS provided concurrence that the Proposed Action is not likely to adversely affect federally listed species, provided that conservation measures identified in the consultation are implemented. Final requirements associated with the NMFS consultation will be incorporated into the Final EIS.

Terrestrial Vegetation and Habitats

Daily operations of Spaceport Camden are not expected to cause significant impacts to vegetation. As stated in in Section 4.7, *Hazardous Materials, Solid Waste, and Pollution Prevention*, 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 will be in place to reduce accidental spills, fires, explosions, or other potential incident risks that could adversely impact vegetation at, or down range from, the vertical launch and control center areas.

The area around the launch pad will primarily be cleared of vegetation during the construction phase; however, pre-launch and launch 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 (see Section 4.7.1.2, *Operation: Emissions from Launch Operations*). Small fires could result from pre-launch and launch activities. These small fires may scorch surrounding vegetation, but vegetation would likely return as the surrounding habitats are fire tolerant.

Operational impacts from new impervious surfaces have the potential to increase stormwater discharge, introducing contaminants from runoff, which could impact terrestrial vegetation during storm events. However, as discussed in Section 4.14, *Water Resources*, appropriate permits and requirements, such as retention ponds, will be in place to minimize impacts from new impervious surfaces in order to decrease stormwater discharge to surrounding vegetation within the proposed Spaceport Camden site.

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.

If present, impacts to State-listed plants (listed in Table 3.2-1) from Spaceport Camden operations would be similar to those described above for terrestrial vegetation. Appropriate permits and requirements would be in place to reduce accidental spills, fires, explosions, or other potential incident risks that could adversely impact State-listed plants within or near the site.

Summary

Overall, impacts to terrestrial vegetation and habitats from Spaceport Camden operations would not be significant.

Terrestrial Animals

Daily operations would increase human presence and traffic within the Spaceport Camden site. Visual presence of people, in concert with associated noise (as discussed in Section 4.11, *Noise and Noise-Compatible Land Use*), may startle species or deter use of surrounding habitats. Over time, some animals may leave the area due to the presence of humans, which may decrease biodiversity. Permanent staffing at Spaceport Camden will consist of approximately 77 full-time employees, with up to 200 personnel present starting about 2 weeks before the launch. These surges in personnel may occur up to 12 times annually. This is fewer than the average historic uses of the property dating back to the 1950s (approximately 400 personnel), during the production of rocket engines, munitions, and pesticides (Nelson, 2017).

Public access restrictions associated with the OEZ would be required during pre-launch and launch operations (described in Section 2.1.2.5, *Pre-Launch Activities*). Closures for safety could last up to 3.5 hours on a typical launch day; however, access controls could be in place for up to 12 hours on an atypical launch day. Soft access control checkpoints would be established at certain points on both land and water throughout the USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*) to control and monitor access as depicted in Exhibit 2.1-10. During public access restrictions or limitations (within the OEZ or LAA, respectively), monitoring would be conducted by vehicles along existing roads and via video surveillance.[23]

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 sensitive species (i.e., gopher tortoise and indigo snake) to avoid during daily operations and during closure procedures (refer to the USFWS consultation located in Appendix A).

Artificial lighting at night from daily operations, pre-launch and launch activities may alter the feeding, resting, or reproductive behavior of terrestrial animals. To reduce the potential for effects to animals from artificial lighting, lighting for buildings and infrastructure would comply with the Lighting Management Plan, which will address seasonality, what times lights may be on, and safety measures for animals. The Lighting Management Plan 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 (refer to Section 6.13, *Visual Effects*, and the USFWS consultation located in Appendix A for suggested lighting management guidelines).

Noise, sound pressure induced vibration, and the visual effect (stimuli) from pre-launch and launch activities have the highest potential to impact animals. Operations at the site would not produce any noticeable seismic effects (ground vibrations) (TetraTech, 2017). The 65 dBA DNL noise contours for launch and static engine fire events would be contained within the spaceport boundaries and would not extend to land areas outside of the spaceport site (Exhibit 4.11-1). However, animals within a 10-mile radius of the launch site would be exposed to a short duration (less than 7 seconds for a static fire and up to 51 seconds for a launch) of maximum A-weighted noise levels ranging from 65 to 115 dBA $L_{A,max}$ (refer to Section 4.11, *Noise and Noise-Compatible Land Use*) during pre-launch and launch activities. The 115-dBA $L_{A,max}$ contour is localized to a small area immediately surrounding the launch pad, while the 65-dBA $L_{A,max}$ contour encompasses a portion of Cumberland Island and includes a small area of the

[23] Ground sweeps would only occur in emergency situations. Other monitoring methods would only be used if video surveillance is insufficient (as noted in Section 2.1.2.5, *Pre-Launch Activities*).

Atlantic Ocean (Exhibit 4.11-2). The maximum overpressure of the sonic boom footprint from launches is 0.2 psf, which occurs over the Atlantic Ocean and would not result in sonic booms on land (see Exhibit 4.11-6 in Section 4.11). Therefore, sonic boom noise levels generated during launches would not contribute additional effects to any land areas exposed to noise levels associated with pre-launch and launch activities.

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 2 minutes (refer to Section 4.13, *Visual Effects*). 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 by causing it to stop feeding, breeding, or leave nest/young exposed. The most susceptible species to impacts from noise, sound pressure induced vibration, and visual effect are birds, which may be startled. Feral horses on Cumberland Island may also be sensitive to effects associated with launches and may startle or stampede; however, feral horses on Cumberland Island seem to tolerate nearby airplane landings and takeoffs without noticeable effect (Duffe, 2011). 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 (1995) 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 and launch 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. As noted earlier, feral horses seem tolerant of airplane operations on Cumberland Island, and there has been no indication that these operations have impacted the overall population (NPS, 2017b). 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, 1995). 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).

Special Status Terrestrial Animals

Migratory Birds, Seabirds, and Wading Birds

To understand potential impacts to birds from noise, and given that a lot of noise information is expressed in terms of human-hearing impact thresholds, a brief explanation of some differences between bird and human hearing is warranted. Exhibit 4.2-1 is a diagram of a hearing audiogram of humans and birds.

This audiogram represents the sound level in unweighted dB and the frequency range of humans and birds, offering some insight into a few differences. The average bird, woodpecker, or owl does not hear low-frequency sounds (e.g., rumbles) as well as humans or frequencies on the high end of the audiogram. Some have a greater range in terms of being able to hear softer sounds—owls can hear sounds that humans cannot—and appear to tolerate, or rather are sensitive to, higher decibel levels at mid- and high

frequencies. The structure of the human ear is often compared to that of an animal ear to understand whether similarities in hearing ability exist. Scientists have measured the hearing range and frequencies of birds and people and found some similarities in function and ability (Okanoya & Dooling, 1987). Major differences include the ability of some birds to regenerate damaged hair cells within the inner ear, something humans cannot do (Dooling & Dent, 2001).

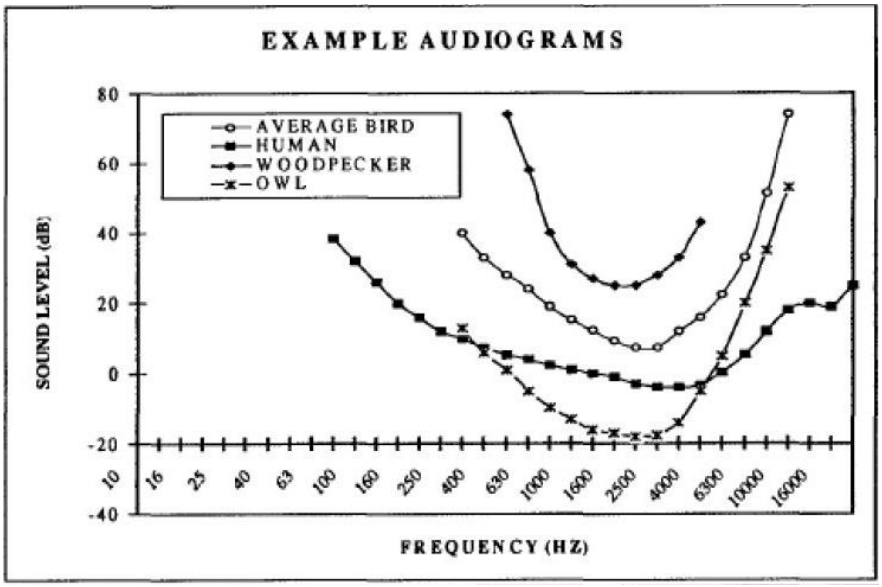

Exhibit 4.2-1. Comparison of Human and Bird Hearing Sensitivities
Source: (Delaney et al., 2002)

Impacts to migratory birds, seabirds, and wading birds from Spaceport Camden operations would be similar to those described above for terrestrial animals, including potential direct physical impacts from collisions with power lines, towers, and construction equipment and impacts to feeding, roosting, and nesting due to noise and visual disturbance. Noise, sound pressure induced vibration, and visual effects from up to 12 launches and up to 12 static fire engine tests, would last less than 1 minute per event over the 10-mile range. The potential for nonauditory injury (i.e., barotrauma) to birds from sonic booms associated with launch activities is very low because sonic booms would only occur over the Atlantic Ocean and not over land areas typically occupied by birds. Furthermore, as indicated in Section 4.2.1.1, *Construction, Terrestrial Animals, Species Status Animal Species, Migratory Birds, Seabirds, and Wading Birds*, birds have compact, rigid lungs with strong pulmonary capillaries that do not change much in diameter when exposed to extreme pressure changes, reducing the risk for noise-induced barotrauma. Increased noise levels from launch operations may cause birds to flush from the area during pre-launch and launch activities; this is considered a behavioral reaction but would reduce the potential for physiological impacts such as hearing loss from prolonged noise exposure.

The areas affected by increased noise levels from pre-launch and launch operations would include the Cumberland Island National Seashore and the Satilla River Marsh Island Natural Area, where large numbers of seabird, shorebird, and wading bird species, including the brown pelican, are known to occur. Noise effects could temporarily interfere with normal behaviors such as breeding, feeding, or sheltering and cause increased stress, resulting in extra caloric expenditure. Nests, eggs, or chicks in the affected areas could be abandoned by adults, resulting in nest failures. Nest abandonment 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 of high noise levels, the behavioral effects would be temporary, bird species would be expected to resume normal behavior after the disturbance was over.

Operations would not have any significant impacts on migratory birds, seabirds, or wading birds.

State-Listed Species

All but one State-listed species (the gopher frog) that occurs within the operational ROI have Federal listing status either under the ESA, MBTA, or the Bald and Golden Eagle Protection Act; therefore, potential impacts from operations to State-listed species with Federal listing status are addressed in the corresponding sections. Exhibit 3.2-3 shows where sensitive species habitats overlap with the OEZ and composite USCG LAA for operations (described in Section 2.1.2.5, *Pre-Launch Activities*). Potential impacts to gopher frogs from monitoring and controlling access within these areas would be similar to those described above for terrestrial species. To reduce the potential for impacts to State-listed terrestrial species 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 sensitive species (e.g., gopher tortoise and indigo snake) to avoid during daily operations and closure procedures. (Refer to the USFWS consultation located in Appendix A.) Other spaceport operational impacts, such as noise and human disturbance to gopher frogs, would also be similar to those described above for terrestrial species, which are expected to be short term and minor. Long-term population level effects to gopher frogs are not anticipated. Based on analyses presented for migratory birds, seabirds, wading birds, ESA-listed and candidate species, and bald eagles, combined with short-term and minor impacts to gopher frogs, operational activities would not have significant impacts to State-listed species.

ESA-Listed and Candidate Species

FAA has completed consultation with the USFWS by submitting a Biological Assessment to the USFWS in accordance with Section 7 of the ESA (see Appendix A). The Biological Assessment addresses potential effects of the Proposed Action on federally listed threatened and endangered species, candidate species, and critical habitat under USFWS jurisdiction. Table 4.2-3 summarizes the potential for direct physical impacts, harassment impacts, and habitat impacts to federally listed species within the operational ROI; refer to the Biological Assessment in Appendix A for the complete analysis. FAA determined the Proposed Action "may affect, but would not likely adversely affect," the striped newt, eastern indigo snake, gopher tortoise, wood stork, red-cockaded woodpecker, red knot, piping plover, eastern black rail, West Indian manatee, and loggerhead, green, and leatherback sea turtles. All potential effects were determined to be insignificant or discountable. FAA determined the Proposed Action would have no effect on piping plover, red knot, and loggerhead sea turtle critical habitat. On February 12, 2018, the USFWS provided concurrence that the Proposed Action is not likely to adversely affect federally listed species, provided that conservation measures identified in the consultation are implemented. In July 2020, FAA submitted revised consultation documentation reaffirming its determinations of "no effect" and "may affect but not likely to adversely affect" based on the modified Proposed Action as described in this Final EIS. The USFWS concurred again with this determination in September 2020 (see Appendix A, *Public Involvement/Agency Coordination and Consultation*). As previously stated, FAA submitted a revised consultation to address the recent listing (October 2020) of the eastern black rail as threatened and affirmed a "may affect but not likely to adversely affect" determination for the species. The USFWS concurred with this determination again in December 2020, provided conservation measures (to include pre-project surveys) are implemented (see Appendix A, *Public Involvement/Agency Coordination and Consultation*).

Table 4.2-3. Federally Listed Species[1] Potentially Affected Within Operational Region of Influence

Stressor	Striped newt[2]	Eastern Indigo Snake	Gopher Tortoise	Red-cockaded Woodpecker	Wood Stork	Piping Plover	Red Knot	Eastern Black Rail	Sea Turtles	Loggerhead Critical Habitat	Atlantic and Shortnose	Atlantic Sturgeon Critical Habitat	North Atlantic Right Whale	North Atlantic Right Whale Critical Habitat
Boats	NI	NI	NI	NI	NI	NI	NI	NI	DPI	NI	DPI	NI	DPI	NI
Buildings, Infrastructure, lights	H, Hb	H, Hb	H, Hb	H, Hb	H, Hb	H, Hb	H, Hb	H, Hb	H, Hb	NI	NI	NI	NI	NI
Daily operations	H	H	H	H	H	NI	NI	NI	NI	NI	NI	NI	NI	NI
Drone	NI	NI	NI	H	H	H	H	H	NI	NI	NI	NI	NI	NI
Invasive species	Hb	Hb	Hb	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Launch vapor	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Launches/rehearsals	H	H	H	H	H	H	H	H	H	NI	NI	NI	NI	NI
Rocket debris	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Sound pressure induced vibrations	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Spaceport Camden personnel	H	H	H	H	H	NI	NI	NI	NI	NI	NI	NI	NI	NI
Spectators	H	H	H	H	H	H	H	H	H	NI	H	NI	H	NI
Spills	Hb	Hb	Hb	Hb	NI	NI	NI	Hb	NI	NI	NI	NI	NI	NI
Stormwater runoff	Hb	Hb	Hb	Hb	Hb	NI	NI	Hb	NI	NI	NI	NI	NI	NI
Towers	NI	NI	NI	DPI	DPI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Utility Lines	NI	NI	NI	DPI	DPI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Vehicles	NI	DPI	DPI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Wildfires	Hb	Hb	Hb	Hb	Hb	NI	NI	NI	NI	NI	NI	NI	NI	NI

Notes: DPI = Direct Physical Impact; ESA = Endangered Species Act; H = Harassment; Hb = Habitat Impacts; NI = No Impact; USFWS = U.S. Fish and Wildlife Service.

[1] Species potentially affected by these stressors were determined through discussions with the Federal Aviation Administration, the USFWS, the National Marine Fisheries Service, and Leidos, Inc.

[2] On December 19, 2018, the USFWS announced 12-month findings on petitions to list multiple species under the ESA and determined that listing the striped newt was not warranted (*Federal Register* 83[243]: 65127 – 65134). While the Biological Assessment and subsequent USFWS concurrence included the striped newt, currently it is not considered a candidate species.

Bald Eagle

Bald eagles have been documented within 1 mile of the Spaceport Camden site (Yellin, 2014; Forster, 2016). Bald eagles can coexist at spaceport launch complexes, as demonstrated at Kennedy Space Center/Cape Canaveral Space Force Station (KSC/CCSFS), which supports 12 nesting pairs of bald eagles. However, KSC/CCSFS has been operating for decades with a robust natural resources management program, whereas rocket launches in Georgia have never occurred and this launch site will be new to the landscape. Impacts to the bald eagle from Spaceport Camden operations would likely be similar to those described above for migratory birds, including potential direct physical impacts and impacts to feeding, roosting, and nesting due to noise effects and visual or light disturbance. Effects and disturbance could interfere with normal behaviors, but behavioral responses would be temporary, as individuals would be expected to resume normal behavior after the disturbance was over. Spaceport Camden would follow applicable regulatory requirements in accordance with the Bald and Golden Eagle Protection Act (USFWS,

2007). State and Federal permits for eagle take (disturbance) are required in order to avoid liability under Bald and Golden Eagle Protection Act. The County is responsible for determining if a Bald and Golden Eagle Protection Act permit is necessary.

Summary

The operation of Spaceport Camden would not result in significant impacts to terrestrial animal species, including special status animal species and would not affect critical habitat.

Marine and Estuarine Vegetation and Habitats

The primary impacts to marine vegetation and habitats resulting from Spaceport Camden operations would be associated with increased equipment/vessel traffic and debris from first-stage ejections over the Atlantic Ocean. There would be 12 first stages ejected and dropped into the Atlantic Ocean each year (one per launch event) under the Proposed Action; these would be considered a potential source of pollution to marine environments. While the exact location of where first stage would drop in the ocean cannot be predicted, based on the launch trajectory it is assumed to occur at least 100 miles offshore from the launch site, far away from coastal marine and estuarine habitats, including tidal marshes (e.g., salt and brackish marshes) wetlands, and estuaries. Recovery of first stages would not occur; therefore, they would sink to the ocean floor after impact. It is assumed all or at least the majority of the fuel in the first stage would be spent prior to being ejected. For small launch vehicles, very small residual amounts of liquid oxygen and RP-1 fuel would be left in the fuel tanks at the time of the splashdown. Localized temporary adverse impacts on marine waters in the immediate area surrounding each splashdown may occur. Liquid oxygen is dissolvable in marine waters, but liquid fuels such as RP-1 that are relatively insoluble pose a slight risk in the marine environment until evaporation occurs. If the RP-1 escapes the fuel tank and enters the water column, it would form a thin film that would be broken up by wave action or by sunlight and oxygen if it travels to the water surface. It is anticipated that trace amounts of propellant from first-stage ejections would quickly dissipate within a few days (FAA, 2014). Therefore, long-term impacts to the marine environment from first-stage ejections would be negligible.

No in-water dock improvements or modifications are planned at this time. However, should future improvements or modifications to the dock be required, then a Coastal Marshlands Protection Committee permit, which is facilitated through the GDNR Coastal Resources Division and approved by the Committee, may be required.

Disturbance or impacts on submerged vegetation (marine and estuarine) from spectator and USCG vessel traffic would be minimal. Vegetation would likely experience only temporary disturbance during establishment of soft access control checkpoints for the water-based portion of the USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*). In addition, with the exception of zooplankton, relatively few invertebrates occur at the surface or in the water column and the number of individuals potentially affected would be low.

Essential Fish Habitat

EFH in the affected area consists of the water column and unconsolidated sand substrate. First-stage ejections over offshore areas of the Atlantic Ocean would not result in permanent changes to physical parameters (temperature, salinity, oxygen concentration, etc.) of the water column. Designated EFH that occurs in the coastal areas of the ROI, including HAPC for shrimp and other areas containing estuarine and marine submerged vegetation, tidal marshes, wetlands, etc., would not be affected by first-stage ejections because they would be dropped at least 100 miles offshore of the Atlantic coast. The amount of propellant, metals, or other substances that could leach or dissolve into the water column or substrate

after first stages sink to the ocean floor would be minimal and would not result in detectable changes to water or sediment quality. Impacts would be temporary and minor and would not result in long-term impacts to EFH. Additionally, it is not considered likely that an ejected first stage would sink directly onto hardbottom areas or coral reefs. The probability of a first stage landing within other HAPCs for snapper-grouper complex and corals is also considered negligible given the small number of launches per year, the relatively small size of the first stage, and vast area of the Atlantic Ocean where it could land after ejection. The FAA initiated consultation with NMFS in this regard by submitting an EFH assessment letter in October 2020 (see Appendix A, *Public Involvement/Agency Coordination and Consultation*) indicating that the construction and operation of the proposed project and associated mitigation measures may have minor adverse effects on EFH. However, the majority of the potential impacts are considered minor and insignificant, and implementation of mitigation measures would further reduce the potential for long-term adverse effects. In correspondence completing the EFH assessment with NMFS (completed in December 2020 and provided in Appendix A), FAA and the County committed to respond appropriately and immediately should launch failures and the need for emergency response occur and consult with NMFS SER HCD on impacts to EFH resulting from such events or from the responses to the events. Given this commitment from FAA, NMFS SER HCD provided no EFH Conservation Recommendations for launch failures and usage of emergency procedures. However, NMFS SER HCD provided the following general recommendations for activities related to operation of Spaceport Camden:

- Vessels establishing LAAs and OEZs (described in Section 2.1.2.5, *Pre-Launch Activities*) should avoid anchoring within 350 yards of known coral reefs, live/hardbottom buffer, and artificial reefs.
- Should an ejected first-stage rocket sink to the bottom near coral reefs, live/hardbottom, or artificial reefs, FAA will consult with NMFS SER HCD on appropriate mitigation measures if these habitats are damaged or are likely to be damaged from the rocket moving due to waves and currents.

Marine and Estuarine Animals

Marine and estuarine animals may be impacted by vessel use during operations associated with soft access control checkpoints established by the USCG for the water-based portion of the USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*). A very small portion of the Atlantic Ocean would be closed during launch activities, including water areas immediately surrounding the launch site and some areas surrounding Cumberland Island and Little Cumberland Island, extending out along the 100-degree trajectory. Vessels used to secure this area would be located at various access control checkpoints throughout the water-based portion of the USCG LAA. Accidental collisions between marine animals and vessels are not expected because vessels would either be stationary or operating at low speeds as they monitor the area. The majority of marine animals, such as fish and marine invertebrates, are typically fully submerged at depths that would not interfere with vessel operations except for marine mammals and sea turtles. The ability of vessels to detect and avoid marine mammals and sea turtles is enhanced by the fact that all of these species that potentially occur within the Spaceport Camden operation area tend to surface at relatively short intervals. It is further expected that the vessel operators would comply with all applicable State and Federal laws and regulations when transiting between the Spaceport Camden site and the soft checkpoint areas within the water-based portion of the USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*). This includes operating vessels at speeds that are reasonable and prudent based on boating traffic, weather conditions, visibility, and other potential hazards such as encounters with marine mammals and sea turtles. In the event a marine mammal or sea turtle is encountered during transit, boat captains are expected to adjust course and speed as necessary to maintain a safe distance consistent with prudent seamanship. The NMFS consultation in Appendix A identifies additional mitigation measures expected to further reduce the potential for adverse impacts.

As previously stated, 12 first stages (one per launch event) would be ejected and then drop into the offshore areas of the Atlantic Ocean, sinking to the ocean floor. Given the small number of first stages used per year and the low probability of an animal occurring at the water surface at the same time and location where a first stage would impact the water, the potential for a direct strike of any marine animal, including marine mammals, sea turtles, and fish, is negligible. After impact, the first stage would sink to the ocean floor but at a gradually slower rate as it descends through the water column. Marine animals would be able to detect and avoid it due to the slower velocity. It is possible that marine invertebrates on the ocean floor where the first stage settles would be impacted; however, the amount is considered to be discountable given the small size of the first stage compared with the vast area of ocean floor available for marine invertebrate habitat. Chemical contamination from the first stage and associated propellants is not anticipated to impact marine animals because only trace amounts of metals, fuels, and other substances would leach into the sediments and water immediately surrounding the first stage. Underwater currents and sediment movement would quickly dissipate contaminants and possibly bury the first stage over time. Therefore, effects to water and sediment quality would be localized and temporary and would not result in significant impacts to marine animals.

Special Status Marine and Estuarine Species

Marine Mammals

In-air noise from pre-launch and launch activities is not expected to result in impacts to marine mammals 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, in-air noise associated with Spaceport Camden operations is not expected to result in adverse impacts to marine mammals.

A launch event may increase boat traffic during clearance of water areas within the USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*) and from spectators watching launch events, which would increase the risk for marine mammal boat strikes. Launches would only occur a maximum of 12 times a year. The number of potential spectators on boats is unknown and would likely vary per launch event. If a marine mammal is observed during soft checkpoint procedures, security boats would maintain a 50-foot distance from the observed animal.

As discussed in Section 4.7, *Hazardous Materials, Solid Waste, and Pollution Prevention*, potential for contamination from spaceport operations would primarily occur on land areas within and immediately surrounding the proposed spaceport facility and is not likely to spread to the marine waters of the Atlantic Ocean. Therefore, chemical degradation of marine mammal habitat from incidental spills, leaks, and inadvertent releases of contaminants from spaceport operations is not likely to occur. Access controls and monitoring of the USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*) is not likely to interfere with the rescue of distressed marine mammals. The operator would coordinate with NMFS prior to each launch event to ensure all conflicts associated with monitoring soft access control checkpoints within the USCG LAA are resolved prior to launch day.

Direct strikes and chemical contamination from first-stage ejections into the Atlantic Ocean would not be expected to occur to any marine mammal species. As previously stated, the potential for direct strike of any marine mammals is discountable, and chemical contamination effects would be localized, temporary, and very unlikely to affect marine mammals in the Atlantic Ocean. Additionally, while the exact location of where first stages would drop in the ocean cannot be predicted, based on the launch trajectory it is

assumed to occur at least 100 miles offshore from the launch site, outside of North Atlantic right whale designated critical habitat for calving grounds. Therefore, spaceport operations would not result in significant impacts to marine mammals.

ESA-Listed Species

FAA submitted an ESA consultation letter to NMFS in accordance with Section 7 of the ESA (see Appendix A). The letter addresses potential effects of the Proposed Action on federally listed threatened and endangered marine species and critical habitat under NMFS jurisdiction. Table 4.2-3 summarizes the potential for direct physical impacts, harassment impacts, and habitat impacts to federally listed species within the operational ROI; refer to the Biological Assessment in Appendix A for the complete analysis. FAA determined the Proposed Action "may affect, but would not likely adversely affect," Atlantic sturgeon, shortnose sturgeon, North Atlantic right whale, and green, hawksbill, Kemp's ridley, loggerhead, and leatherback sea turtles. FAA determined the Proposed Action would have no effect on Atlantic sturgeon, loggerhead sea turtle, and North Atlantic right whale critical habitat. NMFS is currently reviewing the consultation letter. The Final EIS will document the conclusion of the ESA consultation with NMFS.

Summary

The operation of Spaceport Camden facilities and infrastructure would not result in significant impacts to marine/estuarine animal species, including special status animal species, and would not affect critical habitat.

4.2.1.3 Launch Failures

Types of launch failures and their likelihood of occurrence are discussed in Section 2.1.2.7, *Launch Failures*. In the event of a launch failure, an explosion could injure or kill species or damage habitat adjacent to the launch pad or within areas impacted by debris. It is anticipated that vehicle debris and propellants from a launch failure within the first seconds of a launch would be confined to the immediate area around the launch site and would not spread to the Satilla River, Cumberland River, and associated estuaries and habitats or any portion of the Cumberland Island National Seashore or Atlantic Ocean. Therefore, protected and sensitive habitats and wildlife species in these areas are not anticipated to be significantly impacted by a launch failure. Portions of Floyd Creek and associated tidal marshes and wildlife species may be impacted from a launch failure. Impacts would be adverse to affected areas and individuals. While adverse impacts to Floyd Creek and associated tidal marshes, vegetation, and wildlife may occur from a launch failure, the potential exists only within the first 45 to 75 seconds of flight before the vehicle tips horizontally. Therefore, the potential for impacts to biological resources from launch failures is low.

Fires could potentially start from an explosion on the pad or in flight, which could result in a temporary loss of habitat lasting a few weeks during the growing season or up to a few months during the dormant season. 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 local surface water bodies, upland areas, and soils (infiltrating to groundwater). The extent of potential impacts would depend on the condition of the accident, the type of propellant (Section 4.7, *Hazardous Materials, Solid Waste, and Pollution Prevention*), and the nature of the terrestrial and water resources affected (Section 4.14.1.3, *Launch Failures*).

Terrestrial and marine/estuarine animals 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. Spaceport Camden would prepare and implement a plan to ensure that

adequate and appropriate guidance, policies, and protocols regarding fire incidents, hazardous material incidents, and associated emergency responses are available to and followed by all personnel, including coordination with the NPS Cumberland Island National Seashore and its Fire Management Plan. In the event of a launch failure, emergency response and cleanup procedures contained in the plan would reduce the magnitude and duration of any impacts.

In the event of an emergency situation, in which ground sweeps or unmanned aerial systems are required (described in Section 2.1.2.5, *Pre-launch Activities*), prior to such an event, security personnel would be briefed on protected species and avoidance areas to minimize damage to sensitive habitats. In addition, personnel would be provided with a 24-hour emergency contact to minimize impacts from conducting ground sweeps.

In the event of a launch failure or emergency response procedures, FAA would reinitiate ESA Section 7 consultation with the USFWS and/or the NMFS to assess the impacts of the incident as well as potential impacts from cleanup and restoration. Emergency and contingency planning and response measures would serve to minimize potential adverse impacts, and emergency consultation with regulatory agencies (e.g., USFWS, Georgia SHPO, USACE, etc.) would be required should a launch failure result in impacts to sensitive resources.

4.2.1.4 Summary

The USFWS determined that the Proposed Action would not be likely to jeopardize the continued existence of a federally listed threatened or endangered species or would result in the destruction or adverse modification of federally designated critical habitat. NMFS concurred on findings that the Proposed Action is not likely to adversely affect the NMFS ESA-listed species and/or designated critical habitat (see Appendix A, *Public Involvement/Agency Coordination and Consultation*). USFWS and NMFS conservation recommendations and mitigation requirements are identified in Section 6.2, *Biological Resources*, of this EIS. Additionally, FAA has not identified any long-term or permanent loss of unlisted plant or wildlife species; adverse impacts to special status species (e.g., state species of concern, species proposed for listing, migratory birds, bald and golden eagles) or their habitats; substantial loss, reduction, degradation, disturbance, or fragmentation of native species' habitats or their populations; or adverse impacts on a species' reproductive success rates, natural mortality rates, nonnatural mortality (e.g., road kills and hunting) or their ability to sustain the minimum population levels required for population maintenance. As a result, FAA has not identified any significant adverse impacts to biological resources that would result from the Proposed Action.

4.2.2 No Action Alternative

Under the No Action Alternative, FAA would not issue a Launch Site Operator License for operation of Spaceport Camden and no spaceport facilities would be constructed. The site use would not change and the proposed construction and operations would not take place. The No Action Alternative would not change the existing conditions for biological resources and, therefore, would not result in impacts on biological resources.

4.3 Climate

Potential impacts on climate (climate change) could result from the proposed construction and operation of the new facilities. Construction activities are expected to occur over a 15-month period. Activities associated with operations are evaluated based on the site conducting up to 12 launches per year, wet dress rehearsals, and static engine tests.

4.3.1 Proposed Action

4.3.1.1 Construction

This analysis addresses GHG emissions from construction activities and worker vehicles commuting to and from the area. Emission factors were obtained from USEPA's emissions calculation software MOVES 2014a. Further discussion and detailed description of climate change analysis methodology can be found in Appendix E.

To evaluate GHG emissions and their impact, the emissions associated with the project's construction activities were compared with the total ROI emissions of GHGs for Camden County and the Jacksonville-Brunswick Interstate Air Quality Control Region from the 2017 regional NEI data and national USEPA NEI data. Results related to the construction of the spaceport are provided in Table 4.1-1 (Section 4.1, *Air Quality*).

The Proposed Action would increase GHG emissions by 9,423 tons CO_2e over the annual baseline for the region. This increase would comprise less than 0.02 percent of GHG emissions in the Air Quality Control Region and less than 1.45 percent in Camden County. Total annual GHG emissions would be minimal in terms of the national GHG emissions, which total 6,677 million metric tons (7,360 million tons) annually (USEPA, 2020b). GHG emissions may be further reduced by implementing measures such as changing to more fuel-efficient equipment, reducing operational delays, and using renewable fuels. A change of this minute magnitude is not likely to have any impact on global climate change, sea level rise, or any potential impacts of climate change. However, sea level rise and other climatological changes such as an increase in extreme weather events, may or may not impact the spaceport in the coming years.

4.3.1.2 Operation

This analysis addresses GHG emissions from launches and associated launch activities (static engine fire tests, etc.), commuting employees, delivery vehicles, support vessels and barge operations, and associated activities on an annual basis. The methodology for GHG calculations is the same as the methodology for air quality emissions calculations and uses the same emission factor sources. Further discussion and detailed description of climate change analysis methodology is located in Appendix E.

Calculated emissions from the project's end-state operations were compared with the total ROI emissions on a pollutant-by-pollutant for Camden County and the Air Quality Control Region's NEI data and USEPA 2017 NEI data. Results for the proposed spaceport operations are provided in Table 4.1-2 (Section 4.1, *Air Quality*).

The Proposed Action would increase GHG emissions by 39,313 tons CO_2e over the annual baseline for the region. This increase would comprise approximately 0.13 percent of the GHG emissions in the Air Quality Control Region and approximately 6.03 percent in Camden County. Total annual GHG emissions would be minimal in terms of the national GHG emissions, which total 6,677 million metric tons (7,360 million tons) annually (USEPA, 2020b). GHG emissions may be further reduced by implementing measures such as changes to more fuel-efficient equipment, delay reductions, and use of renewable fuels.

A small change of this magnitude is not likely to have any impact on global climate change, sea level rise, or any potential impacts of climate change. However, sea level rise and other climatological changes, such as increase in extreme weather events, may impact the spaceport in the coming years.

4.3.1.3 Launch Failures

Types of launch failures and their likelihood of occurrence are discussed in Section 2.1.2.7, *Launch Failures*. Air quality impacts resulting with a launch failure would essentially be the same as those

described for a nominal launch and would be associated with fuel combustion. As a result, significant impacts to climate from a launch failure would not be expected.

4.3.1.4 Summary

There are no significance thresholds for commercial space launch GHG emissions, nor has FAA identified specific factors to consider in making a significance determination for GHG emissions. There are currently no accepted methods of determining significance applicable to commercial space launch projects given the small percentage of emissions they contribute. CEQ has noted that "it is not currently useful for the NEPA analysis to attempt to link specific climatological changes, or the environmental impacts thereof, to the particular project or emissions, as such direct linkage is difficult to isolate and to understand." Accordingly, analysis within the context of this EIS has determined that the Proposed Action would emit limited amounts of GHGs, and FAA has determined that these emissions would not be expected to contribute to overall regional GHG emissions in any significant manner.

4.3.2 No Action Alternative

Under the No Action Alternative, FAA would not issue a Launch Site Operator License for operation of Spaceport Camden and no spaceport facilities would be constructed. The site use would not change and the proposed construction and operations would not take place. The baseline climate of the area under the No Action Alternative would continue to change over time, affected by natural processes and ongoing activities within the ROI as described in Section 3.3, *Climate*.

4.4 Coastal Resources

4.4.1 Proposed Action

Coastal resources may be impacted during construction activities or operations by an increase in impermeable surface, new structures, noise from launches, daily use of the facilities, and associated lighting. These activities may result in increased runoff and impacts on wildlife. Potential impacts from Spaceport Camden construction activities and operations relative to coastal resources are described in the following sections of this EIS: Section 4.2, *Biological Resources*; Section 4.8, *Historical, Architectural, Archaeological, and Cultural Resources*; Section 4.9, *Land Use*; Section 4.11, *Noise and Noise-Compatible Land Use*; Section 4.12, *Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks*; and Section 4.14, *Water Resources*.

In accordance with the CZMA and Georgia's Coastal Management Program, the County has submitted a Federal consistency certification to GDNR's Coastal Resources Division. The County declares that its proposal to construct and operate a launch site in Camden County, Georgia, complies with the policies of Georgia's approved Coastal Management Program (i.e., State laws) and will be conducted in a manner consistent with such program. FAA has submitted this EIS to the GDNR's Coastal Resources Division to assist the State with its Federal consistency review. To date, FAA, the County, and GDNR's Coastal Resources Division are working through the GDNR coastal consistency determination process. The County submitted a coastal consistency certification to the GDNR certifying the project is consistent with the State's Coastal Management Program (see Appendix A). The County will continue to coordinate with the GDNR regarding coastal consistency. Associated documentation regarding coastal consistency submittals is included in Appendix A.

FAA has not identified any significant adverse impacts associated with the Proposed Action. FAA and the County, through consultation with GDNR and completion of supplemental coordination, has determined the Proposed Action is consistent with the Georgia Coastal Management Program (see Appendix A).

4.4.1.1 Marine Protected Areas

Satilla River Marsh Island Natural Area

Construction

No construction would occur on the Satilla River Marsh Island Natural Area. As discussed in Section 4.2.1.1, *Biological Resources, Proposed Action, Construction, Marine and Estuarine Vegetation and Habitats*, and Section 4.14.1.1, *Water Resources, Proposed Action, Construction*, construction-related activities would not adversely impact the designated HAPC for shrimp or the Satilla River estuary that surrounds the Satilla River Marsh Island Natural Area. Since the Satilla River system and the natural area are located more than 1 mile from proposed construction activities, the potential for the offsite migration of sediments and contaminants would be low. Erosion control BMPs and stormwater controls would be implemented to further reduce the potential for adverse impacts (see Section 4.14, *Water Resources*). Additionally, the implementation of spill prevention and containment procedures would prevent chemical materials from harming estuarine and marine resources surrounding the Satilla River Marsh Island Natural Area.

Operation

As discussed in Section 4.2.1.2, *Biological Resources, Proposed Action, Operation, Marine and Estuarine Vegetation and Habitats*, and Section 4.14.1.2, *Water Resources, Proposed Action, Operation*, no significant adverse impacts to surrounding EFH or surface waters are anticipated from normal operations of the spaceport. This would include no adverse impacts to the Satilla River Marsh Island Natural Area.

Cumberland Island National Seashore

Construction

None of the proposed construction areas occur on Cumberland Island. However, for visitors to the seashore during the construction phase of the spaceport, even a slight increase in noise would be easily noticeable in an otherwise quiet setting. Refer to Section 4.9.1.1, *Land Use, Proposed Action, Construction, Cumberland Island Wilderness*, for additional discussion of noise effects from construction activities on wilderness characteristics. Increased noise levels from construction would be intermittent and temporary, in that they would only occur during certain activities (i.e., those with higher intensities during activities such as pile driving) over approximately 15 months (the anticipated duration of construction). Therefore, construction activities would have no long-term, significant impacts to coastal resources at Cumberland Island.

Operation

Potential impacts from Spaceport Camden operations relative to Cumberland Island resources are described in the following sections of this EIS: Section 4.2, *Biological Resources*; Section 4.8, *Historical, Architectural, Archaeological, and Cultural Resources*; Section 4.9, *Land Use*; Section 4.11, *Noise and Noise-Compatible Land Use*; Section 4.12, *Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks*; and Section 4.14, *Water Resources*. The following is a summary of operational noise impacts found in Section 4.11 that are applicable to the coastal resources discussion.

The Settlement is located within the Cumberland Island National Seashore, approximately 14 miles north of the Sea Camp dock. This cultural landmark is a main tour stop as part of the Lands and Legacies Tours (Section 3.12, *Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks*) and was selected as a representative location on Cumberland Island National Seashore for the noise analysis (Section 4.11, *Noise and Noise-Compatible Land Use*). To better evaluate park visitor response in terms of human annoyance, an adjusted DNL is used to compute the percent highly annoyed. The adjusted DNL for a quiet environment adjusts the basic DNL by adding 10 dBA to account for the greater expectation for and value placed on "peace and quiet" in rural settings. For the Settlement, the adjusted DNL is approximately 53 dBA, which equates to 3 percent highly annoyed. During launches at Spaceport Camden, levels may exceed 66 dBA for as long as 51 seconds per launch at the Settlement. For static engine firing tests, noise levels at the Settlement may exceed 44 dBA for 7 seconds per test (ICF International, 2020). As shown in Exhibit 4.11-6, the maximum predicted sonic boom level from the small launch vehicle is 0.20 psf, which would be down range over the Atlantic Ocean, and no sonic booms are expected to over land areas (ICF International, 2020). Therefore, sonic booms associated with the operations are not anticipated to affect hearing conservation or cause structural damage.

As discussed in Section 4.9.1.2, *Land Use, Proposed Action, Operation, Cumberland Island Wilderness*, the majority of Cumberland Island Wilderness would be exposed to maximum A-weighted noise levels between 65 and 75 dBA $L_{A,max}$ during launches (Exhibit 4.11-2). For static fire engine tests, none of the wilderness would be exposed to noise levels of 65 dBA $L_{A,max}$ or greater (Exhibit 4.11-3). These maximum noise levels from each launch event and static fire engine test would be short, lasting approximately up to 51 seconds for a launch and 7 seconds for a static fire test. Noise levels from launches would exceed baseline conditions and temporarily alter the soundscape of Cumberland Island Wilderness, detracting from the solitude quality of wilderness (Section 4.9.1.2, *Land Use, Proposed Action, Operation, Cumberland Island Wilderness*). However, only 12 launches would be conducted annually; therefore, adverse noise impacts to solitude would be short-term.

Noise and overpressure levels experienced on Cumberland Island originating from activities at the spaceport are similar to those already experienced due to existing conditions on Cumberland Island. As described in Section 3.9.3, *Land Use, Existing Conditions*, Cumberland Island Wilderness is exposed to noise from sources outside the area, including vehicular traffic on Main Road, vessel use of surrounding water ways, military aircraft overflights, and beach driving. Therefore, visitors currently experience a diminished level of solitude within Cumberland Island Wilderness. Given the short duration of operations-related noise, combined with the existing soundscape of Cumberland Island Wilderness, impacts to the solitude or primitive and unconfined recreation quality would be adverse but short-term and minor and would not degrade this wilderness quality (Section 4.9.1.2, *Land Use, Proposed Action, Operation, Cumberland Island Wilderness*). Overall, noise impacts to coastal resources at Cumberland Island from Spaceport Camden operations would not be significant.

Overall, spaceport operations would not interfere with Cumberland Island's fire management practices because the OEZ (see Section 2.1.2.5, *Pre-Launch Activities*) does not overlap any portion of Cumberland Island, and access to the island would not be restricted for NPS personnel. However, to reduce potential wildfires, a Wildland Fire Management and Burn Plan would be developed in coordination with the USFWS and GDNR. See Section 4.2, *Biological Resources*, for additional information. As stated in Section 2.1.2.7, a Fire Mitigation Plan has also been developed and provides guidance, policies, and protocols for fire incidents and associated emergency responses (see Section 4.4.1.2, *Launch Failures*).

4.4.1.2 Launch Failures

Launch Failure and Emergency Procedures

Types of launch failures and their likelihood of occurrence are discussed in Section 2.1.2.7, *Launch Failures*. Potential impacts from launch failures and emergency procedures to coastal resources would be similar to those discussed in Section 4.2, *Biological Resources*; Section 4.7, *Hazardous Materials, Solid Waste, and Pollution Prevention*; and Section 4.14, *Water Resources*. An explosion could damage coastal resources adjacent to the launch pad or within areas impacted by debris, including portions of Floyd Creek and associated tidal marshes and wildlife species. However, it is anticipated that the majority of vehicle debris and propellants from a launch failure within the first seconds of a launch would be confined to the immediate area around the launch site and would not spread to the Satilla River Marsh Island Natural Area or Cumberland Island National Seashore. Any debris landing in tidally-influenced marsh or State waters out to 3 miles would be recovered when feasible and may require authorization from and coordination with the GDNR Coastal Resources Division. In the event of an emergency situation, in which ground sweeps or unmanned aerial systems are required (described in Section 2.1.2.5, *Pre-launch Activities*), prior to such an event, security personnel would be briefed on avoidance areas to minimize damage to sensitive coastal resources. In addition, personnel would be provided with a 24-hour emergency contact to minimize impacts from conducting ground sweeps.

Spaceport Camden would prepare and implement an Emergency Operation Response Plan and a Fire Mitigation Plan to ensure that adequate and appropriate guidance, policies, and protocols regarding fire incidents, hazardous material incidents, and associated emergency responses are available to and followed by all personnel, including coordination with the GDNR Coastal Resources Division and the NPS Cumberland Island National Seashore. In the event of a launch failure, emergency response and cleanup procedures contained in the plan would minimize the magnitude and duration of any impacts.

While adverse impacts to Floyd Creek and associated tidal marshes, vegetation, and wildlife may occur from a launch failure, the potential for significant adverse impacts to coastal resources from launch failures exists only within the first 45 to 75 seconds of flight before the vehicle tips horizontally. In the event of a launch failure or other situation requiring execution of emergency response procedures, Camden County, in coordination with FAA, would coordinate with the GDNR Coastal Resources Division and/or the NMFS to assess the impacts of the incident as well as potential impacts from cleanup and restoration. Emergency and contingency planning and response measures would serve to minimize potential adverse impacts, and emergency consultation with regulatory agencies (e.g., USFWS, Georgia SHPO, USACE, etc.) would be required should a launch failure result in impacts to sensitive resources.

4.4.1.3 Summary

Through coordination with the GDNR Coastal Resources Division, the County has determined that the Proposed Action is consistent with the Georgia Coastal Zone Management Plan, would not result in long-term adverse effects to the Georgia coastal barrier resources system, would not pose an impact to coral reef ecosystems (and the degree to which the ecosystem would be affected), and would not cause adverse impacts to the coastal environment that cannot be satisfactorily mitigated. FAA finds through analyses in this EIS that construction and operation of Spaceport Camden would not result in significant impacts to coastal resources, including marine protected areas such as the Satilla River Marsh Island Natural Area and Cumberland Island National Seashore. Camden County continues consultation with the GDNR regarding coastal zone consistency determinations, which must be completed before the FAA can make a license determination.

4.4.2 No Action Alternative

Under the No Action Alternative, FAA would not issue a Launch Site Operator License for operation of Spaceport Camden and no spaceport facilities would be constructed. The site use would not change and the proposed construction and operations would not take place. There would be no impacts on the specific resource area because the site would remain in its current state.

4.5 Department of Transportation Act, Section 4(f)

This section provides impact analyses for resources under Section 4(f) of the U.S. Department of Transportation Act. Following the Section 4(f) regulations, recommendations included in the FHWA *Section 4(f) Policy Paper* (DOT, 2012) and guidance from the FAA Order 1050.1F Desk Reference (FAA, 2020a), this section assesses the potential for the Proposed Action to result in a *use* of properties eligible for protection under Section 4(f) and identified in Section 3.5.3, *Existing Conditions.* The construction and operations of the proposed launch site were analyzed and the potential for all types of *use*—including *permanent incorporation*, *temporary occupancy*, and *constructive use*—were considered.

All properties qualifying for protection under Section 4(f) (see Section 3.5.1, *Definition and Description*) described in the ROI were identified and screened following the process described in Section 3.5.3, *Existing Conditions.* This resulted in four parks and recreational areas that were analyzed in detail to determine if the Proposed Action would result in a *use* under Section 4(f). As part of this analysis, FAA engaged in coordination with officials with jurisdiction over the Section 4(f) properties, both to ascertain the significance of the properties and in determining potential for *use* under Section 4(f).

Because all four parks and recreation areas are well outside the footprint of the proposed launch site's permanent boundaries and physical construction footprint, only the potential for *constructive use* was considered. In order for this type of *use* to occur, a proposed action or alternatives must result in substantial impairment to the property's activities, features, or attributes that qualify the property for protection under Section 4(f). As a general matter, this means that the value of the resource, in terms of its Section 4(f) purpose and significance, will be meaningfully reduced or lost (DOT, 2012). As noted in FHWA's Section 4(f) Tutorial[24], "*Constructive use* involves an indirect impact to the Section 4(f) property of such magnitude as to effectively act as a permanent incorporation."

As noted in Section 3.5.3, *Existing Conditions,* the ROI for historic sites eligible for protection under Section 4(f) corresponds to the APE for historical, architectural, archaeological, and cultural resources as defined in Section 3.8, *Historical, Architectural, Archaeological, and Cultural Resources*. In order for a historic site to be protected under Section 4(f), it must be determined to be significant through the Section 106 process—typically, with a corresponding determination that the property is on or eligible for the NRHP. For archaeological sites to qualify for protection under Section 4(f), they must be on or eligible for the NRHP and the site must warrant preservation in place.

Based on FAA's review of the historic sites, archaeological sites, parks, and recreation areas to identify the significant activities, features, and attributes of the properties, and incorporating information obtained through coordination with officials with jurisdiction over the Section 4(f) properties, FAA has made the determinations of *use* described below.

[24] Available online at: https://www.environment.fhwa.dot.gov/section4f/default.aspx

4.5.1 Proposed Action

4.5.1.1 Construction

Construction of facilities for the Proposed Action would not involve the permanent incorporation of lands from Section 4(f) properties. The land that would be acquired for construction of the launch site launch, support, and control facilities along with the required infrastructure is privately owned. No lands from public parks, recreation areas, refuges, or historic sites would be purchased or placed under a permanent easement.

The proposed construction of the launch site facilities and infrastructure was analyzed to determine whether construction activities would constitute a *constructive use* of Section 4(f) properties (i.e., whether construction would result in adverse indirect impacts that would substantially impair Section 4(f) properties). A Section 4(f) property is substantially impaired when the activities, features, or attributes of the property that contribute to its significance are substantially diminished. The following sections provide this assessment for public parks, recreation areas, and historic and archaeological sites.

Parks and Recreation Areas

Upland portions of Cumberland Island National Seashore at a distance of about 3.5 miles from the closest construction (Vertical Launch Facility) would experience noise levels of approximately 43 dBA DNL (see Section 4.11.1.1, *Noise and Noise-Compatible Land Use, Proposed Action, Construction*). At this location, construction noise could be audible during certain phases of construction (e.g., pile driving). Pile driving activities would occur over a period of a month for each construction location. Construction noise would be temporary, lasting only the duration of the construction project, and would be limited to normal working hours. Some visitors may experience construction noise during their visit and, in the case of day-use visitors, potentially lasting the duration of their visit. Such audible noise may be inconsistent with visitor expectations for natural quiet and the natural setting found on much of the island. However, because construction noise attributable to the Proposed Action would be temporary and limited, the noise would not substantially limit the use or diminish the quality of any of the Section 4(f) properties, such that their value would be substantially impaired. Therefore, FAA has made the determination that construction activities would not constitute a *constructive use* of Section 4(f) properties. FAA informed the National Park Service of its determination in October 2020 (see Appendix A, *Public Involvement/Agency Coordination and Consultation*).

Historic and Archaeological Sites

The analysis of impacts on historic sites protected under Section 4(f) was determined in accordance with Section 106 regulations (36 CFR Part 800). As described in Section 4.8, *Historical, Architectural, Archaeological, and Cultural Resources*, four archaeological historic properties are within or partially within the construction footprint of the Vertical Launch Facility. The four archaeological sites are considered "potentially eligible" for listing on the NRHP. In order to qualify for Section 4(f) protection, the sites must be eligible for listing and warrant preservation in place. If construction-related activities cannot avoid these sites, and if Phase II testing determines that the sites are eligible for listing on the NRHP and that they warrant preservation in place, construction of the proposed spaceport could result in the *permanent incorporation* of the sites. Consultation between FAA and the SHPO could also determine that the archaeological resources are important chiefly for data recovery and are not important for preservation in place, in which case, Section 4(f) does not apply to these resources.

Three NRHP-eligible architectural components of the Floyd's Fairfield and Bellevue Plantations/Union Carbide Property are located within the proposed Spaceport Camden site boundary near the proposed construction area for the Vertical Launch Facility. There would be no direct impact to the three historic

properties and vibration from construction (e.g., pile driving) would be far enough away that there would also be no indirect effects. Outside of the proposed Spaceport Camden site boundary, within the 5-mile radius APE for audible, vibratory, and visual effects, the Cumberland Island National Seashore historic properties and cultural landscape are also unlikely to experience audible or visual impacts related to construction activities rising to the level of substantial impairment. FAA determined that construction activities within the proposed Spaceport Camden site boundary would not constitute a *constructive use* of these Section 4(f) historic sites.

4.5.1.2 Operation

Proposed Spaceport Camden operations were evaluated to determine if they could result in a *constructive use* of the Section 4(f) properties including four parks and recreation areas identified in Section 3.5.3, *Existing Conditions,* and a number of cultural and historic resources identified in Section 4.8, *Historical, Architectural, Archaeological, and Cultural Resources*.

Operations associated with the Proposed Action would not result in the in the *permanent incorporation* or *temporary occupancy* of Section 4(f) properties. The potential for the Proposed Action to result in a *constructive use* on Section 4(f) properties, due to visual impacts, noise impacts, or access limitations to parks and recreation areas during launch activities, was considered and is described below.

Parks and Recreation Areas

FAA has engaged in coordination with officials with jurisdiction over the four parks and recreational properties that qualify for Section 4(f) in the ROI and for which the Proposed Action may result in a *constructive use*. As described in Section 3.5.3, *Existing Conditions,* natural and quiet surroundings are key attributes of several of the parks and recreation areas and are important components of the primary activities that take place and attract users to these properties. In many cases, a quiet, serene, and natural soundscape were identified by officials with jurisdiction as significant attributes or features of the properties.

FAA considered the potential for the Proposed Action to substantially impair the quiet and serenity of the Section 4(f) properties to the extent that it would result in a *constructive use*. FAA also considered the potential for the Proposed Action to impair the aesthetic features of the properties to the extent that it would constitute a *constructive use.* Although noise from launch activities would be perceptible at all four Section 4(f) parks and recreation areas, these events would be infrequent and short in duration. While other noise-generating activities would occur during the operation of the proposed spaceport (e.g., static engine tests) noise from launches would have higher intensity and would propagate farther than other sources.

As described in Section 4.13.1, *Visual Effects*, *Proposed Action,* certain project elements have the potential to impact views to the proposed spaceport site from surrounding areas. Using Google Earth satellite imagery, it was determined that most facilities on the site would not be visible, except for the tall water tower and launch pad lightning towers at the Vertical Launch Facility Complex. Although the project elements that are anticipated to rise above the surrounding forest would generally be visible, they would be subordinate to the larger viewshed, except in near- and middle-distance locations. These project features would be visible, but not dominant, from the western shore of Cumberland Island National Seashore, the closest Section 4(f) property to the proposed spaceport.

As described in Section 2.1.2, *Representative Launch and Vehicle Operational Activities*, operations would consist of up to 12 launches per year and the associated 12 engine tests and wet dress rehearsals. With these events occurring once per month (on average) and with noise levels being above the thresholds

used to measure interference with outdoor speech for short durations of time only, the operation of the proposed spaceport would not substantially impair the Section 4(f) properties. Furthermore, even within secluded and undeveloped locations in each Section 4(f) property, it is likely that other human-caused noises are perceived on a regular basis including noises such as motorized watercraft, automobiles, and fixed-wing and rotary-wing aircraft.

Visual disturbances during launches may also be perceptible at the properties, depending on weather and atmospheric conditions, the time of the launch, and other factors. These events would also be infrequent and short in duration. As described in Section 4.13.1.2, *Visual Effects*, *Proposed Action, Operation*, the visibility of launch vehicles during operations are temporary and sporadic and would not change existing landscapes; therefore, they would not cause permanent visual impacts. Although the occurrence of a launch is inconsistent with wilderness values for naturalness and lack of any imprint of humans, launches would not cause any lasting imprint nor any impairment. Weather conditions (low cloud cover, fog, and high humidity) could partially or totally obscure the visibility of a rocket trajectory soon after lift-off.

FAA considered light emissions as a potential visual impact from the Proposed Action as well. FAA acknowledges that the depletion of darkness in the night sky is at odds with wilderness values and the NPS responsibility to keep the imprint of man to a minimum. Because of the distance of the launch site to Section 4(f) properties, including the Cumberland Island National Seashore, and the low frequency of night launch activities, effects on dark skies would likely not rise to a level of substantial impairment.

As noted in Section 3.5.2, *Department of Transportation Act, Section 4(f), Regulatory Setting*, potential impairments in property access may constitute a *constructive use* of a Section 4(f) property. The potential for *constructive use* to occur as a result of closures or limited access to Section 4(f) properties was not evaluated in the Draft EIS because information regarding the launches, including important launch variables such as trajectory, size, and payload of the launch vehicle, was not available at the time. However, based on current information about the size, trajectory, volume of propellant, and payload of the representative launch vehicle analyzed in this EIS, Camden County has identified an OEZ (see Section 2.1.2.5, *Pre-Launch Activities*) that would be expected to include the land and water immediately adjacent to the Vertical Launch Facility. Because the anticipated OEZ would not extend onto any portions of the four Section 4(f) properties in the ROI, no restrictions or closures of the 4(f) properties due to establishment of OEZs are anticipated during the operation of the proposed spaceport.

A USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*) would be established, and access to this area would be monitored and controlled by the USCG during launch activities. The USCG LAA would be expected to include the waterways surrounding the launch site and some of the waterways surrounding Cumberland Island and Little Cumberland Island. A range of USCG LAAs proposed by the USCG would not require closures to either the Sea Camp or Dungeness Docks on Cumberland Island National Seashore. Therefore, no access limitations of the 4(f) properties due to establishment of USCG LAAs are anticipated during the operation of the proposed spaceport.

For the reasons described above, and in the case of all four properties, FAA has determined the Proposed Action would not result in a *constructive use*. FAA informed the National Park Service of its determination in October 2020 (see Appendix A, *Public Involvement/Agency Coordination and Consultation*).

Historic Sites

Information on noise and vibration impacts from the operation of the proposed spaceport that is useful in determining the potential for *constructive use* on archaeological and architectural resources is discussed in Section 4.8.1.2, *Historical, Architectural, Archaeological, and Cultural Resources, Proposed Action, Operation*. As noted in that section, noise impacts on historic properties would be transitory, lasting only as long as each noise event. Although such noise would result in an effect on historic

properties, it is unlikely to be an adverse effect and is, therefore, unlikely to constitute a *constructive use.* Vibrations from operational noise could potentially result in structure damage to historic properties, and if allowed to accumulate or go unrepaired, this could constitute a *constructive use*. However, a *constructive use* to historic sites can only be determined through consultation with the officials with jurisdiction, in this case, the SHPO and tribes. FAA continues to consult with these parties to determine the eligibility of historic sites, the potential for adverse effects to the sites, and an agreement necessary to resolve any adverse effects that may be identified. In order to meet FAA's responsibilities to protect historic resources under Section 106 of the NHPA, FAA anticipates that a Programmatic Agreement will be established and will outline the process by which the eligibility of historic sites and the effect of the proposed spaceport on historic sites will be determined, as well as actions that will be taken by parties to the Programmatic Agreement. Because historic sites will be evaluated and protected under the Programmatic Agreement, FAA has determined that the Proposed Action would not result in a *constructive use* of historic sites eligible for protection under Section 4(f).

4.5.1.3 Launch Failures

Types of launch failures and their likelihood of occurrence are discussed in Section 2.1.2.7, *Launch Failures*. Should a launch failure occur, potential impacts to Section 4(f) properties would depend on the scope and location of the failure. Were a failure to occur over a Section 4(f) property or result in effects to Section 4(f) properties, FAA and the County would engage in coordination with officials with jurisdiction applicable to the affected Section 4(f) properties.

4.5.1.4 Summary

Analysis shows that the Proposed Action does not involve more than a minimal physical use of a Section 4(f) resource and would not result in a constructive use based on FAA's determination that the Proposed Action would not substantially impair a Section 4(f) resource. Therefore, FAA has determined that the Proposed Action would not result in significant adverse impacts to Section 4(f) properties/resources.

4.5.2 No Action Alternative

Under the No Action Alternative, FAA would not issue a Launch Site Operator License for operation of Spaceport Camden and no launch site facilities would be constructed. The site use would not change and the proposed construction and operations would not take place. Consequently, there would be no *use* of any identified Section 4(f) properties.

4.6 Farmlands

This section analyzes potential impacts to important farmlands (including pastureland; cropland; forest considered to be prime, unique, or of State or local importance; and aquaculture areas), including those from construction and operational activities. The analysis involved the following steps:

- Identify existing farmland and determine if there is a change in land use from farmland to another land use, resulting in decreased farmland uses (see Section 3.6.3, *Existing Conditions*). A significance determination is presented based on the FAA Order 1050.1F significance threshold, which states a significant impact would occur if "the total combined score on Form AD-1006, 'Farmland Conversion Impact Rating,' ranges between 200 and 260 points." As discussed in Section 3.6.3, *Existing Conditions*, there would be no land use change; therefore, no impact analysis is required for this step in the methodology.

- Consider whether the action would have the potential to convert important farmlands to nonagricultural uses.
- Evaluate indirect and direct impacts from limiting access and/or activities to/on land with farmlands.
- As described in Chapter 2, *Proposed Action and Alternatives*, evaluate impacts from the proposed launch trajectory, composite USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*), and access-controlled areas (outside the fenced areas) using a programmatic approach. More specific impact analysis will be evaluated on a case-by-case basis in a separate environmental analysis study specific to that launch operation.

4.6.1 Proposed Action

4.6.1.1 Construction

Construction of the facilities (Launch Control Center Complex, Alternate Control Center and Visitor Center, Mission Preparation Area, Vertical Launch Facility) at the three proposed sites (see Table 2.1-3 for acreage) and the infrastructure improvements (roads, above- and below-ground power lines, communication lines, water lines, and septic systems) as described in Section 2.1.1, *Construction – Activities and Facility Descriptions*, would occur in areas already developed and/or within the proposed spaceport site boundary. None of these locations are designated as farmland; therefore, no impacts would occur.

Existing trees at the proposed sites where construction would occur would need to be cleared. These trees could be used for timber, and the sale or use of the timber could offset construction or other costs.

There would be no indirect impacts on access to existing farmlands due to the location of construction sites and no road closure requirements.

There would be no indirect or direct impacts to aquaculture areas, as they are not located within or near the construction ROI. Additionally, aquaculture areas would not be impacted by sedimentation and pollutant disturbances from construction activities, due to the distance from the construction site. See Section 4.2, *Biological Resources*, for additional information about impacts to habitats.

4.6.1.2 Operation

Site-Specific ROI

No farmland or aquaculture area was identified within site-specific ROI (spaceport site boundary); therefore, the year-round and launch operations would have no impact on farmland or aquaculture resources. However, the land within the site-specific ROI is generally forested, which could provide the opportunity to sell timber to a local timber-harvesting company.

Operational ROI

No farmland was identified within the operational ROI (the land outside the spaceport site boundary but within the proposed launch trajectory and composite USCG LAA, described in Section 2.1.2.5, *Pre-Launch Activities*); therefore, there would be no impacts on farmland.

Road closures to "unauthorized persons" (see Section 1.4.2, *Other Licenses, Permits, and Approvals*) associated with the areas for the launches, wet dress rehearsals, and static fire engine tests could last up to 12 hours. The closed roads are not known to be used by farmland-related transportation or site access; however, there could be a low indirect impact based on the length of the closure causing traffic

congestion. There is also the possibility that timber-harvesting activities may consider coordinating their schedule with launch activities to prevent any impacts.

The parcel owned by Big Pasture LLC (southwest of the proposed spaceport site, north of Union Carbide Road and outside the LAA and OEZ [described in Section 2.1.2.5, *Pre-Launch Activities*]) could be included as an authorized location to allow vehicles access through the access control checkpoints. Access control checkpoints are identified in Exhibit 2.1-10. This site has the potential for timber harvesting; however, it is zoned as planned development, which allows for a variety of future land uses. Considering the possibility of being an authorized location and the potential for future planned development, there would be no impacts to farmlands.

Aquaculture

Aquaculture areas within the operational ROI include 3,000 acres of a single, inactive, commercial shellfish lease area; 1,658 acres of two recreational shellfish harvest areas; and 8,724 acres of the shellfish growing area within the composite USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*). Aquaculture areas, specifically those used for harvesting (not growing), within the composite USCG LAA would be closed to "unauthorized persons" (see Section 1.4.2, *Other Licenses, Permits, and Approvals*) during launches, wet dress rehearsals, and static fire engine tests, lasting up to 12 hours. There could be an indirect impact from preventing access to potential future commercial parties and recreational shellfish harvesters from the harvesting areas. The severity of the impact would be based on the length of the closure. However, since the planned activities for Spaceport Camden include advanced notification of any planned closures and do not exceed 12 hours, the impacts could be minimized by including the GDNR Coastal Resources Division on the notification list. GDNR's Coastal Resources Division can coordinate and assist, ensuring that harvesters (including commercial) can coordinate their harvesting schedule with launch activities.

There is no expected direct impact to aquaculture areas, as impacts to habitat and water resources would not be considered significant due to the limited occurrence and duration of any potential access limitations (see Section 4.14, *Water Resources*, and Section 4.2, *Biological Resources*). In addition, the planned erosion control BMPs, stormwater controls, and spill prevention and containment procedures would prevent harm from occurring to marine and water resources.

4.6.1.3 Launch Failures

Launch Failure

Types of launch failures and their likelihood of occurrence are discussed in Section 2.1.2.7, *Launch Failures*. If a launch failure occurs early in flight, which could result in an explosion or crash, it could damage areas adjacent to the launch pad or areas impacted by debris. The area most likely affected would be the OEZ (see Section 2.1.2.5, *Pre-Launch Activities*), as the launch vehicle and most, if not all, of the payload would likely be consumed by the launch failure's explosion.

Impacts to farmland areas from a launch failure would be expected to be minimal, because the closest farmland is located approximately 1 mile west of the launch site and opposite from the launch trajectory.

Aquaculture areas are not anticipated to be impacted from a launch failure, as vehicle debris and propellants would likely be concentrated to the launch pad and OEZ and would not spread to the Satilla River, Cumberland River, and associated estuaries and habitats; any portion of the Cumberland Island National Seashore; or the Atlantic Ocean (see Section 4.2, *Biological Resources*, for additional information about impacts to habitats).

Fire

If a launch failure results in a fire (likely from the result of the launch vehicle propellant tank(s) rupturing and/or propellant burning explosively), there is the possibility of temporary impacts to aquaculture areas from propellants spilling or releasing into local bodies of surface water and infiltrating soils.

There would be no impacts from fires to farmlands, as farmlands are not located within or near the launch pad, OEZ, or trajectory.

The severity of impacts to aquaculture would be based on the amount and type(s) of pollutants introduced to adjacent water bodies (see Section 4.2, *Biological Resources*; Section 4.7, *Hazardous Materials, Solid Waste, and Pollution Prevention*; and Section 4.14*, Water Resources*) and their speed in which they traverse and spread towards the aquaculture areas. However, any potential for impacts would likely be reduced to a degree that is not significant, given the amount of propellants used in a small launch vehicle and due to the Spaceport Camden's Fire Mitigation Plan and Hazardous Materials Emergency Response Plan. These plans address adequate and appropriate guidance, policies, and protocols for fire incidents, hazardous material incidents, and associated emergency responses and also include coordination and compliance with all applicable agencies (e.g., local fire departments, GDNR, NPS Cumberland Island National Seashore) and their respective Fire Management Plans.

Emergency Response

Spaceport Camden would be prepared to respond to an emergency situation by having an emergency response team, plans, procedures, equipment, and trained staff and local first responders. There would be minimal indirect impacts to farmlands and aquaculture from an emergency situation, as their locations are distanced from areas that would likely be impacted (i.e., the launch pad and OEZ). Emergency and contingency planning and response measures would serve to minimize potential adverse impacts, and emergency consultation with regulatory agencies (e.g., USFWS, Georgia SHPO, USACE, etc.) would be required should a launch failure result in impacts to sensitive resources.

4.6.1.4 Summary

Under the Proposed Action, potential access limitations to aquaculture areas and timber-harvesting areas would be minimal. There would be no conversion of important farmlands (i.e., pastureland, cropland, and forest considered to be prime, unique, or of state or local importance) to nonagricultural uses. Therefore, FAA has determined that the Proposed Action would not result in significant adverse impacts to farmlands.

4.6.2 No Action Alternative

Under the No Action Alternative, FAA would not issue a Launch Site Operator License for operation of Spaceport Camden and no spaceport facilities would be constructed. The site use would not change and the proposed construction and operations would not take place. Farmlands in the area would continue to be affected by ongoing and future activities within the region, but no change would occur to farmlands as a result of spaceport development and operation.

4.7 Hazardous Materials, Solid Waste, and Pollution Prevention

This section describes the activities that may require the transportation, storage, and use of hazardous materials or generate solid waste during site preparation, construction, and operations activities and addresses potential impacts associated with hazardous materials, solid waste, and pollution prevention as compared to the environmental baseline.

This section identifies waste streams that would be generated by the Proposed Action and the No Action Alternative; environmental site investigations and site remediation that may be required for the construction of the proposed project; hazardous and solid wastes that may be generated by construction and operation of the proposed project; management, transportation, storage, and use of hazardous materials for site preparation, site remediation, construction, and operation of the proposed spaceport (including transportation); and pollution prevention strategies and procedures for site preparation, site remediation, construction, and operation of the proposed spaceport.

Additionally, this section identifies whether waste disposal related to the Proposed Action would result in impacts to facility disposal capacity, whether the Proposed Action would interfere with any ongoing remediation of existing contaminated sites at the proposed project site or in the immediate vicinity of the project site. It also describes any special precautions needed to transport hazardous materials and hazardous waste as part of the Proposed Action and how construction and operation of the proposed spaceport will conform to the existing restrictions of the site, including land use and groundwater use restrictions, covenants, required ongoing monitoring and maintenance requirements, maintenance of signage, etc.

The methodology used to evaluate the impact of these factors identified proposed activities and, using process knowledge or other available data, determined the type and quantity of waste (hazardous and nonhazardous) that would likely be generated by the Proposed Action. Resulting waste types/quantities were then compared to proposed management measures to determine if applicable waste regulations would be met or if regional landfill capacities (in the case of solid wastes) would be exceeded.

Analysis also evaluated the types and quantities of hazardous materials that would be employed and whether proposed engineering controls (e.g., secondary containment) or operational controls (emergency response plans) would be adequate to address potential releases and whether local emergency response resources would be available to respond to a potential release of hazardous materials.

To evaluate impacts to existing contamination sites, the existing location of these sites was compared with the location of proposed activities. Site-specific conditions, including the existence of land use controls, were then analyzed against proposed activities to assess whether these activities could result in health impacts to workers or releases of hazardous constituents to the environment.

Based on the above factors, FAA has not identified any significant adverse impacts associated with hazardous materials, solid waste, or pollution prevention. No National Priorities List properties are involved in the project, and landfill capacities would not be exceeded. As indicated in discussions below, there is the potential for effects to historical contamination sites. Once the land is acquired by the County, the potentially contaminated sites could continue to be managed under the existing hazardous waste facility permit, unless that permit has been modified or rescinded by the GDNR EPD. Also, the County, as the owner of the site, would be responsible for any restrictions placed on the site as part of State-approved corrective actions for the historical sites.

4.7.1 Proposed Action

Construction activities associated with roads and facilities are expected to occur over a 15-month period. Activities associated with operations are evaluated based on the site conducting up to 12 launches per year. Secondary indirect impacts are also identified and included in the analysis. Additional information on activities associated with the Proposed Action is provided in Section 2.1, *Proposed Action*.

4.7.1.1 Construction

Hazardous Materials

Hazardous materials that are common to construction include diesel and gasoline to fuel the construction equipment; hydraulic fluids, oils, and lubricants; and welding gases, paints, solvents, adhesives, and batteries. Typical of most construction projects, the storage and use of these materials may result in minor, incidental spills of diesel fuel or oil to the ground during fueling of equipment, filling of fuel storage tanks, and handling of lubricants. Other incidental spills could be associated with equipment failures such as ruptured hoses. To prevent the release of hazardous materials to the environment, appropriate measures would be implemented to ensure hazardous materials are handled, stored, and used in compliance with Federal, State, and local regulations.

Hazardous materials would be brought onsite using DOT-approved trucks or containers and would be temporarily stored until needed. Transportation would be only over approved roads by licensed carriers who will employ appropriate DOT placarding. In case of a hazardous materials incident during the course of transportation (including loading, unloading, and temporary storage), the carrier would be required to immediately provide notification to the appropriate agency, such as the local police or fire department.

Because more than 1,320 gallons of petroleum would be stored onsite, a federally mandated Spill Prevention, Control, and Countermeasure (SPCC) Plan would be developed and implemented. The SPCC Plan would describe all oil handling operations, spill prevention practices, discharge or drainage controls, and training requirements, as well as the personnel, equipment, and resources at the facility that would be used to prevent oil spills. Additional chemical-specific spill response plans would be developed for other hazardous materials stored onsite (e.g., fuel, hydraulic fluid, and lubrication oils). Typical measures that would be implemented to minimize the potential for a hazardous material release would include the following:

- Implementing SPCC Plan prevention measures while loading and unloading fuel, such as preventing movement of transport vehicles during product handling operations and inspecting vehicle outlets for leakage before filling and truck departure
- Providing secondary containment for all bulk hazardous materials storage locations
- Storing bulk hazardous materials in approved containers that meet National Fire Protection Association industrial fire protection codes and required containment systems
- Storing hazardous materials in protected and controlled areas designed to comply with the SPCC Plan or chemical-specific plans
- Implementing appropriate storage container inspection and personnel training procedures

The use and management of hazardous materials for the construction phase of the Proposed Action are summarized in Table 4.7-1.

Table 4.7-1. Hazardous Materials Management for Construction

Material	Storage Quantity	Use	Management
Fuel, hydraulic fluid and lubrication oils	Containers up to 5 gallons (gal) each	Construction equipment	Stored on impervious surface with spill cleanup materials available. Used oils would be collected for recycling.
Welding gases	Containers up to 150 pounds each	Construction of launch structures and fabrication and maintenance of equipment	Consumed in welding operations. Cylinders would be removed from launch site by vendors.

Table 4.7-1. Hazardous Materials Management for Construction (Continued)

Material	Storage Quantity	Use	Management
Diesel fuel, gasoline, propane	Up to seven tanks of up to 5,000 gal each	Fuel for construction equipment	Stored in aboveground tanks with secondary containment and periodic inspections.
Paints, primers, thinners, cleaning fluids, degreasers, adhesives, sealants, etc.	Containers up to 5 gal each	Construction of launch site facilities and equipment, cleaning	Limited quantities stored onsite at any one time. Stored in a small, locked steel building in the shop areas at least 2,500 feet from any fuel storage.

Hazardous and Solid Wastes

Hazardous and non-hazardous solid wastes would be generated in small quantities during construction, and would include empty containers, spent solvents, waste paint and solvents, used oil, spill cleanup materials, and lead-acid batteries from construction equipment. These wastes would be stored in appropriate containers in accordance with applicable Federal and State of Georgia regulations. Wastes that cannot be recycled would be disposed of by the contractor at licensed facilities in a manner approved by USEPA; consequently, no significant impacts would be expected.

Construction activities would also generate construction-related debris. A total of approximately 200,000 square feet of building space would be constructed as part of the Proposed Action. (Note: This quantity does not include storage tanks, parking areas, roads, pads, or retention ponds.) The largest construction would be associated with the Vehicle Integration Building (120,000 square feet). Using conventional construction methods, approximately 4.34 pounds of C&D debris would be generated for every square foot of building space (USEPA, 2003). This would equate to a total of approximately 435 tons of C&D debris generated (the product of 200,000 [square feet] multiplied by 4.34 [psf], divided by 2,000).

However, buildings on the site would primarily be of a pre-engineered design. These are metal buildings that are pre-fabricated offsite and then assembled onsite over a concrete slab-type of foundation; consequently, the actual quantity of C&D debris generated would be minimal and would consist of scrap materials associated with interior spaces (e.g., offices), including wood, drywall, plastic, masonry, etc. C&D debris would also be generated during construction of paved surfaces (e.g., parking areas, roads, sidewalks). Building materials, such as asphalt and concrete, would not be expected to generate significant waste since they are produced in the needed quantities and can be recycled in the event that the material or its placement does not meet specifications. In the case of paved surfaces, C&D debris would likely consist mostly of wooden forms that could be recycled.

Soil excavated during construction activities would be stockpiled for construction and landscaping uses, while woody debris from land-clearing activities could also be chipped or mulched onsite and used for landscaping. (Note: Because this is a RCRA-regulated site, any soils removed from their native locations are required to be fully characterized with regard to potential contamination. These soils would be shipped offsite for proper disposal in accordance with the characterization results.) The County would develop and implement a Construction Management Plan, which would detail the steps necessary for the management of all waste generated as a result of construction. Other non-hazardous waste generated would be the result of construction site operations (e.g., food waste, office waste, packaging materials). The quantity of this type of waste would be minor, when compared to the C&D debris generated.

C&D debris from construction activities would likely be disposed of at the Camden County C&D and Industrial Waste Landfill. As discussed in Section 3.7.3, *Existing Conditions*, sufficient landfill capacity exists to accommodate the additional solid waste generated as a result of construction activities; consequently, no significant impacts are expected to solid wastes.

Management actions of hazardous and solid waste for the construction phase of the Proposed Action are summarized in Table 4.7-2.

Table 4.7-2. Hazardous and Solid Waste Management for Construction

Waste	Source	Management
Construction-related debris (drywall, scrap lumber, scrap wood, metal, cardboard, paper, etc.)	Construction activities	Removed for offsite recycling or disposal during construction phase.
Spent solvents, paper, waste oil, batteries, spill cleanup materials, antifreeze, and empty containers	Construction, grounds maintenance, housekeeping, maintenance, and spill response (as needed) activities	Removed for appropriate offsite recycling or disposal.
Paints, primers, thinners, cleaning fluids, degreasers, adhesives, sealants, and isopropyl alcohol	Construction and maintenance of launch site facilities and equipment, and cleaning	Small amounts of spent solvents would be transported offsite for recycling or disposal. Waste generated from these materials would be managed by the contractor and disposed of at the local landfills, or hazardous waste quantities may be disposed of as allowed under Georgia regulations.

Asbestos/LBP

As discussed in Section 3.7, *Hazardous Materials, Solid Waste, and Pollution Prevention*, information was not available regarding existing buildings or foundations, when previous buildings were removed, or if remaining structures contain asbestos or LBP. Regardless, prior to demolition or modification of any structures, asbestos surveys would be conducted, and if present, asbestos would be abated. Disposal of asbestos wastes would be conducted as directed by the National Emission Standards for Hazardous Air Pollutants. The State of Georgia would be notified prior to removal actions and only Georgia-licensed contractors would be allowed to perform the work. Contractor personnel would have to be trained and certified. Transport and disposal documentation records, including signed manifests, would also be required.

As with asbestos, prior to demolition or modification of any structures, a LBP survey would be conducted. Proper disposal of any resulting lead-containing wastes would also be conducted in accordance with Federal regulations, including the Toxic Substances Control Act and the Occupational Safety and Health Act. Further, these wastes would be accompanied by a waste manifest and disposed of at an approved facility. Implementation of these waste management requirements would mitigate any adverse impacts resulting from asbestos or LBP, and neither of these materials would be employed in new construction.

Pollution Prevention

Construction projects would apply pollution prevention measures to the greatest extent possible. In addition to the release prevention measures described above, these measures would include purchase of

environmentally friendly products, such as paints with a low VOC content. Projects would also incorporate recycling to limit the quantity of solid waste generated. This may include recycling wooden pallets and using soils and woody debris from land-clearing activities for landscaping onsite.

Historical Areas of Contamination

MEC Sites

Several historical areas of contamination are located within the ROI, as described in Section 3.7.3, *Existing Conditions*. These MEC contamination sites are primarily associated with historical uses of munitions. Construction in areas such as MRA-1 and MRA-2 could potentially expose workers to MEC.

Risks from exposure to MEC differ greatly from risks associated with exposure to chemicals. Direct (handling) or indirect contact with MEC has the potential to result in injury or death. Unlike chemical exposure where there may be an exposure limit where no adverse effects will occur, there is no accepted method for establishing the incremental probability for injury or death from an encounter with MEC. If the potential for an encounter with MEC exists, the potential that the encounter will result in death or injury also exists.

To eliminate the potential for impacts, prior to any work on MEC sites (e.g., MRA-1 and MRA-2), comprehensive surveys would be conducted by a qualified unexploded ordnance disposal contractor. Prior to construction, workers would also be educated on the potential for MEC in these areas, including how to recognize MEC and what procedures to apply in case MEC are encountered. These procedures would include leaving MEC where found, stopping all work around the MEC, and contacting the appropriate response personnel. Any detected MEC (either during the surveys or during construction activities) would be investigated and disposed of by an approved unexploded ordnance disposal contractor. If any explosive MEC were encountered, it would be detonated in place, with prior coordination with local agencies (such as the police and fire departments) and the GDNR EPD. With implementation of these construction and coordination practices, no adverse impacts would be expected as a result of construction activities in these areas.

Road Improvements

The Proposed Action also includes improvements to roads that currently traverse historical MEC sites, such as MRA-1 and MRA-2. Road improvement activities, such as filling and grading or removing and replacing existing surfaces, would primarily be limited to the existing road beds, limiting the potential for exposure to MEC. Soil-disturbing activities that extend outside the existing road bed, such as road widening, would also be subject to the same risk minimization construction and coordination practices described above; consequently, no adverse impacts would be expected.

Post-Construction Practices

In order to be exposed to MEC, personnel would have to leave the prescribed work areas and leave the prescribed access routes to each part of the site. After construction, signage would be posted along all non-cleared MEC areas to inform employees and visitors of potential MEC hazards. Additionally, when non-employees visit the site, they would be escorted and instructed not to leave the prescribed travel routes. So long as these travel routes are adhered to, the probability of an employee or a visitor being exposed to MEC would be extremely low.

As discussed in Section 3.7, *Hazardous Materials, Solid Waste, and Pollution Prevention*, a 2012 CAP determined that updating the current ICP would achieve the project objective of mitigating MEC hazards at MRA-1 and MRA-2 by preventing potential contact with MEC through site restrictions (signage and

perimeter fencing) and passive restrictions (through training and educational programs). As part of the Proposed Action, the CAP would need to be updated to include any additional legal restrictions that may be required to prevent future contact with MEC resulting from any land use disturbances or changes.

Non-MEC Sites

Areas/roads associated with proposed activities also traverse non-MEC contamination areas, such as the Empty Drums Area (proposed site of the Vertical Launch Facility), SWMU 6, and the Loop Road Equipment and Material Surface Storage site (proposed site of the Mission Preparation Area). These areas have been investigated and have been found to require no further action (see Section 3.7.3, *Existing Conditions*). However, if any evidence of potential contamination is encountered during construction (stained/discolored soil, odors, sheen on groundwater, etc.), all work would cease and the Spaceport Camden management and/or the GDNR EPD would be immediately notified. Regardless, all work on or near these areas would be coordinated with these same agencies. With implementation of these procedures (to include risk minimization practices previously discussed), no significant impacts would be expected as a result of construction activities in these areas.

Additional Investigations

As discussed in Section 3.7.3, *Existing Conditions*, there are also 10 additional sites that may be potentially contaminated. They are located on the northwest quadrant of the Bayer CropScience property, with most of the sites adjoining, or located near, Union Carbide Road (which would be improved as part of the Proposed Action).

In addition, the site is under an Enviromental Covenant between Union Carbide Corporation and GDNR (see Section 3.7.3, *Existing Conditions*). The Covenant prohibits any activity at the site (including on the RCRA landfill) that may result in the release of or exposure to hazardous wastes, hazardous constituents, or constituents of concerns; consequently, any proposed disturbance on the site would have to be coordinated with the GDNR EPD. Additional investigations may be required by the GDNR EPD to satisfy stipulations of the Covenant and to ensure that Covenant requirements are not violated. The site would not be able to be removed from the RCRA permit and program until all SWMUs achieve No Further Action designations. Thereafter, the property owner may request a RCRA permit modification to remove the site from RCRA regulation. After this occurs, management of the site may occur under another applicable program, such as the Georgia Brownfields Program. The Brownfields Program makes it possible to acquire previously contaminated property without assuming all the liability, as the new owner is protected from third party claims (lawsuits) resulting from prior contamination. Note: The Proposed Action implementation would not be contingent on SWMUs achieving No Further Action designations and/or achieving a RCRA permit modification and removal from RCRA regulation. The Proposed Action would also not be contingent on the property's acceptance to the Brownfields Program.

The land acquisition process would also require completion of a Phase I Environmental Site Assessment. The Environmental Site Assessment would document environmental conditions at the Spaceport Camden site. The Environmental Site Assessment would also include a radius search report with information on properties located up to 1 mile from the spaceport site boundary, as documented in various government environmental databases (leaking underground storage tanks, hazardous waste generators, etc.).

With implementation of the above procedures, no significant impacts would be expected from historical areas of contamination.

4.7.1.2 Operation

Hazardous Materials

Hazardous materials would be used during launches, maintenance, and flight support activities (Table 4.7-3). Flight support operations at the vertical launch area would use products containing hazardous materials, including paints, solvents, oils, lubricants, acids, batteries, fuels, surface coating, and cleaning compounds. Some rocket propellants and materials used in maintaining launch vehicles are considered hazardous. The types of rocket propellants fuels to be potentially launched from Spaceport Camden include the following:

- Hydrocarbon fuel (i.e., RP-1 Propellant) with an oxidizer such as liquid oxygen
- Cryogenic propellants (i.e., liquid oxygen) maintained at very low temperatures
- Satellite and special fuels (i.e., hydrazine, MMH, UDMH, and NTO)

Table 4.7-3. Hazardous Materials Management for Operations

Material	Storage Quantity	Use	Management
Paints, primers, thinners, cleaning fluids, degreasers, adhesives, sealants, and isopropyl alcohol	Containers up to 5 gallons (gal) each	Maintenance of launch site facilities and equipment, and cleaning	Limited quantities are stored onsite at any one time in a small, locked steel building in the shop areas at least 2,500 feet from any fuel storage.
Liquid oxygen	Up to six tanks of 50,000-100,000 gal each	Used as oxidizer	Stored in appropriate storage tanks on impervious ground surfaces with berms capable of containing full volume of material stored. Areas would be fenced and checked for security. Consumed during launch.
RP-1 Propellant	Up to four tanks with 50,000 gal each	Used as propellant	Stored in appropriate storage tanks on impervious ground surfaces with berms capable of containing full volume of material stored. Areas would be fenced and checked for security. Consumed during launch.
Hydrazine, MMH, UDMH, and NTO	Containers 30 to 55 gal each	Satellite and special fuels	Stored on impervious ground surfaces with berms capable of containing full volume of material stored. Areas would be fenced and checked for security. Consumed during launch.
Helium gas	Total storage of 10,000 to 15,000 gal	Used in Launch Vehicle assembly and testing	Consumed onsite. An additional 1,000 cubic feet of helium gas would be stored tanks at the Launch Control Center Complex.
Nitrogen gas	Total storage of 25,000 to 50,000 gal	Used in Launch Vehicle assembly and testing	Consumed onsite. An additional 3,000 cubic feet of nitrogen gas would be stored tanks at the Launch Control Center Complex.
Small explosive initiators and rocket motor igniters	-	Ignite fuels and propellants	Stored in a locked bunker at least 2,500 feet from fuel storage. Consumed during launch.

Notes: MMH = monomethylhydrazine; UDMH = unsymmetrical dimethyl hydrazine; NTO = nitrogen tetroxide.

These products would be supplied by conventional suppliers and would be delivered to the site by licensed vendors in approved tanker truck or other containers. Offsite storage would be maintained by the suppliers and is outside the scope of this EIS. Fuel and oxidizer loading/unloading operations would take place in designated areas located on impervious surfaces, with spill prevention and emergency response procedures in place. Fueling operations would take place under the provisions of the SPCC Plan. The risk of hazardous material releases due to leaking storage tanks, tanker trucks, delivery lines, or other infrastructure would be limited by proper handling practices, in compliance with 14 CFR §420.67 for liquid fuels (see Section 3.7.2).

Routine spaceport operations could result in minor or major leaks, spills, and inadvertent releases of fuel and other contaminants into the soil and groundwater. To minimize this potential, hazardous products would be used and stored at appropriate locations throughout the facility. As discussed previously, specific materials management plans would be developed that included strategies and procedures for storing, handling, and transporting hazardous materials (in addition to responding to onsite spills). This would include compliance with protocols for maintaining up-to-date Material Safety Data Sheets, as well as SPCC Plans. Containment areas surrounding the fuel storage tanks and any fueling facilities must be designed to ensure adequate containment or catchment of fuel so that people and natural resources would not be impacted by a fuel spill (O.C.G.A. 12-8-60, *Hazardous Waste Management Act*).

Spaceport Camden would coordinate with, and obtain approval from, the State Fire Marshall regarding the onsite storage of any flammable materials (e.g., diesel, gasoline, propane). Additionally, Spaceport Camden would comply with EPCRA hazardous materials reporting requirements. Under EPCRA Sections 311 and 312 (Community Right-to-Know Requirements), facilities that handle or store any hazardous chemicals in excess of applicable reporting thresholds must submit Material Safety Data Sheets and annual inventory (Tier II) forms to State and local officials and local fire departments. In Georgia, the reporting threshold is 10,000 pounds for most common chemicals, with lower thresholds for chemicals identified as extremely hazardous substances, for example, hydrazine, which has a reporting threshold of 1,000 pounds. Note: It is not known at this time whether the reporting threshold for hydrazine or other extremely hazardous substances would be exceeded. Inventories for hazardous chemicals and EPCRA reporting would be required once the facility is operational.

Hazardous and Solid Wastes

Hazardous wastes would also be generated during operations, although during successful launches all hazardous materials would be consumed, so no waste would be left requiring disposal. Spacecraft and 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. The sources of hazardous waste include waste fuel, waste oils, spent solvents, paint waste, and used batteries. The Spaceport Camden operations and management entity would develop a hazardous waste management plan. The plan would lay out the steps for appropriate management of hazardous waste, such as establishment of satellite accumulation points and properly labeled DOT-approved containers. Wastes would be disposed of using designated hazardous waste accumulation facilities or private hazardous waste contractors, as needed.

Based on operations at similar facilities, it is estimated that the hazardous waste quantities would be small enough to qualify Spaceport Camden as a very small quantity generator (VSQG) of hazardous waste (FAA, 2008). VSQGs are defined as those facilities that produce less than 100 kilograms (220 pounds) of hazardous waste per calendar month, or less than 1 kilogram (2.2 pounds) of acutely hazardous waste per calendar month. The VSQG requirements additionally limit the facility's waste accumulation quantities to less than 1,000 kilograms (2,200 pounds) of hazardous waste, 1 kilogram (2.2 pounds) of acute hazardous

waste, or 100 kilograms (220 pounds) of any residue from the cleanup of a spill of acute hazardous waste at any time. Spaceport Camden would obtain a generator identification number related to hazardous waste operations from the GDNR EPD.

Spaceport Camden would utilize the services of a Georgia-permitted transporter to ensure all hazardous wastes were disposed of only in approved treatment, storage, and disposal facilities. All hazardous waste shipments would be tracked using a USEPA hazardous waste manifest. The regulations governing hazardous waste management are found in Georgia Administrative Code 391-3-11, *Hazardous Waste Management*. Generation rates for a VSQG (i.e., less than 220 pounds per month) would have a negligible impact on the capacity of disposal facilities in the region.

Operations would also generate non-hazardous solid waste such as office waste, break room waste, packaging from supplies, and solid waste from maintenance activities that use non-hazardous materials. There would be approximately 77 full-time employees at the facility, with up to 300 staff present during launch operations. Based on an estimated generation rate of 9.2 pounds per worker per day (California Integrated Waste Management Board, 2007), the annual generation would be approximately 250 tons (assuming an average annual staff of 150 personnel). For comparison, the Camden County MSW Landfill accommodates up to 400 tons per day of solid wastes; consequently, no adverse impacts would be expected.

Management actions of hazardous and solid waste for the operations phase of the Proposed Action are summarized in Table 4.7-4.

Table 4.7-4. Hazardous and Solid Waste Management for Operations

Waste	Source	Management
Spent solvents, paper, waste oil, batteries, spill cleanup materials, antifreeze, and empty containers	Grounds maintenance, housekeeping, maintenance, and spill response (as needed) activities	Removed for appropriate offsite recycling or disposal.
Paints, primers, thinners, cleaning fluids, degreasers, adhesives, sealants, and isopropyl alcohol	Maintenance of launch site facilities and equipment, and cleaning	Small amounts of spent solvents would be transported offsite for recycling or disposal. Waste generated from these materials would be managed by the contractor and disposed of at the local landfills or hazardous waste quantities may be disposed as allowed under Georgia regulations.

Emissions from Launch Operations

As discussed in Section 4.1.1.2, *Environmental Consequences, Air Quality: Operation*, rocket launches result in the release of chemical byproducts from the combustion of fuel. Rockets can produce many different emissions, with primary byproducts comprising water vapor, carbon dioxide, carbon soot, and carbon monoxide. Other chemicals produced during combustion, in much smaller quantities, may include nitrous oxides, chlorine, sulfuric compounds, and other trace gases. Potential impacts on air quality associated with the release of chemical byproducts from launch operations were previously discussed in Section 4.1.1, *Environmental Consequences, Air Quality, Proposed Action*.

Pollution Prevention

As with construction, operational activities would also apply pollution prevention measures to the greatest extent possible. These measures may include purchase of environmentally friendly products;

recycling cardboard containers and wooden pallets; incorporating energy efficient building design for cooling, heating, and lighting; and using alternate power sources such as photovoltaic cells. Additionally, as part of security patrols during launches, Spaceport Camden personnel may coordinate sweeps after each event to recover materials that have been discharged from rockets. Any launch vehicle debris landing in tidally-influenced marsh or State waters, out to 3 miles, must be recovered when feasible and may require authorization from the GDNR Coastal Resources Division (O.C.G.A. 12-5-230, *Shore Protection Act*, O.C.G.A. 12-5-280, *Coastal Marshlands Protection Act*, and/or O.C.G.A. 50-16-61, *Administrative Procedures Act/Revocable License Program*). This debris may comprise large metallic components used in the construction of the rocket body (e.g., metallic skin, propellant tanks, engines), as well as smaller debris associated with metal and plastic sub components.

Vibration and Historical Areas of Contamination

Analysis of the potential effects of ground vibration on the landfill site (located 1.65 miles from the launch site) concluded that launches would result in vibration levels equivalent to those produced by a passing truck. This analysis was based on the use of medium-heavy launch vehicles. The use of the site for the launch of only small launch vehicles, in combination with the use of vibration suppression systems (see Section 2.1.2.6, *Launch Day Activities*), would further limit any vibration effects; consequently, vibration would not be anticipated to contribute to the migration of contaminants in the soil at contamination areas.

4.7.1.3 Launch Failures

Types of launch failures and their likelihood of occurrence are discussed in Section 2.1.2.7, *Launch Failures*. Most propellants would be expected to be consumed during the destruction of the vehicle, but some could escape and be released into the environment. Spaceport Camden would prepare and implement an emergency response plan to ensure that adequate and appropriate guidance, policies, and protocols regarding fire incidents, hazardous material incidents, and associated emergency responses are available to, and followed by, all personnel, including coordination with the NPS Cumberland Island National Seashore and its Fire Management Plan. Additionally, if required, memoranda of agreement would be established with local fire departments to provide supplemental firefighting support as needed. Spaceport-based firefighting personnel and other emergency response personnel would receive appropriate training related to the types of fires/hazards that may be encountered in case of a launch failure.

The largest potential for a release of hazardous materials would occur in the event of a launch failure. Possible outcomes include fires, explosions, or releases of propellants or other hazardous materials. In the event of a launch failure, Spaceport Camden would have procedures, equipment, launch site staff, and spaceport-based first responders trained in emergency response. As discussed in Section 2.1.2.1, *Representative Launch Vehicle*, the representative small launch vehicle is anticipated to carry approximately 1,000 gallons of liquid oxygen and 750 gallons of RP-1. Additionally, smaller quantities of propellants may be carried by the payloads. Most propellants would be expected to be consumed during the destruction of the vehicle, but some could escape and be released into the atmosphere, where it usually dissipates or evaporates before contact with the ground. Debris from a failure at the launch pad would be generally expected to be confined to the vicinity of the pad; consequently, hazardous material storage tanks would be situated outside the OEZ (see Section 2.1.2.5, *Pre-Launch Activities*) around the launch pad to minimize any potential impacts.

In the event that debris from a launch failure were to land on historical areas of contamination (e.g., former landfill or other SWMUs), the GDNR EPD would be contacted to ensure that all recovery activities in these areas were conducted in accordance with the terms of the existing hazardous waste facility

permit or with other applicable environmental regulations. Any launch vehicle debris landing in tidally-influenced marsh or State waters, out to 3 miles, must be recovered when feasible and may require authorization from the GDNR Coastal Resources Division (O.C.G.A. 12-5-230, *Shore Protection Act*, O.C.G.A. 12-5-280, *Coastal Marshlands Protection Act*, and/or O.C.G.A. 50-16-61, *Administrative Procedures Act/Revocable License Program*). Trained spaceport-based fire suppression teams would be sent to the area to put out possible fires and contain possibly hazardous materials.

Among the requirements associated with launch accident planning, the launch operator would be required by FAA regulations (14 CFR §450.173(d)) to establish procedural controls for hazards associated with a launch failure that results in a water or land impact beyond the spaceport site boundary. These procedural controls must address safety of members of the public, extinguishing fires, securing impact areas, and ensuring public safety from hazardous debris.

Releases of any hazardous materials from a launch failure would be cleaned up in accordance with the procedures identified in the emergency response plans. After all required investigations and related actions on the site were complete, debris would be removed from the site. Overall, the purpose of emergency response planning is to save lives, property, and material by timely and correct response to any launch failures and to investigate the cause of the failure, in order to preclude the reoccurrence of the same or a similar event. The specific recovery activities following accidents would be specified in emergency response plans, the Launch Site Operator License, and Spaceport Camden standard operating procedures. Implementation of emergency response and cleanup procedures would reduce the magnitude and duration of any impacts.

Any resulting hazardous materials and waste would be managed in accordance with Federal, State, and local requirements, and any necessary permits would be obtained prior to onsite treatment. Additional considerations for specific launch vehicles would be specified in the Vehicle Operator Licenses. In all cases, the owner or agency of the affected land would be notified of the accident and response activities would begin as soon as possible. All activities on the site would also be conducted in coordination with all affected landowners. Emergency and contingency planning and response measures would serve to minimize potential adverse impacts, and emergency consultation with regulatory agencies (e.g., USFWS, Georgia SHPO, USACE, etc.) would be required should a launch failure result in impacts to sensitive resources.

4.7.1.4 Summary

The Proposed Action would not violate applicable Federal, State, tribal, or local laws or regulations regarding hazardous materials and/or solid waste management. While the Proposed Action involves a contaminated site, not all the grounds within the boundaries of the proposed spaceport are contaminated, which leaves space for siting a facility on uncontaminated land within the boundaries of the proposed spaceport. Overall, the siting of facilities to avoid contaminated sites to the greatest extent possible serves as a pre-planning mitigation to minimize potentially adverse impacts. Additionally, the Proposed Action would not produce an appreciably different quantity or type of hazardous waste from that already produced in the region, would not generate an appreciably different quantity or type of solid waste or use a different method of collection or disposal and/or would exceed local capacity, and would not adversely affect human health and the environment. Therefore, FAA has determined that the Proposed Action would not result in significant adverse impacts associated with hazardous materials, solid waste, and/or pollution prevention.

4.7.2 No Action Alternative

Under this alternative, Spaceport Camden would not be constructed or operated; consequently, no impacts from hazardous materials and wastes or contamination sites other than those under current conditions would occur.

4.8 Historical, Architectural, Archaeological, and Cultural Resources

This section provides the results of the analysis of the actions and recommendations for the appropriate finding of effect for each historic property and then summarizes the finding of effect for the entire project. Possible outcomes for the findings of effect include: no historic properties affected; no adverse effect on historic properties; and adverse effect on historic properties. As part of the Section 106 process mandated by the NHPA, FAA consults with the SHPO and seeks concurrence on the finding of effect. This section reports the status or results of the consultation at the time of the publication of this EIS and identifies the need for mitigation measures to resolve adverse effects.

Analysis of potential impacts on historic properties considers direct impacts that may occur by physically altering, damaging, or destroying all or part of a resource; altering characteristics of the surrounding environment that contribute to the resource's significance; introducing visual or audible elements that are out of character with the property or alter its setting; or neglecting the resource to the extent that it deteriorates or is destroyed. Direct impacts can be assessed by identifying the types and locations of proposed activity and determining the exact location of cultural resources that could be affected. Indirect impacts occur later in time or farther from project activities. Indirect impacts are assessed by identifying cultural resources located near the project that may be altered by effects related to noise, vibrations, or visual intrusions related to project construction, maintenance activities, and operation of the spaceport, as well as increased use of the area attributable to the proposed project.

Impacts on historical, architectural, archaeological, and cultural resources could arise from direct effects resulting from ground-altering activities associated with construction and possibly operational activities. Indirect impacts could also affect this resource type through changing the audible or visual environment during the period of construction and operation of Spaceport Camden.

This introductory section briefly describes the activities that are evaluated for potential impacts on historic properties. Table 4.8-1 summarizes the potential effect on resources within the spaceport site boundary and within the 5-mile audible, vibratory, and visual APE, including the type of effect and whether it would occur from construction or operation.

Construction-related actions would include ground-disturbing activities such as excavation, fill, utility installation, or use of an area for staging; these activities could impact archaeological sites that are within the area of direct disturbance and could have an adverse effect on *archaeological* historic properties (i.e., archaeological sites that are eligible for listing on the NRHP).

Table 4.8-1. Effect on Historic Properties of Proposed Spaceport Camden

Resource Number	Resource Description	NRHP Eligibility*	Location in APE	Potential Effect*	Potential Source of Effect
Historic Properties in the APE for Direct Effects: Construction Areas					
9CM30	Shell scatter and pottery, pre-contact	Potentially Eligible, Criterion D	Vertical Launch Facility	Potential for effect	Construction: Ground disturbance

Table 4.8-1. Effect on Historic Properties of Proposed Spaceport Camden (Continued)

Resource Number	Resource Description	NRHP Eligibility*	Location in APE	Potential Effect*	Potential Source of Effect
9CM64	Shell midden and pottery, Mississippian	Potentially Eligible, Criterion D	Vertical Launch Facility	Potential for effect	Construction: Ground disturbance
9CM570	Shell midden and pottery, Woodland	Potentially Eligible, Criterion D	Vertical Launch Facility	Potential for effect	Construction: Ground disturbance
9CM571	Shell midden and pottery, Woodland	Potentially Eligible, Criterion D	Vertical Launch Facility	Potential for effect	Construction: Ground disturbance
Historic Properties in the APE for Direct and Audible, Vibratory, and Visual Effects: Proposed Spaceport Camden Site Boundary					
9CM24	Shell scatter, Late Archaic - Mississippian	Potentially eligible, Criterion D	Outside of construction area, within proposed Spaceport Camden site boundary	No effect	n/a
9CM25	Shell midden, Woodland, Mississippian	Potentially eligible, Criterion D	Outside of construction area, within proposed Spaceport Camden site boundary	No effect	n/a
9CM26	Shell mounds, Woodland	Potentially eligible, Criterion D	Outside of construction area, within proposed Spaceport Camden site boundary	No effect	n/a
CM-CO 31	Floyd's Fairfield and Bellevue Plantations/ Union Carbide Property, c. 1804-c. 1877	Eligible, Criteria B and C, Criteria Consideration C and D	Outside of construction area, within proposed Spaceport Camden site boundary	Potential for effect	Operations: Vibration
CM-CO 31, Resource A	Anchor House ruins, early 19th century	Eligible, Criterion A	Outside of construction area, within proposed Spaceport Camden site boundary	Potential for effect	Operations: Vibration
CM-CO 31, Resource B	Charles Rinaldo Floyd Burial Site, 1845	Eligible, Criterion B, Criteria Consideration C	Outside of construction area, within proposed Spaceport Camden site boundary	Potential for effect	Operations: Vibration
CM-CO 31, Resource C	Floyd Family Cemetery, early to mid-19th century	Eligible, Criterion A, Criteria Consideration D	Outside of construction area, within proposed Spaceport Camden site boundary	Potential for effect	Operations: Vibration

Table 4.8-1. Effect on Historic Properties of Proposed Spaceport Camden (Continued)

Resource Number	Resource Description	NRHP Eligibility*	Location in APE	Potential Effect*	Potential Source of Effect
Historic Properties in APE for Audible, Vibratory, and Visual Effects: 5-mile Radius					
#78000265	High Point-Half Moon Bluff Historic District (HP-HMB), c. 1700-1950	Listed as HP-HMB HD, Criterion A	CUIS: High Point-Half Moon Bluff Historic District (HD)	Potential for effect	Operation: Vibration, noise, visual
#78000265, Resource A	First African Baptist Church, 1937	Contributing to HP-HMB HD, Criterion A	CUIS: Half Moon Bluff	Potential for effect	Operation: Vibration, noise, visual
#78000265, Resource B	Rischarde Red Barn, c. 1935-1945	Contributing to HP-HMB HD, Criterion A	CUIS: Half Moon Bluff	Potential for effect	Operation: Vibration, noise, visual
#78000265, Resource C	Alberty House, c. 1935-1945	Contributing to HP-HMB HD, Criterion A	CUIS: Half Moon Bluff	Potential for effect	Operation: Vibration, noise, visual
#78000265, Resource D	Trimmings House, c. 1935-1945	Contributing to HP-HMB HD, Criterion A	CUIS: Half Moon Bluff	Potential for effect	Operation: Vibration, noise, visual
#78000265, Resource I	Cemeteries, c. 1880	Contributing to HP-HMB HD, Criterion A	CUIS: Half Moon Bluff	Potential for effect	Operation: Noise, visual
#78000265, Resource J	High Point Road, c. 1880	Contributing to HP-HMB HD, Criterion A	CUIS: Half Moon Bluff to High Point	Potential for effect	Operation: Noise, visual
#84000941	Main Road, c. 1800-1870	Listed individually (no HD), Criterion A	North end of CUIS	Potential for effect	Operation: Visual
[no number]	Cumberland Island Cultural Historic Landscape	Eligible as Historic Landscape (no HD), Criteria A and B	CUIS	Potential for effect	Operation: Noise, visual
[no number for historic district]	Dover Bluff Club HD	Eligible HD, Criterion C	Dover Bluff	Potential for effect	Operation: Vibration, noise
CRA #15	Cabin Bluff Cumberland River Retreat HD, c. 1920s-1930s	Eligible, Criteria A and C	Cabin Bluff	Potential for effect	Operation: Vibration, noise

Notes: APE = area of potential effect; c. = circa; CUIS = Cumberland Island National Seashore; EIS = Environmental Impact Statement; FAA = Federal Aviation Administration; HD = historic district; HP-HMB = High Point-Half Moon Bluff; n/a = not applicable; NRHP = National Register of Historic Places; SHPO = State Historic Preservation Officer.

* Within the APE for direct effects, or construction areas, the SHPO has concurred with potential eligibility of archaeological resources and avoidance to resolve unknown potential effects. Within the APE for audible, vibratory, and visual effects, the SHPO has concurred with FAA that effects are unknown (see Appendix A). FAA continues to consult with the SHPO and other consulting parties to execute a Programmatic Agreement to take into account the effects of the Proposed Action on historic properties; the Programmatic Agreement will be completed before a Record of Decision is signed.

Architectural historic properties, including aboveground structures or ruins, potentially could be adversely affected by vibration associated with ground disturbance activities, such as pile driving. Vibrations could cause cracks in tabby concrete walls or unsettle the foundations of grave markers and monument footings. However, distance from the construction activity would diminish vibration effects, which is taken into account in the analysis of potential impacts to the historic properties in the APE.

Transitory noise associated with construction activity is unlikely to affect archaeological resources as setting is rarely a component of an archaeological site's eligibility for listing on the NRHP. Architectural resources could be affected if the noise level were great enough to cause damage, as noted above, but noise related to construction of the spaceport is unlikely to have a lasting effect on the setting of historic properties because of its short-term nature. Within the APE for audible, vibratory, and visual effects, it is unlikely that construction would cause any effect due to the distance of historic properties from the activities associated with the Proposed Action.

Post-construction activities, including operation of the spaceport, would likely have no effect on archaeological historic properties. However, operation of the spaceport could have a visual and audible effect on other historic properties when setting is a key characteristic of NRHP eligibility. Noise or vibrations from spaceport operation or visual intrusion from spaceport structures, static engine firings, and launches could potentially affect historic landscapes, as well as architectural historic properties, or traditional cultural properties.

Audible effects could arise from static engine tests and launches. Although there is no established criterion for how loud noise must be to adversely affect a historic property, the 65 dB level identified for "Noise and Noise-Compatible Land Use" is a generally accepted standard (FAA Order 1050.1F; FAA 1050.1F Desk Reference Sections 11.1.2, 11.1.3, and 11.2: Projects Not Requiring a Noise Analysis, FAA Aircraft Noise Screening Tools and Methodologies, and Affected Environment, respectively). Noise above this level in a previously quiet environment, or even a noise level below this in a noise-sensitive area where the increase is above the FAA standard of 1.5-dB increase, is generally accepted as creating a potential adverse effect to historic properties. Impacts to historic properties from noise in the APE for audible, vibratory, and visual effects would be from changes to setting through the increase in noise levels, as vibrations are unlikely to be of a duration or at a level great enough to result in physical changes (refer to Section 4.11, *Noise and Noise-Compatible Land Use*).

Visual effects may arise when the view from a historic property or the view to the historic property is changed in a way that affects its NRHP eligibility characteristics. Constructed elements such as buildings, lightning protection system towers and water towers, ambient elements such as lights visible at night, or the rocket launches themselves may have a visual effect on a historic property if the setting is a key element of its NRHP eligibility.

4.8.1 Proposed Action

4.8.1.1 Construction

An archaeological survey of the portions of the APE for direct effects where ground disturbance would occur (see Section 3.8.3, *Historical, Architectural, Archaeological, and Cultural Resources*, *Existing Conditions*) was conducted to identify archaeological historic properties that could be directly affected by ground-disturbing activities (Cultural Resources Analysts, Inc., 2017a). An architectural survey of the APE for audible, vibratory, and visual effects identified cultural resources that could be affected by changes to the audible, vibratory, and visual environment (Cultural Resources Analysts, Inc., 2017b). The results of

these surveys are described in Chapter 3, *Affected Environment*, of this EIS (refer to Table 3.8-1) and used as the baseline for analysis.

Archaeological Resources

Cultural resources inventory of the areas of the proposed Spaceport Camden facilities located a total of four archaeological historic properties within the APE for direct impacts. The four archaeological sites, all within or partially within the construction footprint of the Vertical Launch Facility, are considered "potentially eligible" for listing on the NRHP (SHPO letter dated April 3, 2017); if project activities cannot avoid these sites, and if Phase II testing determines that the sites are eligible for listing on the NRHP, they could be adversely affected by construction of the spaceport through direct disturbance related to construction activities.

Construction could affect the integrity of an archaeological site, which is an essential feature of its ability to yield information important in prehistory or history (NRHP Criterion D). Two isolated finds within the footprint of the Vertical Launch Facility and one within the Launch Control Center Complex are not eligible for listing, and construction would have no effect on them. Three other archaeological sites, within the proposed Spaceport Camden site boundary but outside of the project construction areas of direct impact, have not been evaluated for NRHP eligibility, but would not be disturbed by construction. Until evaluated, these three sites are treated as if they are eligible. However, none of these three would be affected by actions related to construction of the facilities. Not all parcels within the proposed Spaceport Camden site boundary but outside of the project construction areas have been surveyed, because some project elements are on Bayer CropScience property. Phased identification of archaeological resources may locate additional sites; if identified as historic properties (36 CFR §800.4(b)(2)), continuation of Section 106 consultation would be required.

Despite the intensive nature of the archaeological survey in the portions of the APE for direct effects where ground disturbance would occur, it remains possible that additional archaeological sites could be located during construction-related ground disturbance. In the event of such a discovery, the spaceport operator should immediately notify the SHPO and evaluate the resource for NRHP eligibility. If the resource is a historic property (i.e., eligible for listing on the NRHP), initiation of the Section 106 consultation process would determine the next steps needed to comply with the NHPA.

Architectural Resources

Physical disturbance. No architectural historic properties would be permanently affected by construction of the spaceport facilities. Of the three NRHP-eligible architectural components of the Floyd's Fairfield and Bellevue Plantations/Union Carbide Property located within the proposed Spaceport Camden site boundary, none are within the construction areas. The three historic properties are: ruins of the Anchor House, the Charles Rinaldo Floyd Burial Site, and the Floyd Family Cemetery. Because these historic properties are outside of the construction footprint, there would be no direct impact from construction. Noise generated by construction would be short-term and would not reach levels sufficient to affect the NRHP eligibility of these resources, as their eligibility is based on their significant associations and setting is not a key characteristic of the properties' integrity.

Noise and vibration from construction, possibly including pile driving, are not anticipated to impact any architectural resources in the APE. The common measure for construction point source noise (i.e., pile driving) is the maximum decibel level (i.e., the L_{max}), which is the highest value of a sound pressure over a certain time interval (see Table 4.11-1 in Section 4.11, *Noise and Noise-Compatible Land Use*). Noise levels for construction activities range from 73 (for a generator) to 101 dBA L_{max} (for pile drivers) at 50 feet from the activities (FHWA, 2006). As most of the proposed 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. Within the proposed Spaceport Camden site boundary, the Anchor House, the Charles

Rinaldo Floyd Burial Site, and the Floyd Family Cemetery would be far enough away from the noise source so that there would be no effect.

Visual intrusion. Visual effects to historic properties could stem from visibility of launch facility features such as buildings and towers and/or view of the space vehicles during launch (see Sections 3.13 and 4.13, *Visual Effects*, for the viewshed analysis performed). Within the proposed Spaceport Camden site boundary, the three historic properties and seven potentially eligible archaeological sites are unlikely to be affected by visual intrusions. As recently as 2009, their setting contained a more-than-300-foot-tall manufacturing building with conveyors and related buildings and structures (which have since been removed); the setting has also undergone significant changes since the resources' period of significance, without affecting NRHP eligibility. Outside of the proposed Spaceport Camden site boundary, within the 5-mile radius APE for audible, vibratory, and visual effects, the historic properties on Cumberland Island are unlikely to experience audible or visual impacts from construction.

On Cumberland Island, visual intrusions from the proposed lightning towers and water towers could have an effect on historic properties because setting is a key element of their NRHP listing. Vegetation or other structures would block the view of the proposed lightning and water towers from most of the High Point-Half Moon Bluff Historic District and the Main Road. However, the proposed lightning and water towers and the 65-foot-tall Vehicle Integration Building at the Vertical Launch Facility site will reach heights that will be visible from the westernmost portion of the High Point-Half Moon Bluff Historic District, which a part of the Cumberland Island Cultural Historic Landscape. Representative observation points for the visual analysis are illustrated in Exhibit 3.13-3; observation point 4 is adjacent to the easternmost point of the Historic District.

Structures and lights would be barely visible from the western coastal portions of the Cumberland Island Cultural Historic Landscape that lie within the indirect APE, introducing elements to the setting of the historic landscape that affect a key characteristic of its eligibility (Cultural Resources Analysts, Inc., 2017b). However, as with the Cumberland Island Historic District, only the western coastal portions will "see" the proposed facility on the distant horizon.

These same effects apply to the Dover Bluff Club Historic District, the Tabby Ruins on Dover Bluff, and the Cabin Bluff Cumberland River Retreat Historic District. Although lightning and water towers may be visible at times, views from these resources have included contemporary industrial objects during their periods of significance.

Cultural Landscape

The Cumberland Island Cultural Historic Landscape, located within the 5-mile radius APE for audible, vibratory, and visual effects, is unlikely to experience impacts from construction.

Traditional Cultural Resources

No traditional cultural resources have been identified within the facilities' construction footprints or within the proposed spaceport site boundary.

4.8.1.2 Operation

Effects to historic properties related to noise and vibration within the APE for direct effects and the APE for audible, vibratory, and visual effects (the 5-mile radius from the spaceport) were examined with measurements of $L_{A,max}$ (dBA), L_{max}, and sonic booms.

Archaeological Resources

There would be no impacts to archaeological resources anticipated from the proposed operation of Spaceport Camden. The archaeological survey of the APE for direct effects identified four archaeological sites that are potentially eligible for listing on the NRHP for the purposes of Section 106, all located within or partially within the construction area for the Vertical Launch Facility. As discussed in Section 4.8.1.1, *Construction*, if project actions cannot avoid one or more of these sites, then Phase II testing would formally determine NRHP eligibility (see Appendix A for the letter from the SHPO dated April 3, 2017). There are three other archaeological sites outside the facilities' footprints that have not been assessed for NRHP eligibility but are also treated as though they are eligible for listing on the NRHP. Once construction is completed, it is unlikely that any of these resources would be affected by operation of Spaceport Camden, for example, by vibration and noise generated by static engine tests, movement of the launch vehicle to the launch pad, or other activities (Cultural Resources Analysts, Inc., 2017a). The change in the acoustical setting due to the proposed Spaceport Camden operations would not be an adverse effect to the seven prehistoric archaeological sites because they are considered potentially eligible for their potential data content under Criterion D, and setting is not one of the characteristics of these sites that would qualify the property for inclusion in the NRHP.

Architectural Resources

Acoustic Setting SEL (dBA). Three NRHP-eligible architectural features associated with the 19th century Floyd's Fairfield and Bellevue Plantations are within the proposed Spaceport Camden site boundary but outside the construction areas. These features are the Anchor House ruins, the Charles Rinaldo Floyd Burial Site, and the Floyd Family Cemetery. These historic properties are within a radius of the launch site that would experience noise levels in most cases between 105 and 115 dBA during static fire and launch activities. The DNL of the SEL contour of 115 dBA corresponds to approximately 53 dB DNL, which is substantially lower than FAA's 65 dB DNL significance threshold. These periodic noise events would exceed the standards identified by FAA Order 1050.1F of a 1.5-dB increase in the noise environment of a generally quiet setting, as in the case of the historic properties. This increase in noise would constitute a change to the setting of the historic properties. However, the change would be transitory, lasting only as long as each noise event, varying from about 7 seconds for a static test to slightly more than 1 minute for a launch. Although such noise-induced changes to the quiet setting would be an effect to historic properties, effects would be transitory and infrequent.

An architectural survey of the APE for audible, vibratory, and visual effects within a 5-mile radius of the proposed Spaceport Camden also identified historic properties. As described in Chapter 3, *Affected Environment*, in addition to the three NRHP-eligible architectural resources within the proposed Spaceport Camden site boundary, architectural historic properties on Cumberland Island were identified as listed on or eligible for listing on the NRHP. The architectural resources that could be affected by changes to the audible and visual environment (Cultural Resources Analysts, Inc., 2017b) include the NRHP-listed Main Road and High Point-Half Moon Bluff Historic District (listed on the NRHP), including six contributing elements: the First African Baptist Church, Rischarde Red Barn, Alberty House, Trimmings House, three cemeteries dating to circa 1880, and the High Point Road. Historic properties were also identified on Dover Bluff and Cabin Bluff. On Dover Bluff, the Dover Bluff Club Historic District includes 23 contributing elements consisting of residences (Table 4.8-1). Tabby Ruins comprise a contributing element of the Black Hammock Plantation. The plantation is outside of the APE and is of unknown NRHP eligibility, but is treated as eligible, as are the Tabby Ruins. On Cabin Bluff, the Cabin Bluff Cumberland River Retreat Historic District includes 16 contributing elements, mostly cabins but also including a main lodge and various facilities (Table 4.8-1).

These historic properties would be subject to periodic noise levels of between 90 and 95 dBA during a launch event (see Exhibit 4.11-2 in Section 4.11, *Noise and Noise-Compatible Land Use*). These noise events would exceed the standards identified by FAA Order 1050.1F of a of 1.5-dB increase in the noise environment of a generally quiet setting, in this case of the historic districts. The Settlement at the NRHP-listed Half Moon Bluff, including the First African Baptist Church, is considered a noise-sensitive area (refer to Section 4.11, *Noise and Noise-Compatible Land Use*, and as defined in Paragraph 11-5.b(8) of FAA Order 1050.1F). This increase in noise would constitute a change to the setting of the historic properties. However, the effect would be transitory, lasting only as long as each noise event. This varies from about 7 seconds for a static test, to slightly more than 1 minute for a launch, after which sound levels would decrease to below median ambient noise levels—approximately 40 dB (refer to Table 4.11-3 in Section 4.11, *Noise and Noise-Compatible Land Use).* Although such noise would be an effect to historic properties, it would be transitory and infrequent. On Dover Bluff and Cabin Bluff, setting includes enough modern elements and intrusions so that short-lived noise events are unlikely to constitute an adverse effect.

Noise Vibration (Peak Particle Velocity [millimeters per second]). Technical analysis indicates that an increase in noise and vibration is expected in the area of the NRHP-eligible architectural features of the Floyd's Fairfield and Bellevue Plantations from periodic static fire and launch-related activities (see Exhibit 4.11-4 in Section 4.11, *Noise and Noise-Compatible Land Use*). The technical analysis suggests that cracking or displacement to the tabby walls of the Anchor House ruins or displacement or cracking of grave markers or the base of the Floyd Burial monument could occur as a result of the operation of Spaceport Camden.

Based on PPV analysis to determine the potential for structural damage related to vibrations from noise, PPV for a hypothetical wooden building at the Charles Rinaldo Floyd burial site (4 millimeters per second at 20 hertz) would be approximately the same as the "sensitive" structure criteria level for that frequency. Because the grave markers and cemetery walls at the site are made of stone, vibrations would be less intense than for a wooden structure and would be less than "sensitive" structure criteria. Launch noise-induced structural vibration levels at all other example structures considered to be eligible for listing on the NRHP are well below criteria levels established for "sensitive" structures for all frequency bands. It is unlikely that archaeological structures like the Anchor House ruins, the Charles Rinaldo Floyd Burial Site, and the Floyd Family Cemetery would be damaged by vibration from these periodic elevated noise levels.

The Anchor House ruins are in a state of deterioration, with one elevation of the tabby ruins being braced with wood beam supports (Cultural Resources Analysts, Inc., 2017b). The Charles Rinaldo Floyd Burial Site is mostly intact with barely legible inscription and some collapse of the 1920s concrete block fence that surrounds it. The box tomb features of the Floyd Family Cemetery are in similar condition with illegible inscriptions and cracked and broken slabs. All three properties are heavily overgrown with vegetation. Thus, while archaeological structures like the Anchor House ruins, the Charles Rinaldo Floyd Burial Site, and the Floyd Family Cemetery could be damaged by vibration and overpressure from these periodic noise events, it is unlikely that such damage would affect the condition of the properties to such a degree that they would be no longer eligible for listing on the NRHP.

On Cumberland Island, Dover Bluff and Cabin Bluff, the historic properties within the APE for audible, vibratory, and visual effects, would be subject to vibration levels of less than 1 millimeter PPV. These levels are far below the "sensitive" building category; therefore, no building damage would be expected (refer to Exhibit 4.11-4 in Section 4.11, *Noise and Noise-Compatible Land Use*). On Cumberland Island, historic properties include elements of the NRHP-listed High Point-Half Moon Bluff Historic District, such as the First African Baptist Church, Rischarde Red Barn, Alberty House, and Trimmings House. Effect from noise

on the cemeteries, High Point Road, or Main Road on Cumberland Island is unlikely. Sound pressure level induced vibration would fall below the levels shown to potentially cause damage, and the same holds for static fire engine tests (see Exhibit 4.11-2 and Exhibit 4.11-3 in Section 4.11).

The same conditions apply to the historic properties on Dover Bluff and Cabin Bluff. The Tabby Ruins on Dover Bluff could be vulnerable to adverse effects from vibrations generated by spacecraft launches, but in all cases, the likelihood of damage remains low, with vibration levels of less than 1 millimeter PPV that are well below the "sensitive" building category (see Appendix C for details).

Sonic booms. Sonic booms would be associated with launch events. A sonic boom would occur 55 miles from shore over the Atlantic, which is far enough east of the coastline that there would be no effect on historic properties.

Visual intrusion. Based on the viewshed analysis performed (see Sections 3.13 and 4.13, *Visual Effects*), visual effects to historic properties could stem from visibility of the space vehicles during launch events. Within the proposed Spaceport Camden site boundary, the three historic properties of the Floyd's Fairfield and Bellevue Plantations are unlikely to be affected by visual intrusions, as their setting contained a more-than-300-foot-tall manufacturing building with conveyors and related buildings and structures (which have since been removed); the setting has also undergone significant changes since the resources' period of significance, without affecting NRHP eligibility.

On Cumberland Island, the space vehicle would be visible from the historic properties on Cumberland Island during launches, which would temporarily intrude into their visual setting. However, the intrusion into the visual setting would be very small because the launch vehicle would be at a distance of approximately 4 miles at launch, and then at an estimated altitude of 72,000 feet as it passes overhead. Although these small changes to the viewscape would temporarily affect the setting of the historic properties, the views from Cumberland Island to the mainland over the past decades have varied considerably, including both rural and industrial objects, as well as modern air traffic overhead and boat traffic on the Intracoastal Waterway, but not to the degree that the historic properties no longer qualify for listing on the NRHP.

These same effects apply to the Dover Bluff Club Historic District, the Tabby Ruins on Dover Bluff, and the Cabin Bluff Cumberland River Retreat Historic District. Although the space vehicle may be visible from a distance during launches, resulting in a temporary effect to the visual setting of these historic properties, views from these resources have included contemporary industrial objects, including modern air traffic overhead and boat traffic on the Intracoastal Waterway, during their periods of significance.

Cultural Landscape

Structures and lights would be visible from the portion of the historic landscape that lies within the APE for audible, vibratory, and visual effects. Launches will also introduce elements to the setting of the historic landscape that affect a key characteristic of its eligibility (Cultural Resources Analysts, Inc., 2017b) (see Section 4.11, *Noise and Noise-Compatible Land Use*, and Section 4.13, *Visual Effects*). However, this would not be an adverse effect; the change would be transitory, lasting only as long as each of the 12 annual launch events—between 45 and 75 seconds (see Section 2.1.2.3). Additionally, the viewscape has included industrial features in the recent past and continues to have modern intrusions such as modern elements on the horizon, as well as boat and air traffic. These did not affect the eligibility of some landscape elements that are already listed on the NRHP, including the High Point-Half Moon Bluff Historic District and the Cumberland Island Cultural Historic Landscape.

Traditional Cultural Resources

Resources within the APE considered to be traditional cultural resources by the Gullah/Geechee include the African-American Settlement and associated structures at Half Moon Bluff, which are addressed previously under Section 4.8.1.2, *Operation, Architectural Resources*.

4.8.1.3 Launch Failures

Types of launch failures and their likelihood of occurrence are discussed in Section 2.1.2.7, *Launch Failures*. The 100-degree launch trajectory does not overlie any historic properties in the APE. Therefore, effects to historic properties from a catastrophic failure during initial flight after launch would not be expected. Emergency and contingency planning and response measures would serve to minimize potential adverse impacts, and emergency consultation with regulatory agencies (e.g., USFWS, Georgia SHPO, USACE, etc.) would be required should a launch failure result in impacts to sensitive resources.

4.8.1.4 Summary of Finding of Effects for the Proposed Action

According to FAA Order 1050.1F, FAA has not "established a significance threshold for the full range of historical, architectural, archaeological, and cultural resources." However, FAA considers a finding of adverse effect, identified through the Section 106 process, to be a factor in determining if the impact is significant.

The SHPO concurred with findings of eligibility for the cultural resources within the proposed Spaceport Camden APEs. Adverse effects to historic properties identified through the Section 106 process require resolution, usually through development of a Section 106 agreement between the proponent, SHPO, and consulting parties. The agreement describes the steps necessary to resolve the adverse effect. A finding of adverse effect is also considered a significant impact under NEPA. Section 106 consultation, including resolution of adverse effects must be concluded prior to completion of the NEPA process.

On July 24, 2018, and November 2, 2018, FAA submitted Finding of Effects determinations to the SHPO on the medium-large launch vehicle. The SHPO concurred with the Finding of Effects on December 3, 2018.

On October 16, 2020, FAA submitted a revised Finding of Effects determination letter to the SHPO for the small launch vehicle, per the modified Proposed Action. The SHPO, ACHP, and other consulting parties provided comments on the Finding of Effects for the modified Proposed Action.

On March 29, 2021, FAA submitted a revised Finding of Effects determination letter to the SHPO for potential impacts to those resources that are listed on, or eligible for listing on, the NRHP (see Appendix A). The revised Finding of Effects states:

- FAA's determination, at this time, that it is unknown if there is potential for adverse effect to archaeological historic properties during construction. The FAA will prepare a Programmatic Agreement to resolve any potential adverse effects to archaeological properties. At a minimum, the Programmatic Agreement would contain a number of provisions including the following:
    - A plan to conduct an archaeological survey of the remainder of the property that has yet to be surveyed due to ownership and/or hazardous material concerns (the survey report would be submitted to HPD, once complete).
    - If construction of the Vertical Launch Facility could not avoid the four archeological sites that are currently considered potentially eligible for listing on the NRHP or any currently unknown

sites, a plan to conduct Phase II testing to determine whether the site(s) are eligible for listing on the National Register of Historic Places (NRHP).

  - If determined eligible, then construction of Spaceport Camden would have an adverse effect to historic properties and mitigation measures will be developed.

- FAA's determination that there would be no adverse effects to archaeological resources during operation of Spaceport Camden.
- FAA's determination that there would be no adverse effects to aboveground historic properties associated with the construction of Spaceport Camden.
- FAA's determination, at this time, that it is unknown if there is a potential for adverse effect to aboveground historic properties from the operation of Spaceport Camden. The proposed launch vehicle is conceptual at this time. If a vehicle operator applies for a Vehicle Operator License to launch from Spaceport Camden, the FAA will conduct a separate environmental review and Section 106 consultation. The following information is currently known based on FAA's analysis for Spaceport Camden:
  - There will be no adverse effect if launch noise-induced structural vibration analysis concludes that levels would be well below criteria levels established for "sensitive" structures for all frequency bands for properties in the APE, which includes the historic properties on Cumberland Island.
  - Sonic booms would occur over open ocean areas, more than 50 miles to the east of the APE and historic properties on Cumberland Island.
  - Temporary and infrequent changes in the setting of historic properties in the APE resulting from periodic rises in noise due to launches would not be adverse.
  - The Spaceport Camden area associated with a risk at or above 1.0E-6 is contained within the proposed launch site boundaries and does not pose a debris risk to Little Cumberland Island or Cumberland Island."

On April 15, 2021, the SHPO concurred with the revised Finding of Effects and the APE (see Appendix A). FAA continues to work with the SHPO, ACHP, NPS, Gullah/Geechee, National Trust for Historic Preservation, and Little Cumberland Island Homes Association on the Programmatic Agreement for effects to archaeological and aboveground historic resources. On May 7, 2021, FAA sent a letter to the SHPO noting that the agency would work to resolve potential adverse effects to archaeological and aboveground historic properties in the Programmatic Agreement. Copies of all consultation correspondence through May 7, 2021, are provided in Appendix A, and consultation will be completed prior to the signing of a Record of Decision. A copy of the Draft Programmatic Agreement is available in Appendix A. Once completed, the Programmatic Agreement will be posted to the Spaceport Camden EIS web page.

4.8.2 No Action Alternative

Under the No Action Alternative, FAA would not issue a Launch Site Operator License for operation of Spaceport Camden and no spaceport facilities would be constructed. The site use would not change and the proposed construction and operations would not take place. There would be no effect to historic properties and, thus, no impact on cultural resources within the APE for direct effects and no impact on cultural resources within the APE for audible, vibratory, and visual effects.

4.9 Land Use

This section includes an analysis of whether the construction and operation of the proposed spaceport creates impacts that are incompatible with existing and/or future planned uses in the study area. Typically, impacts to land use involve changes in the land use designation and the manner in which the land may be utilized by people. Adverse impacts may result in recreational use conflicts or preclude recreational use of certain areas either temporarily or permanently. Adverse impacts on landowners can include incompatibilities with current landowner uses or have negative effects on property values. In certain circumstances, incompatibilities in land use may arise that require further planning or consultations between landowners until an agreeable designation is issued.

The analysis discusses any inconsistency with approved State and/or local land use plan(s) or law(s). It was also coordinated and cross-referenced with the analyses performed in other sections such as noise-compatible land use (Section 4.11, *Noise and Noise-Compatible Land Use*) and any induced socioeconomic impacts on land use (Section 4.12, *Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks*).

Cumberland Island Wilderness

The analysis of impacts to Cumberland Island Wilderness determines whether the proposed Spaceport Camden construction and operation activities would potentially degrade wilderness qualities described in Section 3.9.3, *Land Use, Existing Conditions*. The NPS *Wilderness Character Integration User Guide* identifies indicators for each wilderness quality that can be used to monitor trends in a given wilderness area. The User Guide also describes factors that would degrade each quality (Table 4.9-1).

Table 4.9-1. Wilderness Qualities, Associated Indicators, and Degradation Factors

Quality	Indicator	Degradation Factors
Untrammeled	Actions authorized by the Federal land manager that manipulate the biophysical environment	Modern human activities or actions that control or manipulate the components or processes of ecological systems inside wilderness
	Actions not authorized by the Federal land manager that manipulate the biophysical environment	
Natural	Plant and animal species and communities	Intended or unintended effects of modern civilization on the ecological systems inside a wilderness
	Physical resources	
	Biophysical processes	
Solitude or primitive & unconfined recreation	Remoteness from sights and sounds of people inside the wilderness	Settings that reduce opportunities for solitude or primitive and unconfined recreation, such as encounters with other visitors, signs of modern civilization, recreation facilities, and management restrictions on visitor behavior
	Remoteness from occupied and modified areas outside the wilderness	
	Facilities that decrease self-reliant recreation	
	Management restrictions on visitor behavior	
Undeveloped	Non-recreational structures, installations, and developments	Presence of structures, installations, habitations, and the use of motor vehicles, motorized equipment, or mechanical transport that increases people's ability to occupy or modify the environment
	Inholdings	
	Use of motor vehicles, motorized equipment, or mechanical transport	
Other features of value	Condition of cultural resources integral to wilderness character	Deterioration in the condition of a cultural site or loss of an endangered species within the area
	Other locally identified indicators	

Source: (NPS, 2014c)

The indicators and degradation factors listed above offer an approach to assess potential impacts to wilderness qualities. They also imply that an analysis of impacts to wilderness areas would involve both quantitative and qualitative assessments of wilderness qualities. The untrammeled, natural, undeveloped, and other features of value qualities consist of physical attributes found within the wilderness area that can be analyzed quantitatively with field surveys, measurements, and other data-gathering techniques. The Wilderness Act does not provide a definition of what would qualify as "outstanding opportunities" and agency policies do not provide clear guidance on what conditions are necessary to provide outstanding opportunities to wilderness visitors (Carlson et al., 2010). Therefore, in addition to the degradation factors listed above, potential impacts to outstanding opportunities for solitude or primitive and unconfined recreation must include a qualitative analysis. Additional challenges in evaluating the solitude or primitive and unconfined recreation quality, and to a lesser extent the natural quality, can occur when impacts arise from activities outside the boundaries of wilderness.

The NPS *Wilderness Character Integration User Guide* suggests assigning weighting measures to each wilderness quality to reflect ecological importance, managerial importance, vulnerability, or other factors (NPS, 2014c). While the guide provided examples of weighting measures applied to wilderness qualities from other wilderness areas, similar guidance is not available for the Cumberland Island Wilderness. Given the lack of quantitative measures to assess wilderness qualities specific to Cumberland Island Wilderness, the analysis assumes all qualities are equally weighted.

4.9.1 Proposed Action

For Cumberland Island Wilderness, proposed Spaceport Camden activities may generate four types of impacts, or stressors, to wilderness qualities: noise, light emissions, and visual intrusions (i.e., towers, rocket). Based on the revised USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*) for pre-launch and launch activities, while access may be limited, there would not be any access restrictions to Cumberland Island, including Cumberland Island Wilderness. This section focuses on the potential impacts of these stressors as related to wilderness character; for details on analysis methodologies for biological resources, noise impacts, socioeconomics, and visual effects, see Sections 4.2, *Biological Resources*, 4.11, *Noise and Noise-Compatible Land Use*, 4.12, *Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks*, and 4.13, *Visual Effects*, respectively.

Each stressor has the potential to detract from solitude or primitive and unconfined recreation opportunities for wilderness visitors. In addition, light emissions may degrade the natural quality through potential impacts to the light environment of wildlife species that occur within Cumberland Island Wilderness.

Impacts to untrammeled, undeveloped, and other features of value (i.e., cultural/historic resources) qualities of Cumberland Island Wilderness would only occur for activities or actions that would result in a physical change or alteration of these features. No components of proposed Spaceport Camden activities are expected to manipulate the biophysical environment of the wilderness. No structures would be constructed and no vehicle use associated with Spaceport Camden activities is proposed to occur within the land boundaries of the Cumberland Island Wilderness Area. Furthermore, as detailed in Section 4.8, *Historical, Architectural, Archaeological, and Cultural Resources*, proposed Spaceport Camden activities would not result in physical changes to historic properties. Therefore, impacts to untrammeled, undeveloped, and other features of value qualities would not occur from the Proposed Action and are not discussed further in the analysis.

4.9.1.1 Construction

Construction of the facilities associated with Spaceport Camden would not have any adverse land use impacts on the proposed 11,800-acre industrial site presently owned by Union Carbide Corporation and Bayer CropScience. Although the majority of the 1,200-acre upland portion of the site is presently undeveloped, the area has been previously disturbed (primarily from silvicultural activities, industrial manufacturing, and munitions testing). No facilities are presently planned for the adjacent former Bayer CropScience industrial site except for an Alternate Control Center and Visitor Center proposed to be located on a previously developed area near the main front gate. Infrastructure improvements include upgrades of existing roadbeds to regular roads and heavy roads, to accommodate construction and transport of heavier equipment, including large and oversized components. These roads are located on the planned Spaceport Camden site and Bayer CropScience industrial site (see Exhibit 2.1-9).

As described in Section 3.9, *Land Use*, the Camden County Planning and Development Department amended the UDC to allow spaceport-related manufacturing as a permitted use and spaceport-related aviation as a special use in the I-G zoning that applies to the proposed Spaceport Camden site. Future land use for the upland portion of the property would remain as Industrial, and the marsh portion would continue to be designated as Conservation. The zoning and future land use designations for the surrounding parcels would remain unchanged and would be compatible with the industrial use of the Spaceport Camden site.

Floyd Cut and Floyd Creek are located adjacent to the Spaceport Camden site to the north and east. The Floyd Cut and Floyd Creek waterways are designated as part of the Southeast Coast Saltwater Paddling Trail, a paddling trail (specifically for kayaking and similar crafts) that connects more than 800 miles of the East Coast's coastal waters from Virginia to Georgia. This trail is recommended for experienced kayakers. Activities kayakers engage in vary, from observing wildlife to camping (at approved locations), while they traverse through coastal waters. During the construction of the Spaceport Camden site, generated noise and the visual disturbance from construction activities related to the Vertical Launch Facility would have a temporary, short-term impact on the natural aesthetics that recreationists seek on the Southeast Coast Saltwater Paddling Trail.

Cumberland Island Wilderness

Noise. As described in Section 4.2.1.1, *Biological Resources, Proposed Action, Construction,* wildlife species within and around Cumberland Island Wilderness may be exposed to increased levels of noise from construction activities. However, impacts would primarily consist of behavioral effects that are temporary and would not result in permanent changes to ecological systems or biophysical processes within Cumberland Island Wilderness. Therefore, no impacts from construction-related noise to the natural quality of wilderness would occur.

Noise from construction and pile driving activities may occur at levels that would detract from the perception of solitude for visitors of the Cumberland Island Wilderness Area. Section 4.11.1.1, *Noise and Noise-Compatible Land Use, Proposed Action, Construction,* describes noise levels associated with construction equipment and pile driving activities. The northwest boundary of Cumberland Island Wilderness is approximately 3.5 miles away from the nearest construction site, which would be the Vertical Launch Facility (Exhibit 2.1-9 and Exhibit 3.9-1). All other proposed facilities are over 4 miles away from the boundary edge of the wilderness area.

Based on information in Table 4.11-1, pile-driving activities would generate the most intense noise levels of approximately 50 dBA $L_{A,max}$ at 3.5 miles. This would be equivalent to a distant thumping sound near the northwest boundary of Cumberland Island Wilderness, with less-intense noise levels expected to occur within the rest of the wilderness area. Pile-driving activities would occur over a 1-month period at

each location, with the construction of Vertical Launch Facility resulting in the highest noise levels given its proximity to Cumberland Island Wilderness land boundaries. Other construction noise levels at 3.5 miles would be approximately 43 dBA DNL. While this slightly exceeds NPS estimates of noise levels in the area, which have been estimated at between 36 and 38 dBA (NPS, 2016), it does fall within the range of acoustic readings recorded at six separate sites within the Cumberland Island National Seashore for the Travel Management Plan (NPS, 2009a). However, even a slight increase in noise would be easily noticeable in an otherwise quiet setting, as provided and expected within a wilderness area. This change in the soundscape would impact wilderness visitors' perceptions of solitude.

Construction activities are proposed to occur during normal daytime working hours for 15 months, with pile driving estimated to occur over a 1-month period each at the launch pad location. The resulting increases in noise levels from construction would be temporary, in that construction would only last for 15 months, but are expected to be continuous within that time period with higher intensities during pile driving. Overnight visitors of wilderness would still have opportunities to enjoy solitude during the night and on weekends, but day-use visitors would likely experience the majority of impacts. However, given the daily vehicle use of Main Road, occasional aircraft overflights, vessel traffic in surrounding waterways, and beach driving in areas adjacent to Cumberland Island Wilderness, visitors already experience some degree of detraction from solitude. The addition of construction noise from Spaceport Camden sites miles away from wilderness would not substantially diminish perceptions of solitude over baseline conditions. Construction-related noise would result in short-term, minor to moderate adverse effects to solitude or primitive and unconfined recreation quality; however, impacts would not permanently degrade this quality and would therefore not be significant.

Visual Intrusions. This discussion focuses on potential impacts to the daytime viewshed, as nighttime viewshed impacts are addressed in the *Artificial Lighting* subsection below. Visual intrusions to Cumberland Island Wilderness from construction would include visibility of tall cranes, along with buildings and towers at the Vertical Launch Facility, from certain portions of the Wilderness, which may detract from the solitude quality for some visitors. The visual impacts assessment in Section 4.13, *Visual Effects*, considered the extent to which the proposed spaceport would contrast with, detract from, or change the visual character or viewshed of the existing environment. Existing vegetation would mostly obstruct offsite views to the construction activities at three of the four construction project areas (see Section 4.13, *Visual Effects*). The tallest structures are planned for the Vertical Launch Facility, including four 250-foot lightning towers, one 250-foot water tower, and the 65-foot-tall Vehicle Integration Building. The forest surrounding this site would provide partial screening, but use of tall cranes for installation of the higher elements of the site would be visible above the tree canopies.

Visual impacts affecting solitude would vary based on the distance of wilderness visitors from the changes, frequency of viewing (such as sunset viewings), and visual access to the proposed spaceport site from the wilderness (unobstructed line-of-sight). Vegetation, terrain, or other structures block the view of the lightning and water towers from most of the wilderness. Lightning and water towers, and structures on the Vertical Launch Facility would be moderately noticeable from certain areas along the western coastline of Cumberland Island Wilderness because they contrast with natural features and the sky, but they would occupy a very small area in a viewer's cone of vision and viewing plane, low on the horizon (see Section 4.13, *Visual Effects*). Although they would not be dominant features in the viewshed, given the wilderness expectation for views free of human features, the presence of even these few structures may negatively impact a visitor's perception of solitude during their wilderness experience.

For inland and eastern portions of the wilderness, analysis found that the overall impact to viewshed quality was low because visibility is obscured by vegetative screening and local terrain. The overall impact to the daytime viewshed from the western shoreline of the wilderness (using Brickhill Bluff and

Cumberland Wharf as representative locations) is moderate to high, due to the sensitivity of the viewshed (see Table 4.13-1 in Section 4.13, *Visual Effects*). Although up to 300 visitors are permitted daily to Cumberland Island National Seashore, only a small portion of those visitors access the wilderness portion of the island, and the number of those visitors that visit the western shoreline of the wilderness from which the spaceport towers/facilities would be visible is an even smaller number.

The daytime visual intrusion of towers and buildings constructed for the proposed Spaceport Camden would detract from solitude, resulting in long-term and minor adverse impacts to this wilderness quality. However, visual intrusions would be experienced only in a very small area of the wilderness viewshed, and impacts would only occur to those visitors occupying the portion of wilderness where the towers and buildings would be visible. The majority of the wilderness area would not be affected. Therefore, overall impacts to solitude or primitive and unconfined recreation throughout the entire Cumberland Island Wilderness from visual intrusions would not be significant.

Artificial Light. As the proposed spaceport site currently has very low nighttime radiance, the increase in the luminescence from the site would be noticeable. Lighting associated with construction may impact the natural quality and detract from solitude within portions of the wilderness; however, construction occurring at night is expected to be infrequent and may likely only occur during winter months when the days are shorter. Sky glow has been associated with ecological changes and possible human health effects, since natural circadian rhythms are driven by light patterns and are foundational for the functions of biota in any given context. Diminishing dark skies is a concern not just in developed areas, but also in pristine areas where the absence of light is valued for the experience of darkness and higher visibility of the sky and stars.

Construction-related lighting at the proposed Spaceport Camden site would alter the natural lightscape, which may elicit behavioral changes in nocturnal animals exposed to the artificial lighting. Behavioral changes of animals within the wilderness are described in Section 4.2.1.1, *Biological Resources, Proposed Action, Construction*. Since animal species are listed as an indicator, these behavioral changes could degrade the natural quality. However, as described in Section 4.2.1.1, *Biological Resources, Proposed Action, Construction,* the potential for impacts to species on the island were low. To minimize impacts from construction lighting, a Light Management Plan would be developed in coordination with the USFWS and GDNR. Implementation of the plan would minimize direct light impacts to wildlife that occur within and around the wilderness, especially sea turtle nesting beaches (see Section 4.2.1.1, *Biological Resources, Proposed Action, Construction*, and Appendix A). Construction-related lighting would result in minor to moderate adverse effects to the natural quality; however, impacts would not permanently degrade this quality and would therefore not be significant.

A change in the lightscape may also affect wilderness visitors' perceptions of solitude. The introduction of light sources from construction during evening hours may alter the darkness of night skies, degrading the "remoteness from the sights of human activity from areas outside the wilderness" indicator for solitude and primitive or unconfined recreation (Landres et al., 2015; NPS, 2014c). However, any construction activities at night are expected to be infrequent and limited to possibly a few hours during the winter months when days are shorter. Park use during these months is the lowest and, therefore, impacts would be expected to be short-term and temporary, concluding each evening and eliminated after construction is completed.

4.9.1.2 Operation

Proposed Spaceport Camden operations would not be expected to have any adverse land use impacts for the communities of Woodbine, Kingsland, and St. Marys, Crooked River State Park, NSB Kings Bay, Jekyll Island, or Fort Clinch State Park on Amelia Island. Operations would not be expected to result in adverse

impacts to the Ceylon or Cabin Bluff WMAs because the proposed trajectory and associated LAA and OEZs (described in Section 2.1.2.5, *Pre-Launch Activities*) associated with operations would not affect these properties or result in access limitations or restrictions. However, temporary and infrequent noise during launches and testing activities may be an annoyance to users. Spaceport Camden would create temporary adverse land use (i.e., access to recreation areas) impacts on nearby portions of Cumberland Island National Seashore, Intracoastal Waterway users, areas of the Atlantic Ocean within a USCG LAA, and potentially for the residents of Little Cumberland Island. Operational and business activities in St. Marys and on Cumberland Island National Seashore could be disrupted during launch closures (see Sections 3.12 and 4.12, *Socioeconomics*).

Temporary impacts would result from the designated USCG LAAs (described in Section 2.1.2.5, *Pre-Launch Activities*) that would need to be enforced prior to and during launch operations, as defined in Section 2.1.2.5, *Pre-Launch Activities*. These USCG LAAs would result in the establishment of checkpoint areas to monitor and control public access during hazardous operations (i.e., launches, wet dress rehearsals, and static fire engine tests). Temporary indirect impacts would occur from general noise disturbances to the natural aesthetics sought in the surrounding recreation areas during a scheduled operation.

There are no anticipated security impacts to NSB Kings Bay. The U.S. Navy is a coordinating agency for this Proposed Action, and representatives from NSB Kings Bay have participated in the review/comments of this EIS. Security of the NSB Kings Bay installation would not be impacted, as the Spaceport Camden security and USCG LAAs do not infringe on the installation, due to the distance of the Spaceport Camden site from NSB Kings Bay, and the aerial safety surveillance (as described in Section 2.1.2.5, *Pre-Launch Activities*) will be coordinated with the U.S. Navy and facilitated by government personnel.

Exhibit 2.1-4 and Exhibit 2.1-10 show the 100-degree representative trajectory and composite USCG LAA for a launch from Spaceport Camden. There will be no impacts from access restrictions to authorized persons (as defined in Section 1.4.2, *Other Licenses, Permits, and Approvals*) on Cumberland Island and Little Cumberland Island. At no time during a closure will a resident's access be inhibited; this includes residents accessing their property via boat (see Section 2.1.2.5, *Pre-Launch Activities*).

The 300 daily-allowed visitors (see Section 1.1, *Background*) to Cumberland Island National Seashore would potentially be impacted by noise and visual presence of a launch vehicle from Spaceport Camden launch operations up to 12 days per year, during scheduled operations. The St. Marys ferry would not be impacted, as it typically drops and picks up at Sea Camp and Dungeness Dock, which are on the southern part of the island. None of the docks used on Cumberland Island (Sea Camp, Dungeness, and Plum Orchard) would be impacted by USCG LAAs for any launches, as the docks are all south of the composite USCG LAA. Areas affected by noise and visuals would include Brickhill Bluff campground, Cumberland Wharf Ruins, High Point, the Settlement, First African Baptist Church, and up to 10 trails. Closures for launch operations would not be expected to impact the Land and Legacies Tour, which includes historic locations around Cumberland Island National Seashore, including Plum Orchard Mansion, the Settlement (including the First African Baptist Church), Cumberland Island Wharf, and other sites along the main road. There are activities conducted by the general public on a "random" basis (i.e., boating, kayaking, fishing, hiking) within the composite USCG LAA, which could be impacted by access limitations, except for "authorized persons" in the USCG LAA (see Section 1.4.2, *Other Licenses, Permits, and Approvals*). However, closures would expected to be infrequent and of limited duration, with sufficient public notice to avoid adverse impacts to recreationists. It is not anticipated that the six public hunts that are held each year in the north end of the island could be adversely impacted. In accordance with State hunting regulations, these hunts have to be scheduled 2 years in advance.

"Authorized persons" as described in Section 1.4.2, *Other Licenses, Permits, and Approvals*, would not have their access restricted while the USCG LAA is active. The use of kayaks and boating by permitted campers at Brickhill Bluff within the USCG LAA during launch activities would need to be coordinated with the USCG Captain of the Port on a case-by-case basis. The County has discussed the option to offer anyone who is an "authorized person" who wants to depart for the launch window, a complimentary ride and/or appropriate temporary accommodations, including "VIP" viewing passes for the launch. FAA anticipates that, due to most of Cumberland Island National Seashore remaining open and without restrictions during launch events, launch activities and closures would not impact park visits to the northernmost reaches of the island.

The Intracoastal Waterway would be temporarily closed north of Crooked River State Park. People recreating along the Southeast Coast Saltwater Paddling Trail, Floyd Cut, and Floyd Creek, would be impacted from Spaceport Camden's operations. A section of Floyd Creek is within the OEZ, which would be closed to access as described in Section 2.1.2.5, *Pre-Launch Activities*. The rest of Floyd Creek and Floyd Cut, and the other adjacent waterways surrounding the launch site, Cumberland Island, and Little Cumberland Island, would be closed to "unauthorized persons," (see Section 1.4.2, *Other Licenses, Permits, and Approvals*) as these areas are within the composite USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*). Closures could occur up to 12 times per year, from 3.5 to 12 hours, totaling an average of 42 hours per year in the USCG LAA and 114 hours per year in the OEZ (see Table 2.1-6). There will be advanced notification prior to any closure of recreation areas within the Intracoastal Waterways. However, the Southeast Coast Saltwater Paddling Trail covers 800 miles; people using this trail may not have access to typical communication outlets where advanced notice is posted. Recurring short-term access limitations and annoyance impacts to recreational users would occur with each Spaceport Camden operation.

A 100-degree launch trajectory would impact residents of Little Cumberland Island by disturbing the personal property uses with noise annoyance.

The County and/or the launch operator would notify the public anywhere between 1 month to 3 days prior to a launch operation requiring a closure (Sections 2.1.2.3, *Representative Launch*, and 2.1.2.5, *Pre-Launch Activities*). The GDNR Coastal Resources Division recommends avoiding or minimizing launch operations that require limited access on weekends, holidays, and during organized fishing tournaments in the vicinity, as well as posting limited access/times at all public access points within 10 miles of proposed USCG LAAs, including public boat ramps, 30 days in advance (O.C.G.A. 12-5-320, *Coastal Management Act*). Closures could last up to 12 hours on a launch day, with 4 to 6 hours being the typical closure time for a launch. A closure for a wet dress rehearsal or static fire engine test would be shorter (typically 3 hours or less) and would only include those areas within a 2-mile radius of the launch pad and, therefore, would not impact Cumberland Island or Little Cumberland Island. It is anticipated that there could be up to 12 launches, up to 12 static fire engine tests, and up to 12 wet dress rehearsals per year.

Potential noise and noise-compatible land use impacts are discussed in Section 4.11, *Noise and Noise-Compatible Land Use*. Because the sound environment in noise-sensitive locations near the proposed spaceport would be unchanged during the vast majority of the year, current land uses (e.g., recreation, residences, commercial, etc.) would remain compatible. Socioeconomic impacts indirectly associated with land use such as economic impacts (e.g., from temporary limited access within the USCG LAA) and Little Cumberland Island property values are presented in Section 4.12, *Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks*.

Cumberland Island Wilderness

Noise. As described in Section 4.2.1.2, *Biological Resources, Proposed Action, Operation,* wildlife species within and around Cumberland Island Wilderness may be exposed to increased levels of noise from daily operations, launches, and support activities including static fire engine tests, dry rehearsals, and wet rehearsals. However, impacts would primarily consist of behavioral effects that are temporary and would not result in permanent changes to ecological systems or biophysical processes within Cumberland Island Wilderness. Therefore, no impacts from operations-related noise to the natural quality of wilderness would occur.

Noise from daily operations, launches, and support activities may occur at levels that would detract from the perception of solitude for visitors within the wilderness. Section 4.11.1.2, *Noise and Noise-Compatible Land Use, Proposed Action, Operation,* describes noise levels associated with proposed Spaceport Camden operations. As shown in Exhibit 4.11-1, the 65 dBA DNL contour does not extend to land areas past the spaceport site. Therefore, Cumberland Island Wilderness would not experience changes in DNL noise levels from operations. In addition, maximum A-weighted noise generated from daily operations would not exceed 80 dBA $L_{A,max}$ within the wilderness (Exhibit 4.11-2 and Exhibit 4.11-3). However, the majority of the wilderness would be exposed to launch noise levels between 65 and 75 dBA $L_{A,max}$, which meets or exceeds the 65 dBA $L_{A,max}$ threshold for speech interference (Exhibit 4.11-2). None of the wilderness would be exposed to noise levels greater than 65 dBA $L_{A,max}$ during a static fire engine test (Exhibit 4.11-3). Noise levels at the Settlement, which is located on Cumberland Island National Seashore just outside the wilderness area, may exceed 44 dBA during a static fire engine test. Maximum A-weighted noise levels from each launch and support activity event would be short in duration, lasting approximately up to 51 seconds for a launch and 7 seconds for a static fire test. These noise levels would exceed baseline conditions and temporarily alter the soundscape of Cumberland Island Wilderness, detracting from the solitude quality of wilderness. However, only 12 launches and 12 support activities would be conducted annually; therefore, adverse noise impacts to solitude would be short term.

As described in Section 3.9.3, *Land Use, Existing Conditions*, Cumberland Island Wilderness is exposed to noise from sources outside the area, including vehicular traffic on Main Road, vessel use of surrounding waterways, military aircraft overflights, and beach driving. Therefore, visitors currently experience a diminished level of solitude within Cumberland Island Wilderness. As stated in Section 2.1, *Proposed Action*, launches would occur on a trajectory of 100 degrees from true north, which would not result in rocket overflights above Cumberland Island Wilderness (Exhibit 2.1-4). Additionally, restricted access associated with the OEZ (see Section 2.1.2.5, *Pre-Launch Activities*) would not result in access restrictions to Cumberland Island or Little Cumberland Island, which includes Cumberland Island Wilderness.

As shown in Exhibit 2.1-10 and Exhibit 3.9-1, the composite USCG LAA would overlap the northern portion of the Cumberland Island Wilderness. However, each actual launch event would have a specifically defined USCG LAA (Section 2.1.2.5, *Pre-Launch Activities*). The composite USCG LAA is considered the maximum area that encompasses all potential USCG LAAs; therefore, smaller areas of Cumberland Island would likely be affected during actual operational activities (e.g., mission rehearsals, static fire engine tests, and launches). Soft access control checkpoints would be established throughout the USCG LAA to monitor the area.

Visitors to Cumberland Island Wilderness would be made aware of the launch through notifications announcing the tests and launch operation activities and identifying the actual USCG LAA. Based on these notifications, wilderness visitors would either expect the noise disturbance associated with these activities to occur or choose not to visit the wilderness during that time. While avoidance of the Cumberland Island Wilderness during spaceport operations would prevent unexpected disturbances in solitude for potential

visitors, it would still have an impact on the primitive and unconfined recreation quality. Given the short duration of operations-related noise, combined with the existing soundscape of Cumberland Island Wilderness, impacts to the solitude or primitive and unconfined recreation quality would be adverse but short term and minor. These impacts would not permanently degrade this wilderness quality; therefore, impacts would not be significant.

Visual Intrusions. This discussion focuses on potential impacts to the daytime viewshed, as nighttime viewshed impacts are addressed in the *Artificial Lighting* subsection below. Visual intrusions to the wilderness from operations would include visibility of the buildings and towers at the Vertical Launch Facility and views of the space vehicles during launches from certain portions of the wilderness, which may detract from the solitude quality for some visitors. Refer to the *Construction* subsection above for visual impacts to Cumberland Island Wilderness from the daily daytime operations of the towers and buildings. Views of the rockets on the ground would likely be obscured due to the required intervening vegetation buffers at the site.

The rocket launch flight path would not occur over Cumberland Island Wilderness but may be visible for a short duration, about once per month. The visual impact would be temporary and no permanent change to viewscape would occur; however, the launch may affect the perception of solitude for any wilderness visitors with a line-of-sight to the launch path. As these events would be highly publicized and all wilderness visitors would be notified, there should not be any concern for startle effects due to the visual component of the launches.

Overall, visual intrusions associated with proposed Spaceport Camden daily operations would result in long-term, minor adverse impacts to the solitude and primitive or unconfined recreation quality. In addition, visual intrusions associated with launches would result in short-term, moderate adverse impacts to the solitude and primitive or unconfined recreation quality. However, given the minor level of long-term impacts and short-term level of moderate impacts, permanent degradation to this quality is not anticipated; therefore, impacts would not be considered significant.

Artificial Light. Lighting associated with daily operations, pre-launch operations, and launches may impact the natural quality and detract from visitors' perception of solitude within portions of Cumberland Island Wilderness. Night lighting during daily operations would likely involve exterior building lighting and parking area lighting. Additional light emissions associated with pre-launch events would be visible from portions of the wilderness, as would night launches. Lighting and sky glow would increase during monthly pre-launch periods, when lighting would be positioned to illuminate the assembled rocket on the launch pad and ground tasks at the Vertical Launch Facility would increase for one or two nights (dusk to dawn). Lighting and sky glow during the pre-launch period would be most noticeable at locations along the western shoreline of the wilderness, but would typically be obscured by vegetation in inland portions of the wilderness. One night launch annually could have visible high-intensity LED launch pad lighting, generating noticeable sky glow and potential glare spots (see Section 4.13.1.2, *Visual Effects, Proposed Action, Operation*). Artificial lighting and sky glow associated with daily operations and pre-launch operations may detract from the perception of solitude for up to 72 wilderness visitors on a daily basis.

Overnight wilderness visitors are required to camp at one of three designated wilderness campgrounds: Hickory Hill, Yankee Paradise, or Brickhill Bluff (NPS, 2020c) (Exhibit 3.12-3). Both the Hickory Hill and Yankee Paradise sites are inland, with a vegetative buffer between them and the proposed Spaceport Camden site. No lights would be directly visible at these inland campgrounds and most sky glow would be obscured by the interceding vegetation. The Brickhill Bluff campground has a relatively unobstructed view of the proposed spaceport site, thus campers at this location are more likely to experience negative impacts from lighting. Brickhill Bluff campers would likely see the hazard lights on the towers and possibly some direct lighting and sky glow from minimal security lighting. Increased signs of modernization would

be visible by up to 24 wilderness campers at Brickhill Bluff, which would detract from solitude during their wilderness experience. As described in Section 4.13.1.1, *Visual Effects, Proposed Action, Construction,* measures would be taken to reduce light emissions and a Light Management Plan would be developed. These measures are expected to reduce the level of impacts to Brickhill Bluff wilderness campers. In addition, the other two wilderness camping areas located in the interior of the Cumberland Island Wilderness would not be impacted by light emissions, and solitude would not be degraded for wilderness campers at Hickory Hill and Yankee Paradise. Therefore, construction-related lighting may cause long-term, moderate adverse impacts to the solitude and primitive or unconfined recreation quality at and around Brickhill Bluff. However, impacts would be localized, would not permanently degrade this quality throughout the entire Cumberland Island Wilderness and, thus, would not be significant.

Within Cumberland Island Wilderness, light emitted from the rocket may be obscured by vegetation for portions of the launch, but views would be clear for most viewers in open areas and along the shorelines. Visibility of the airborne rocket would only be a few minutes, but the experience of solitude within the wilderness would be interrupted during this brief period. However, public notification would be provided prior to each launch event. Therefore, any interruption of solitude would not be unexpected and would be temporary and short term, concluding after the launch activity.

Artificial light associated with proposed Spaceport Camden daily operations would result in long-term and moderately adverse impacts to the solitude and primitive or unconfined recreation quality. In addition, artificial light from pre-launch operations would result in short-term, moderate adverse impacts. Finally, artificial light associated with launches would result in short-term, moderate-to-high, adverse impacts to the solitude and primitive or unconfined recreation quality. However, permanent degradation to this quality throughout the entire Cumberland Island Wilderness is not anticipated; therefore, impacts would not be considered significant. To minimize unnecessary light and light trespass outside of the Spaceport Camden site, a Lighting Management Plan would be developed. The plan would specify lighting types, directional controls, and dimming mechanisms.

Summary of Impacts to Wilderness

Table 4.9-2 shows potential impacts to all wilderness qualities of Cumberland Island from proposed Spaceport Camden construction and operation activities.

In addition to the analysis of the individual wilderness qualities, impact to the overall wilderness character of Cumberland Island Wilderness was also assessed. Baseline conditions described in Section 3.9.3, *Land Use, Existing Conditions*, suggest that, at a minimum, the untrammeled and undeveloped qualities of Cumberland Island Wilderness are degraded. Since these qualities would not be impacted by proposed Spaceport Camden activities, additional degradation would not occur. Of the five wilderness qualities that are present within Cumberland Island Wilderness, only two are expected to experience adverse impacts: natural and solitude or primitive and unconfined recreation. Most impacts would be short-term and are not expected to permanently degrade these wilderness qualities. For the long-term impacts from the visual presence of the towers/facilities and lighting/sky glow, they are only experienced by wilderness visitors on the western shoreline facing the proposed spaceport site. Since this analysis assumes that all qualities are equally weighted, the overall wilderness character of Cumberland Island Wilderness may be slightly degraded from the proposed Spaceport Camden construction and operation activities, primarily only for visitors on the western shoreline of the wilderness.

Table 4.9-2. Impacts to Cumberland Island Wilderness Qualities from the Proposed Action

Proposed Activity		Stressors	Wilderness Quality Potentially Impacted				
			Untrammeled	Natural	Undeveloped	Solitude or Primitive & Unconfined Recreation	Other Features of Value (Cultural/Historic Resources)
Construction	General Construction	Noise	NI	NI	NI	S (ST)	NI
		Visual Intrusion	NI	NI	NI	S (LT)	NI
		Light Emissions	NI	ST	NI	S (LT)	NI
	Pile Driving	Noise	NI	NI	NI	S (ST)	NI
Operation	Daily Operations	Noise	NI	NI	NI	S (ST)	NI
		Visual Intrusion	NI	NI	NI	S (LT)	NI
		Light Emissions	NI	ST	NI	S (LT)	NI
	Launches	Noise	NI	NI	NI	S (ST)	NI
		Visual Intrusion	NI	NI	NI	S (ST)	NI
		Light Emissions	NI	ST	NI	S (ST)	NI
	Support Activities[1]	Noise	NI	NI	NI	S (ST)	NI
		Light Emissions	NI	ST	NI	S (ST)	NI

Notes: NI = no impact; ST = adverse, short-term impact; S (LT) = Solitude (adverse, long-term impact); S (ST) = Solitude (adverse, short-term impact).

[1] Includes static fire engine tests, dry rehearsals, and wet rehearsals.

4.9.1.3 Launch Failures

Types of launch failures and their likelihood of occurrence are discussed in Section 2.1.2.7, *Launch Failures*. If a launch failure occurs early in flight, which could result in an explosion or crash, it could damage areas adjacent to the launch pad or areas impacted by debris. The area most likely affected would be the OEZ (see Section 2.1.2.5, *Pre-Launch Activities*), as the launch vehicle and most, if not all, of the payload would likely be consumed by the launch failure's explosion.

Impacts to land use areas from a launch failure would include the potential for closure of damaged areas or where debris has fallen for safety and cleanup measures. Areas most likely impacted would be the Floyd Cut and Floyd Creek waterways, which are used for recreation.

Other land use areas within the ROI are not anticipated to be impacted from a launch failure. Vehicle debris and propellants would likely be concentrated to the launch pad and OEZ and not spread to the land use and recreation areas along Satilla River, Cumberland River, or any portion of the Cumberland Island National Seashore or Atlantic Ocean (see Section 4.2, *Biological Resources*, for additional information about impacts to habitats).

Fire

If a launch failure results in a fire (likely from the result of the launch vehicle propellant tank(s) rupturing and/or propellant burning explosively), there is the possibility of temporary access limitations to adjacent

waterways from response activities, if propellants should be spilled or released into local bodies of surface water and soils.

Fires, if not responded to or controlled properly, could impact surrounding land uses. However, it is likely any potential for impacts would be reduced to a degree that is not significant, due to the Spaceport Camden's Fire Mitigation Plan and Hazardous Materials Emergency Response Plan. These plans address adequate and appropriate guidance, policies, and protocols for fire incidents, hazardous material incidents, and associated emergency responses and also include coordination and compliance with all applicable agencies (e.g., local fire departments, GDNR, NPS Cumberland Island National Seashore) and their Fire Management Plans.

Emergency Response

Spaceport Camden would be prepared to respond to an emergency situation by having an emergency response team, plans, procedures, equipment, and trained staff and local first responders. An emergency situation within the launch pad area and OEZ (see Section 2.1.2.5, *Pre-Launch Activities*) could result in minimal indirect impacts from access restrictions to recreation in the Floyd Cut and Floyd Creek waterways. Emergency and contingency planning and response measures would serve to minimize potential adverse impacts, and emergency consultation with regulatory agencies (e.g., USFWS, Georgia SHPO, USACE, etc.) would be required should a launch failure result in impacts to sensitive resources.

4.9.1.4 Summary

The significance of land use impacts associated are normally determined by the degree to which the Proposed Action results in any particular conflicts with current or intended use of land areas surrounding the location of the action or within the ROI and whether impacts associated with other resource areas result in these types of impacts. Based on the analyses for other resource areas, the Proposed Action has not been shown to result in other impacts that have land use ramifications, and therefore FAA has determined that the Proposed Action would not result in significant adverse land use impacts.

4.9.2 No Action Alternative

Under the No Action Alternative, FAA would not issue a Launch Site Operator License for operation of Spaceport Camden and no spaceport facilities would be constructed. Since these activities would not take place, the existing site use would not change and the site would remain in its current state. In addition, no impacts to the Cumberland Island Wilderness would occur.

4.10 Natural Resources and Energy Supply

During construction and operation of Spaceport Camden facilities, energy (electricity and fuels) and natural resources (water and construction materials) would be consumed. This section discusses the potential impacts to energy and natural resources that could result from activities under each alternative.

For impact analysis, the estimated amount of natural and energy resources that are expected to be needed for a project were evaluated and compared to the local context of supply and demand to determine if the Proposed Action would cause demand to exceed available or future supplies of these resources.

4.10.1 Proposed Action

4.10.1.1 Construction

Natural Resources

FAA Order 1050.1F states that the use of natural resources other than for fuel need to be examined only if the action involves a need for unusual materials or those in short supply. At this time, no unusual materials would be used for the construction activities at Spaceport Camden. However, due to the size and nature of the roadways (regular and heavy), facilities, and associated support structures, a large amount of asphalt and concrete would be required.

Table 4.10-1 shows the total volume of asphalt and concrete that would be required to complete all construction activities at Spaceport Camden under the Proposed Action. It was estimated that there would be 823,200 square feet of new roadway and 637,800 square feet of new concrete structures, requiring 333,804 cubic feet of asphalt and 1,266,300 cubic feet of concrete, respectively. Due to Spaceport Camden's relatively remote location, supplies of asphalt and concrete would primarily come from the Brunswick, Georgia, and Jacksonville, Florida, areas (see Chapter 3, *Affected Environment*, Section 3.10.3.3, *Energy Supply*). It is anticipated that these providers would have sufficient supply of asphalt and concrete to meet the requirements of construction activities at Spaceport Camden as well as other construction projects in the area.

Table 4.10-1. Estimated Total Volumes of Asphalt and Concrete Required for Construction – Proposed Action

Structure	Cubic Feet	Cubic Yards
Asphalt		
Perimeter security road	18,750	694
Other pavement sections	26,400	978
Heavy pavement sections	288,654	10,691
Total	333,804	12,363
Concrete		
Launch Pad Complex		
Launcher Track	250,020	9,260
Launch Pad	48,060	1,780
Lightning Towers (four)	63,990	2,370
Flame Track	4,590	170
Helium and Nitrogen Tank Pad	75,060	2,780
Liquid Oxygen Tank Pad	52,650	1,950
Shop Building	15,120	560
Office/Engineering Building	15,120	560
Integration Building	300,240	11,120
Mission Preparation Area		
Prep Pad	400,140	14,820
Storage Areas	39,960	1,480
Shop Building	1,350	50
Total	**1,266,300**	**46,900**

Note: To convert from cubic feet to cubic yards, multiply by 0.037. Rounded to nearest whole number.

Energy Supply

New infrastructure or improvements to existing infrastructure would be required to support Spaceport Camden. Proposed changes to infrastructure at the site of Spaceport Camden are discussed in Section 2.1.1.6, *Infrastructure*. With the exception of the existing dock on Floyd Creek (see Section 2.1.1.6, *Infrastructure*), there are no structures that could be converted to support spaceport operations and there is very little infrastructure (i.e., roadways and water, electricity, and communications systems) available on the site. Therefore, the majority of the facilities and most of the infrastructure proposed for Spaceport Camden would be new. Improvements to the site would include improvements to existing and construction of new roadways, installation of new electrical and water distribution and septic systems, pouring of foundations, and building structures. Construction equipment and portable generators (for single phase and three-phase electric power) would be required for these activities and would require gasoline and diesel fuels to operate. Because of the minimal electrical requirements (approximately 500 kVA) and the proximity of readily available sources of diesel and gasoline fuels, it is unlikely that the availability of these fuels to other users in the area would be impacted. Other energy sources (i.e., natural gas/propane for portable heaters) may be used during construction activities. Therefore, no significant impact to the energy supply is anticipated as a result of construction activities.

4.10.1.2 Operation

Natural Resources

The groundwater supply of the Floridan aquifer is the only natural resource that has the potential to be impacted by Spaceport Camden operations. All water used for Spaceport Camden operations would be provided by two deep wells located on the Bayer CropScience property authorized to withdraw a combined 1.7 million gallons of water daily. As discussed in Section 2.1.1.6, *Infrastructure*, 12-inch water lines would be run underground alongside newly constructed launch site roadways to provide water to the site. Onsite treatment facilities would be used to treat the water from the wells prior to entry into the distribution system and water could be used for both potable and non-potable purposes. Total water usage during site operation is estimated to be approximately 11,500 gallons per day with a peak usage of approximately 405,000 gallons per day. This peak usage would only occur if the water deluge system (which could use up to 250,000 gallons per launch) was activated (see Chapter 2, *Proposed Action and Alternatives*, Section 2.1.1.2, *Vertical Launch Facility*). Both nominal and peak daily water requirements are well below the authorized usage limit of the two onsite wells. Therefore, no impact to the groundwater supply of the Floridan or other regional aquifers is expected as a result of Spaceport Camden operations.

Septic systems would be used 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 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 Mission Preparation Area, and 19,000 at the Vertical Launch Facility). The Georgia Department of Health and the Camden County Department of Health would regulate and permit and any all septic systems installed at Spaceport Camden, as applicable. Because all sewage would be treated onsite, there would be no impact to local municipal wastewater treatment utilities resulting from Spaceport Camden operations.

Energy Supply

As discussed in Section 3.10.3.3, *Energy Supply*, electricity to Spaceport Camden would be provided by Georgia Power. Under the Proposed Action, it is estimated that the maximum electrical demand would be 7,500 kVA. The proposed new distribution system would consist of an extension of the aerial

distribution system (described in Chapter 3, *Affected Environment,* Section 3.10.3.1, *Natural Resources*) from existing offsite transmission lines onto the site and along the site roadways to areas near the new facilities. The system would then transition to underground primary cables which would extend to multiple pad mounted transformers located near each building and load center. The service to all major buildings would be via a three-phase, four-wire (480Y/277V) system, which would then be transformed onsite to the appropriate needs of the specific subsections of the facilities. The maximum electrical demand would be within the capacity of the new and existing electrical infrastructure, and because the electrical transmission line would only provide electricity to Spaceport Camden facilities, other system users would not be impacted by Spaceport Camden operations.

Other energy sources required for Spaceport Camden operations include various propellant fuels, pressurants, and propellants to be used by the launch vehicles, as well as diesel and gasoline to be used by ground equipment, backup generators, and barge tugs. Natural gas would not be used during Spaceport Camden operations; heating of facilities post construction would be from electrical power and/or boilers, depending on specific construction design. The propellant fuels used by the launch vehicles and the quantities of each stored onsite are presented in Table 4.10-2. Approximately 35,000 gallons of diesel would be stored onsite at the Vertical Launch Facility, Launch Control Center Complex, and Alternate Control Center and Visitor Center. Propellants, gasoline, and diesel fuel would be obtained from commercial sources and transported to the storage facilities via tanker truck. The use of these propellants and fuels is not expected to exceed the available supply of the surrounding area or in the region. Therefore, no impacts to energy supply are expected.

Table 4.10-2. Propellant, Pressurant, and Fuel Quantities Stored on Site

Launch Vehicle Fuels/Propellants	Quantity Stored on Site
Liquid oxygen	Up to 350,000 gallons stored in up to six tanks installed at the Vertical Launch Facility
RP-1	Up to 200,000 gallons stored in up to four tanks at the Vertical Launch Facility
Helium	10,000 to 15,000 gallons stored in high pressure tube banks at the Vertical Launch Facility plus another 7,500 gallons stored at the Launch Control Center Complex
Nitrogen	25,000 to 50,000 gallons stored in up to two liquefied nitrogen storage tanks and four gaseous nitrogen storage tanks at the Vertical Launch Facility plus another 22,400 gallons at the Launch Control Center Complex
Hydrazine	Up to 2,000 gallons stored at the satellite fuel storage area of the Launch Control Center Complex
Payload fuel (UMDH, MMH, and NTO)	Up to 5,500 pounds of payload fuel could be stored in aboveground storage tanks in the satellite fuels storage area of the Launch Control Center Complex. Payload fuel would be stored on a single-mission basis as launch operators would not typically store bulk quantities of these propellants in large tanks.
Diesel fuel	35,000 gallons at the Vertical Launch Facility, Launch Control Center Complex, and Alternate Control Center and Visitor Complex in up to seven storage tanks
Gasoline	Minimal amounts stored onsite

Notes: MMH = monomethylhydrazine; NTO = nitrogen tetroxide; UMDH = unsymmetrical dimethyl hydrazine.
To convert from gallons to liters, multiply by 3.7854.

FAA encourages the use of renewable energy within its facilities and activities. FAA and the County endeavor to reduce petroleum use, total energy use and associated air emissions, and water consumption in its facilities. Consistent with NEPA and the CEQ regulations, FAA encourages the development of facilities that exemplify high standards of design including principles of sustainability. To achieve this goal, facility design at Spaceport Camden could include principles outlined in the Leadership in Energy and Environmental Design (LEED®) building certification as outlined by the U.S. Green Building Council. Such

principles include embracing the natural environment, utilizing available alternative energy sources, and reducing overall energy demand. In addition, facility construction and operation could also include practices and procedures for design and energy consumption as outlined in Georgia State Executive Order 04.24.08.02 and the Georgia State Minimum Standard Energy Code.

4.10.1.3 Launch Failures

Types of launch failures and their likelihood of occurrence are discussed in Section 2.1.2.7, *Launch Failures*. Impacts associated with launch failures would be localized and likely temporary. The scope of impacts from a small launch vehicle failure would not be expected to have any effect on natural resource availability and/or use, nor energy supply availability and/or use.

4.10.1.4 Summary

The estimated amount of natural and energy resources that are expected to be needed under the Proposed Action would not have the potential to cause demand to exceed available or future supplies of natural or energy resources within the local or regional context of supply and demand. Therefore, FAA has determined that the Proposed Action would not result in significant adverse impacts associated with natural resources and energy supply.

4.10.2 No Action Alternative

Under the No Action Alternative, FAA would not issue a Launch Site Operator License to the Camden County Board of Commissioners. No activities related to constructing or operating a commercial spaceport would occur at the site. It is assumed that the site, currently under private ownership, would either remain unused or be used for purposes not involving FAA and would be maintained in accordance with its current industrial zoning. Any changes to current energy usage or natural resource consumption at the site and surrounding areas would continue to be affected by ongoing and future activities associated with Union Carbide Corporation, Bayer CropScience, and other entities utilizing natural and energy resources throughout the county.

4.11 Noise and Noise-Compatible Land Use

This section concentrates on potential effects of noise on humans and structures. The ROI for noise and noise-compatible land use includes Spaceport Camden and surrounding areas in which the sounds of the proposed construction and operations would be heard. Noise analysis is based on the *Camden Spaceport Noise Study for ITAR Small Launcher* (ICF International, 2020), as provided in Appendix C. Noise impacts on the respective resources are discussed in Section 4.2, *Biological Resources,* Section 4.8, *Historical, Architectural, Archaeological, and Cultural Resources* (e.g., historic structures), Section 4.12, *Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks*, Section 4.14, *Water Resources*, and Section 4.6, *Farmlands*.

Noise impacts are analyzed to determine increases in dBA DNL within the ROI associated with proposed spaceport construction and operation, the potential for people exposed to elevated noise levels during launch and static fire events to become annoyed by the noise, and whether there would be a risk of damage to structures due to noise. The potential reactions of visitors to designated wilderness area on Cumberland Island National Seashore are of particular interest. Social surveys conducted on the reactions of backcountry visitors to other National Parks to aircraft overflight noise are not directly applicable to the sounds generated by the Proposed Action (e.g., rocket launch or distant construction noise).

4.11.1 Proposed Action

The construction of Spaceport Camden would generate localized noise, and the operation of the spaceport would generate noise over a larger area. Proposed construction would take place over approximately 15 months as described in Section 2.1.1, *Construction – Activities and Facility Descriptions*. Proposed operations would include up to 12 launches and 12 static fire events per year as well as activities related to preparations for a launch (e.g., patrols of the USCG LAA using vehicles).

4.11.1.1 Construction

Construction noise would occur at the facility and infrastructure locations described in Section 2.1.1.1, *Launch Site Construction Activities*, through Section 2.1.1.6, *Infrastructure*. Construction would typically occur during normal working hours (8:00 a.m. to 5:00 p.m.) on Monday through Friday. Noise levels at various distances from construction equipment types expected to be used for the construction of roads and facilities are listed in Table 4.11-1.

Table 4.11-1. Noise Levels Associated with Construction Equipment

Equipment Type	Maximum A-weighted Noise Level ($L_{A,max}$) at 50 feet	Maximum A-weighted Noise Level ($L_{A,max}$) at 2.5 miles	Maximum A-weighted Noise Level ($L_{A,max}$) at 3.5 miles	Use During Roadway Construction	Use During Facilities Construction
Excavator	81	32	29	Yes	Yes
Grader	85	37	34	Yes	Yes
Paver	77	29	26	Yes	Yes
Roller	80	32	29	Yes	Yes
Crane	81	32	29	No	Yes
Concrete pump truck	81	33	30	No	Yes
Man lift	75	26	23	No	Yes
Pile driver	101	53	50	No	Yes
Welding	74	26	23	No	Yes
Support vehicles (pickup truck)	75	27	24	Yes	Yes
Support equipment (generator)	81	32	29	Yes	Yes

Source: (FHWA, 2006)

The FHWA's Roadway Construction Noise Model was used to estimate noise levels under a scenario in which one of each type of equipment expected to be used for roadway construction and facilities construction operates in one location during one workday. Noise levels would not exceed 65 dBA DNL at distances of greater than 500 feet from roadway construction or at distances of greater than 1,500 feet from facilities construction (FHWA, 2006). The closest residence to the proposed construction is about 2.5 miles due west of the closest proposed construction site, and structures associated with a resort facility are located about the same distance due south of the closest construction. Upland portions of Cumberland Island National Seashore are located about 3.5 miles east of the closest proposed construction. At distances of 2.5 and 3.5 miles from the construction site, maximum noise levels generated by all equipment types except the pile driver would be below the median background sound level (approximately 40 dBA). The maximum noise level while pile driving is underway would be approximately 53 dBA at a distance of 2.5 miles and 50 dBA at a distance of 3.5 miles. Pile-driving noise

would be audible as a distant thumping sound under typical environmental conditions. It is anticipated that pile-supported facilities would include the launch pad and Mission Preparation Area and that pile-driving activities would occur over a period of a month for each location.

Audible construction noise is inconsistent with an expectation of natural quiet in Cumberland Island's designated wilderness area and could disrupt visitors' appreciation of the island's typically quiet and peaceful environment. Because construction activities would typically occur during the normal working day, noise impacts would occur to daytime activities (e.g., hiking), but would not disturb nighttime activities (e.g., star gazing, sleeping). Any construction during dark hours would likely be in the early evening during winter months when the days are shorter. During a single work-day in which all the equipment types listed in Table 4.11-1 are used, construction noise levels experienced at a distance of 2.5 miles would be about 46 dBA DNL, while construction noise levels at 3.5 miles would be about 43 dBA DNL, well below established land use compatibility thresholds. However, while background noise also consists of boat traffic, aircraft overflights, and other activities that would detract from the intended wilderness experience, it is recognized that, for people visiting during the 2-month period in which pile driving is underway, any audible construction noise could be disruptive of the intended wilderness experience.

Traffic noise from a heavy-duty diesel truck traveling 50 miles per hour (mph) is approximately 85 dBA at 50 feet (California Department of Transportation, 1998). Roadways in the area are currently used by heavy trucks as part of logging operations and other ongoing activities. Small increases in noise levels along truck routes would be expected as a result of the operation of delivery trucks supporting Spaceport Camden operations.

Construction noise would be temporary, lasting only the duration of the construction project and would be limited to normal working hours. The proposed construction activities would not be expected to result in significant community noise impacts.

Occupational noise exposure prevention procedures, such as hearing protection, would be required at the construction sites to comply with all applicable OSHA occupational noise exposure regulations. Therefore, significant impacts to workers at the construction sites from proposed construction related activities are not anticipated.

In summary, construction noise would be audible during certain phases of construction (e.g., pile driving) at the closest noise-sensitive locations. Although the distant thumping of pile driving heard at Cumberland Island National Seashore (approximately 50 dB $L_{A,max}$ at a distance of 3.5 miles) could interfere with visitors' expected backcountry wilderness experiences, pile driving would last only about 2 months and would be limited to normal working hours. The proposed construction activities would not be expected to result in significant community noise impacts.

4.11.1.2 Operation

Small increases in noise levels along Harrietts Bluff/Union Carbide Road and other access roads would be expected as a result of the operation of delivery trucks and other personnel vehicles. During times when final preparations for a launch are not underway, approximately 75 persons per day could commute to and from Spaceport Camden. During 2 weeks of surge operations immediately prior to and following a launch, up to 450 persons per day could move to and from Spaceport Camden. Ground transportation during a launch campaign would include up to 14 heavy trucks making deliveries to the Spaceport Camden. Increased ground vehicle traffic noise levels would typically be greatest during commuting

hours. Traffic on Harrietts Bluff Road has historically been dominated by local residential traffic and employee, delivery, and pick up from the Bayer CropScience/Union Carbide Corporation property. In its heyday, there were over 400 employees onsite, and toward the end of operations (2012), over 80. It is envisioned that similar or less traffic than the industrial days may be present in the area for between-launch and pre-launch periods. It is possible that visitors to Spaceport Camden could choose to travel by helicopter. No specific plans have been made to accommodate helicopter transport, and it would not be expected to be common. Operations at Spaceport Camden would occur primarily during normal working hours (8:00 a.m. to 5:00 p.m., Monday through Friday), but hours of operation would increase during launch campaigns. Noise sources during operations would include non-road equipment (e.g., forklifts), heavy machinery (e.g., pumps), and vehicles moving around within Spaceport Camden. Much of the activity, including payload checkout, spacecraft propellant loading, and payload encapsulation would take place indoors, resulting in minimal noise levels experienced in nearby areas. Operations tempo and associated localized noise would increase during launch campaigns and decrease again following launch completion.

As was the case during Bayer CropScience/Union Carbide Corporation/Thiokol operations on the site, during launch campaigns, loudspeakers located at Spaceport Camden facilities would be used to make announcements to personnel on Spaceport Camden in the event of an emergency or as part of clearing the launch site prior to a launch. Loudspeaker systems, which would not normally be used outside of launch campaigns, would be designed and positioned to allow clear communication with personnel on Spaceport Camden and would be directed towards the interior of Spaceport Camden. This analysis assumes a speaker configuration typical for this application with a maximum power rating of 25 watts, a sensitivity of 110 dB at 1 watt and a distance of 3 feet, and grouped in clusters of two. At the closest residence to Spaceport Camden, which is located about 2.5 miles from the proposed Spaceport Camden control center, loudspeakers would not be expected to exceed 55 dB $L_{A,max}$. At the closest upland portion of Cumberland Island National Seashore, located about 3.4 miles from the launch pad, loudspeakers would not be expected to exceed 52 dB $L_{A,max}$. At no location either on or off of Spaceport Camden site would loudspeaker use pose a risk to hearing. Loudspeakers would be audible at locations outside of Spaceport Camden, but not at levels that would disrupt conversation. The duration and sound level of announcements would not generate enough noise to add measurably to cumulative DNL at and near Spaceport Camden, which includes rocket launch and static fire test event noise. Loudspeaker use as part of up to 12 launch campaigns per year would not be expected to result in significant community noise impacts.

Table 4.11-2 lists maximum A-weighted noise levels generated by vehicles that would be used during clearing and patrolling the USCG LAA. In order to accomplish the required survey activities, manned and unmanned (i.e., drone) aircraft may operate within the 2,000-foot vertical avoidance area that has been established above Cumberland Island National Seashore per FAA AC 91-36, *Visual Flight Rules Flight Near Noise-Sensitive Areas*. Impacts on biological resources are discussed in Section 4.2, *Biological Resources*.

It is possible that helicopters could be used to move people or items to and from Spaceport Camden. If this were to occur, it would occur on an occasional basis, and no single flight path would be designated. Helicopters used would likely be smaller than the military helicopters that sometimes operate in the area in support of the mission at nearby NSB Kings Bay. Direct overflight by a Bell 222 helicopter at 500 feet AGL generates an $L_{A,max}$ of around 77 dBA. Noise levels associated with this representative civilian helicopter flyover event were calculated using the Air Force's Flyover Noise Calculator under standard acoustic atmospheric conditions (59°F and 70 percent relative humidity). If helicopter operations were to occur at Spaceport Camden, any overflights of populated areas would result in noise events that would be brief and infrequent. Helicopter noise would not be frequent or intense enough to have any

quantifiable effect on overall DNL at and near Spaceport Camden. Noise generated during pre-launch activities, such as helicopter flights and loudspeaker use, are also not consistent with the wilderness character of Cumberland Island National Seashore and would interfere with natural quiet when audible.

Table 4.11-2. $L_{A,max}$ Associated with Vehicles Used in Clearing and Patrolling the USCG LAA

Vehicle Description	$L_{A,max}$ (dB) at Distance of 200 feet
Motorboat[1]	74
Fixed-wing propeller-driven aircraft[2]	70
Small Unmanned Aerial Vehicle[3]	34
Ground vehicle (e.g., pickup truck)[4]	63

Notes: dB = decibels; dBA = A-weighted decibels; °F = degrees Fahrenheit; LAA = Limited Access Area; $L_{A,max}$ = maximum A-weighted overall sound pressure level during the noise event; USCG = U.S. Coast Guard.

[1] The U.S. Coast Guard recommends motorboat noise levels not exceed 86 dBA when at full throttle and measured at a distance of 50 feet. Although Georgia has not adopted this maximum by law, most commonly-used motorboats are compliant. Assuming 6 dB loss per doubling of distance, noise levels would be expected to be less than 74 dB at a distance of 200 feet (CPPerformance, 2005).

[2] Cessna 152 used as representative, noise level from Flyover Noise Calculator under standard acoustic conditions (59°F and 70% relative humidity) for aircraft at 40% power

[3] For small unmanned aerial vehicles, the propeller is the dominant noise source. Measured noise levels at typical high-power revolutions per minute are roughly 70 dBA at a distance of 3 feet (Leslie et al., 2008), and assuming 6 dB loss per doubling of distance, would be approximately 40 dB at 200 feet.

[4] Pickup truck measured noise levels at distance of 50 feet from Roadway Construction Noise Model equipment noise level database (FHWA, 2006). Noise level at 200 feet estimated assuming 6 dB loss per doubling of distance.

Under the Proposed Action, up to 12 launch operations and static fire events would be conducted per year. In the early part of launch trajectory, the ascent from the launch pad would be approximately vertical. As the vehicle ascends further, its horizontal motion would slowly increase with the vehicle traveling on a heading of 100 degrees (approximately east southeast). Static engine tests would be conducted with the vehicle stationary on the launch pad. Most launches would be conducted during the day. However, up to one launch per year could be conducted during the late-night time period between 10:00 p.m. and 7:00 a.m. All static fire events would take place during daylight hours.

Noise generated during subsonic portions of rocket operations were calculated using the FAA-approved Launch Noise Model (FAA, 2020b). Modeling was conducted using a single set of nominal atmospheric conditions, and noise levels experienced could vary slightly based on variable atmospheric conditions. Portions of the launch trajectory would be accomplished at speeds greater than the speed of sound. Sonic booms generated during supersonic segments of the trajectory were modeled using the program PCBOOM. Methods used to model vehicle noise levels are discussed further in Appendix C.

As discussed in Section 3.11.2, *Regulatory Setting*, DNL is the primary noise metric used to assess community noise impacts. DNL was calculated based on the noise energy generated during launch and static fire events (see Appendix C). The cumulative total noise energy generated by proposed launch and static fire events would result in noise levels greater than 65 dBA DNL within 0.25 mile of the launch pad. These areas include 11 acres of waterways that are within the proposed Spaceport Camden site boundary but not owned as part of Spaceport Camden (Exhibit 4.11-1). Noise levels greater than 65 dBA DNL do not affect land areas outside Spaceport Camden. All land use categories are nominally compatible at noise levels below 65 dB DNL per guidelines found in 14 CFR Part 150: Appendix A. However, because the area surrounding Spaceport Camden includes places where the quiet setting is a recognized attribute and part of the purpose of the area, this EIS includes consideration of noise metrics supplemental to DNL.

During launch and static fire events, noise levels near the launch pad would temporarily exceed levels that are safe for human hearing. These areas are closed to all personnel during launch operations. As noted in Section 3.11.1, *Definition and Description*, maximum A-weighted OASPL ($L_{A,max}$) noise levels greater than 115 dBA exceed OSHA guidelines for hearing conservation for a short time at least (see Section 3.11.2, *Regulatory Setting*). To assess the potential hearing conservation risk, $L_{A,max}$ associated with launch and static fire events were calculated. The areas affected by elevated noise levels during launches and static fire events are shown in Exhibit 4.11-2 and Exhibit 4.11-3, respectively.

As shown in Exhibit 4.11-2, launch $L_{A,max}$ would exceed 115 dBA within a radius of 0.45 mile from the launch pad. These areas are closed to all personnel during launch operations.

Static fire engine tests involve the rocket remaining on the launch pad with the rocket plume being directed through the flame trench throughout the duration of the event. The distinctive shape of the $L_{A,max}$ noise contours shown in Exhibit 4.11-3 is a result of the rocket plume being re-directed by the trench. Static engine test noise is highly directional, with maximum levels in lobes that are at about 45 degrees from the main direction of the deflected exhaust.

During a static fire engine test, noise levels can reach 115 dBA $L_{A,max}$ at up to 0.25 mile from the launch pad in directions that receive the highest noise levels. These areas are closed to all personnel during the launch operation. Static fire engine test noise would also differ from launch noise in that the noise level would remain constant throughout the 2- to 7-second duration of the event.

Launch noise levels vary over the course of the event as the vehicle moves along its trajectory. The area outside of Spaceport Camden exposed to levels greater than 115 dBA $L_{A,max}$ would be limited to waterways within the proposed Spaceport Camden site boundary but not owned as part of Spaceport Camden.

Noise-induced vibration levels were calculated for structural elements (e.g., floor) of a wood-framed building at several locations and compared with widely used structural impact criteria contained in DIN 4150 (see Section 3.11.2, *Regulatory Setting*). As shown in Exhibit 4.11-4, the PPV for a wooden building at the Charles Rinaldo Floyd burial site (4 millimeters per second at 20 hertz) would be approximately the same as the "sensitive" structure criteria level for that frequency. Because the grave markers and cemetery walls are made of stone, vibrations would be less intense than calculated for a wooden structure and below criteria levels. Launch noise-induced structural vibration levels at all other structures considered would be well below criteria levels established for "sensitive" structures for all frequency bands.

Structures that contain fluids, such as septic tanks and pipelines, are typically designed to be resilient to induced vibrations at intensities that would be experienced outside of Spaceport Camden boundaries as a result of Spaceport Camden operations. Natural structures, such as sand dunes and creek banks, could experience vibrations similar to those that occur as a result of natural events such as thunder or the passage of land animals. Noise would not be expected to noticeably accelerate erosion of creek banks or dunes.

Potential effects of noise on ruins and other uninhabited structures of cultural or historical significance are further detailed in Section 4.8, *Historical, Architectural, Archaeological, and Cultural Resources*. Other structures located farther from the launch pad would experience less noise-induced vibration with no risk of structural damage.

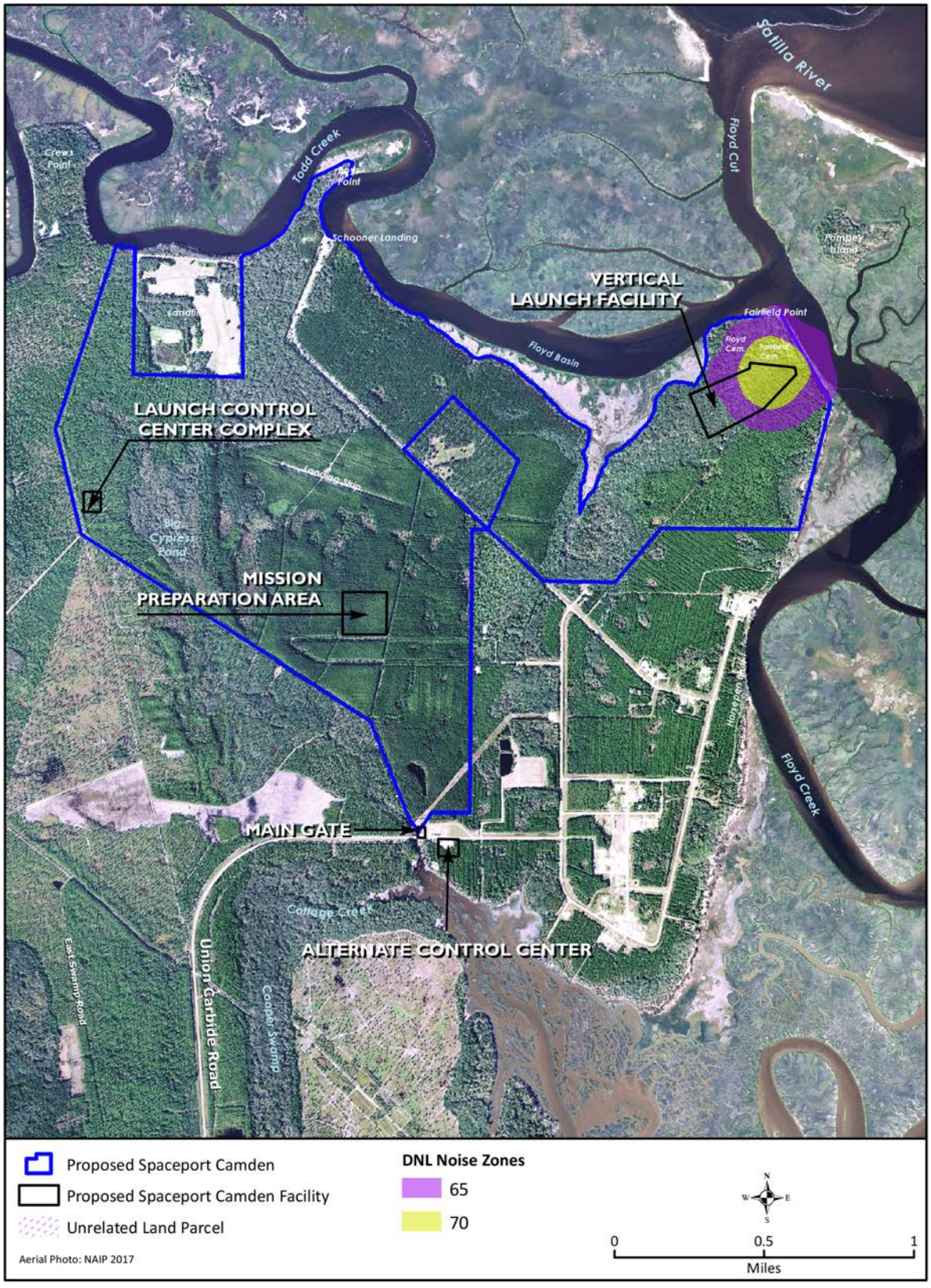

Exhibit 4.11-1. DNL Contours for Operations at Proposed Spaceport Camden

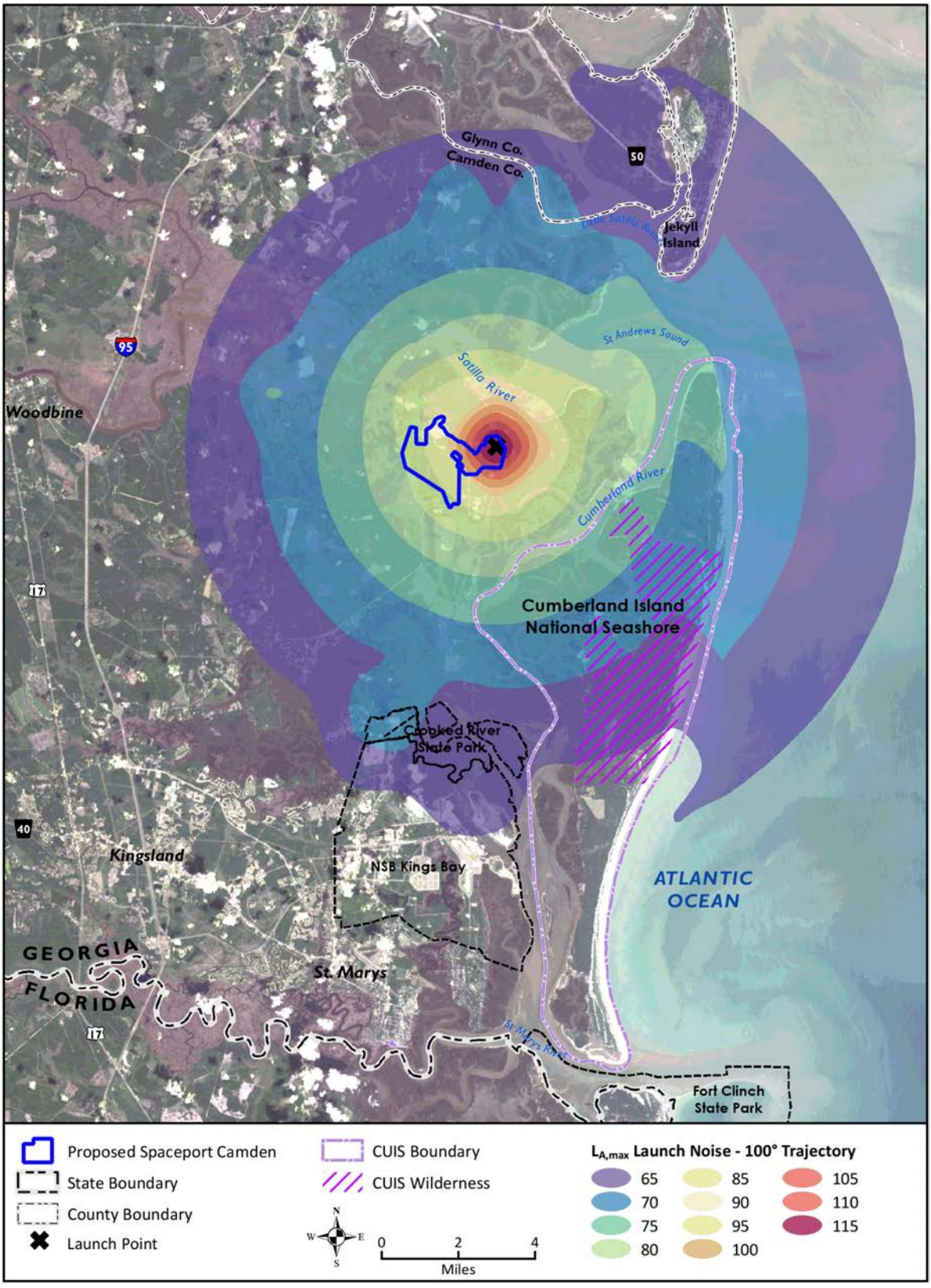

Exhibit 4.11-2. $L_{A,max}$ Contours for a Launch at Proposed Spaceport Camden

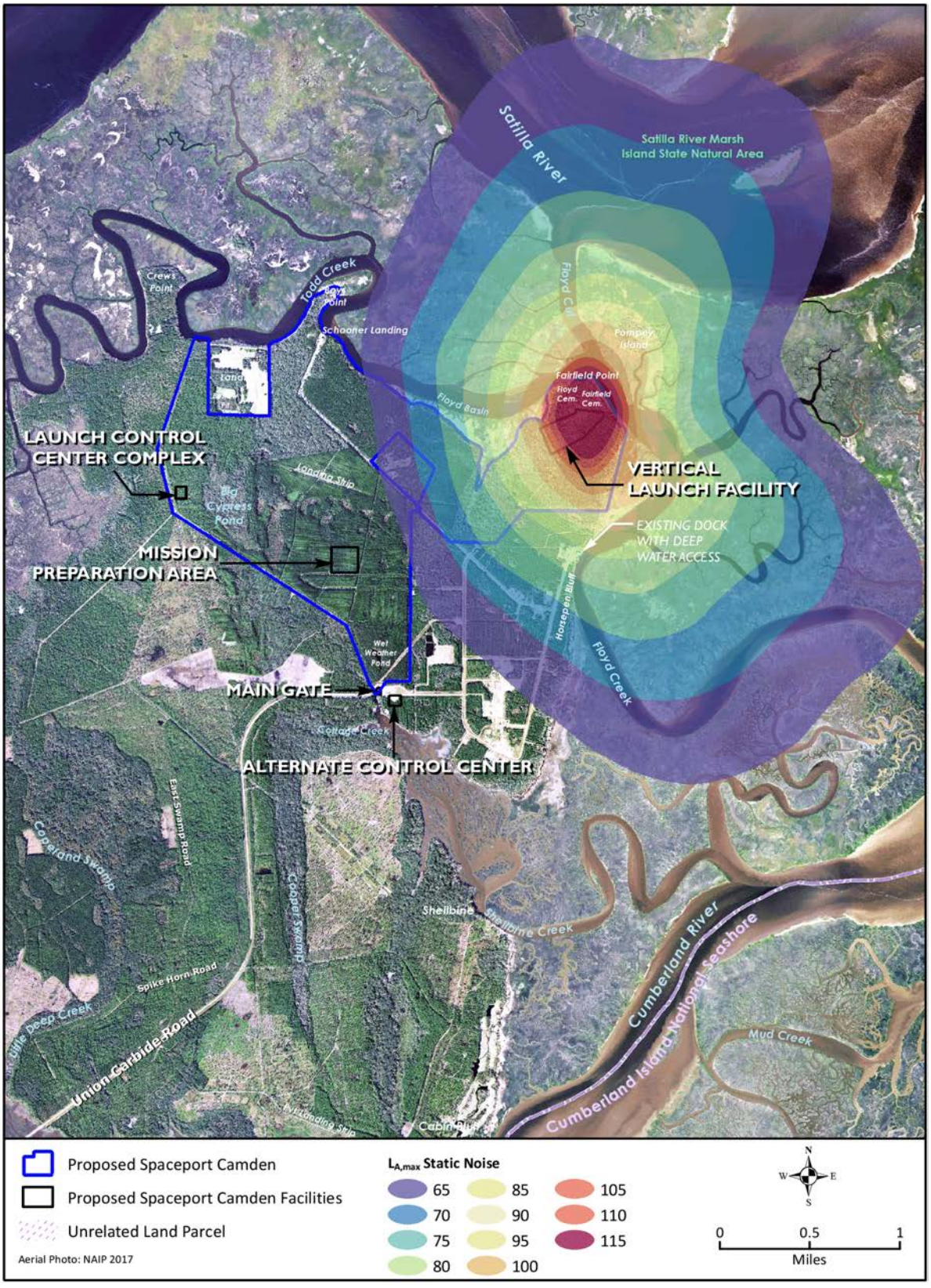

Exhibit 4.11-3. $L_{A,max}$ Contours for a Static Fire Engine Test at Proposed Spaceport Camden

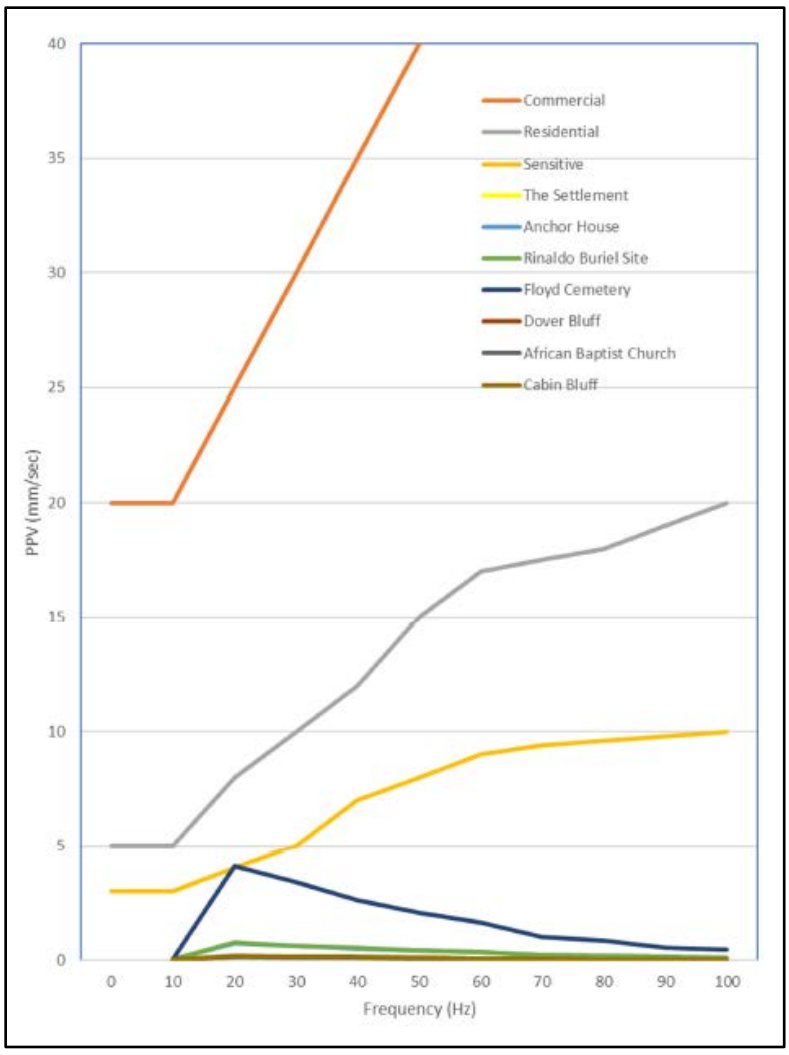

Exhibit 4.11-4. Peak Particle Velocity for Several Structures

Exhibit 4.11-5 shows A-weighted OASPL time histories at the closest residence and at the Settlement and closest residence during a launch event. The time history begins at the moment the sound reaches the locations. The time at which the maximum noise level occurs depends on the thrust profile of the rocket during ascent, the directions relative to the rocket in which the most noise propagates, weather and wind conditions at the time of the launch, and the location of the points of interest relative to the flight path. It is worth noting that OASPL at the closest residence (4.1 miles west of launch pad) reaches $L_{A,max}$ and then remains at that OASPL for approximately 15 seconds before decreasing. On the other hand, at the Settlement (4.6 miles east of launch pad), OASPL continues to increase fairly steadily until reaching $L_{A,max}$ at approximately 41 seconds into the noise event. This difference is a result of the rocket beginning to track towards the southeast (i.e., in the general direction of the Settlement and away from the closest residence) after the initial vertical ascent. The time history for locations farther away from the launch pad would be similar, although the noise levels would be lower throughout launch events farther away.

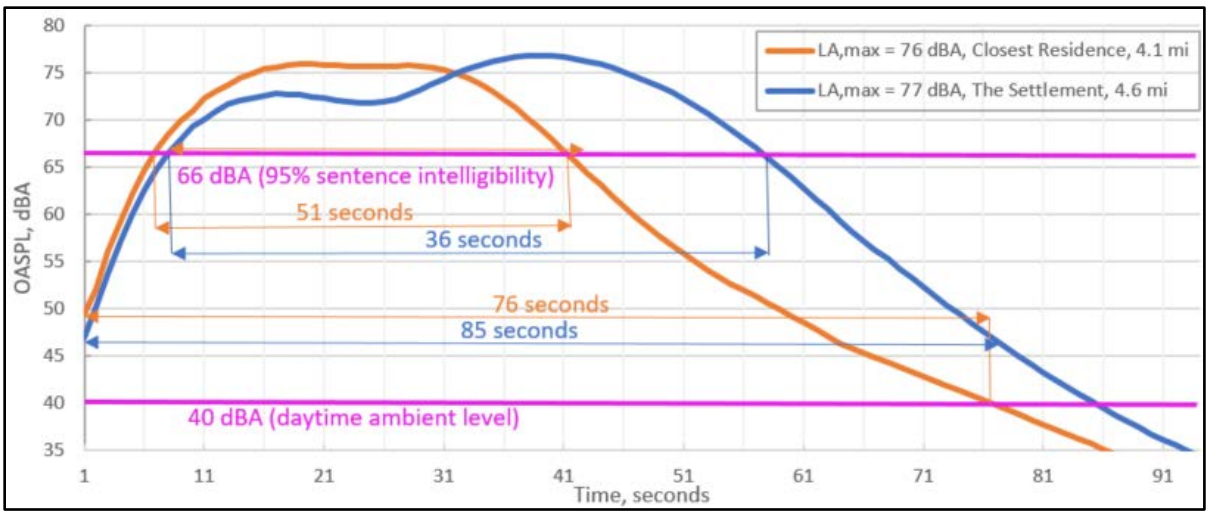

Exhibit 4.11-5. A-Weighted OASPL Time Histories at Representative Points of Interest

At the closest residence and the Settlement, launch noise levels would exceed 66 dBA, the level above which speech intelligibility between two people standing 3 feet apart drops below 95 percent. At both locations, the sound would remain above 66 dBA for less than 1 minute. Noise levels at both representative locations would remain well below 115 dBA, the conservative threshold above which hearing protection might be considered in accordance with OSHA. Launch noise levels at both the closest residence and the Settlement would decrease to levels quieter than median ambient noise—approximately 40 dB—after slightly more than 1 minute. The precise amount of time during which the rocket would remain audible (i.e., distinguishable from background) would depend on background sound levels, which vary between times and places, as well as minor variations between events based on variable atmospheric conditions.

Table 4.11-3 lists numerically noise levels and noise durations at the closest residence and the Settlement during launch and static test events.

Table 4.11-3. Specific Point Noise Analysis Results

Noise Metric	Closest Residence		The Settlement on Cumberland Island	
	Launch	Static Test	Launch	Static Test
$L_{A,max}$ (dBA)	76	38	77	44
Time above 66 dBA (seconds)	36	7	51	7
Time above 40 dBA (seconds)	76	0	85	7

Notes: dBA = A-weighted decibels; $L_{A,max}$ = maximum A-weighted overall sound pressure level during the noise event.

Noise levels would remain well below levels at which hearing loss would be of concern during all operations. At the closest residence, noise levels would exceed 66 dBA, the level at which speech interference becomes likely, for 36 seconds during launches and for 7 seconds during static tests. In a year in which the maximum 12 launches and 12 static tests are conducted from Spaceport Camden, noise levels would be high enough to disrupt conversation for a cumulative total of 9 minutes over the course of the year. Rocket noise generated during launches and static fire events would exceed ambient noise levels (40 dBA) for a cumulative total of 15 minutes over the course of the year. At the Settlement, noise levels during launch and static fire events would exceed 66 dBA for 51 and 7 seconds, respectively,

resulting in a cumulative total of 12 minutes above 66 dBA over the course of the year. Rocket operations noise levels would exceed ambient noise levels for a cumulative total of 18 minutes over the course of a year, including the maximum number of launches and static fire events.

Only one launch per year would occur during the late-night time period between 10:00 p.m. and 7:00 a.m. when most people are asleep. Thus, potential impacts on sleep would be limited to one late-night event per year at most. Static engine fire events would only occur during the daytime and would not be expected to affect sleep. Although the likelihood of sleep disturbance is strongly influenced by several factors specific to the sleeper (e.g., depth of sleep and familiarity with the noise source), behavioral studies suggest a relationship between the average probability of awakening and the A-weighted SEL of the potentially disturbing noise (FICAN, 1997). However, the Acoustical Society of America has called into question sleep disturbance dose-response relationships previously published by ANSI. Therefore, the following data are provided as general indicators of sleep disturbance probabilities.

Typical residences provide at least 17 dB outdoor-to-indoor sound level attenuation if windows are open. At the closest residence, if windows are open, a late-night launch event would generate 89 dBA SEL outdoors and could be expected to result in a 7 percent probability of being temporarily awakened indoors. At the Settlement, launches would generate approximately 91 dBA SEL outdoors and, in a structure with windows open, a late-night launch would result in an 8 percent chance of sleep disturbance. People sleeping outdoors or in tents are not benefitted by structural noise level reduction. People sleeping outdoors at the closest residence (or location at equivalent distance from the launch pad) during a late-night launch would have a 13 percent chance of awakening. At the Settlement (or places at equivalent distance to the launch pad), a late-night launch could result in a 14 percent probability of outdoor sleepers being temporarily awakened.

Camp Jekyll, schools, and public gatherings where children make up a large fraction of the population would experience noise qualitatively different from anything experienced previously; launches of small launch vehicles would generate maximum noise levels at Camp Jekyll between 65 and 70 dBA for short periods. However, areas affected by noise levels with the potential to damage hearing (for children and adults) would be limited to within the spaceport boundaries. Public notification would be provided prior to each launch event. This prior notification would allow camp leaders to maximize the educational benefits to campers from witnessing a rocket launch while minimizing potential for disruptions to other camp activities. Minimizing night launches would reduce the potential for disruption of sleep among children and others.

The intensity of a sonic boom and whether it is heard on the ground are both highly dependent on the specific trajectory and atmospheric conditions at the time of flight. Sonic boom overpressure contours were calculated using the program PCBOOM. The contours reflect a nominal atmospheric temperature, relative humidity, and pressure profile for altitudes developed based on data from several sources (see Appendix C for details). Exhibit 4.11-6 shows peak overpressure contours associated with a proposed launch. The most intense boom overpressures would be approximately 0.2 psf and would occur approximately 55 miles from shore in the Atlantic Ocean. Sonic booms at this intensity might be audible where there is low background noise (e.g., no strong winds) and could be noticed by persons on boats in the affected area. However, sonic booms would pose no risk to structures such as boat windows.

The potential for noise-induced hearing loss in humans as a result of sonic booms is negligible, as noise levels on land are well below the hearing conservation criteria of approximately 4 psf.

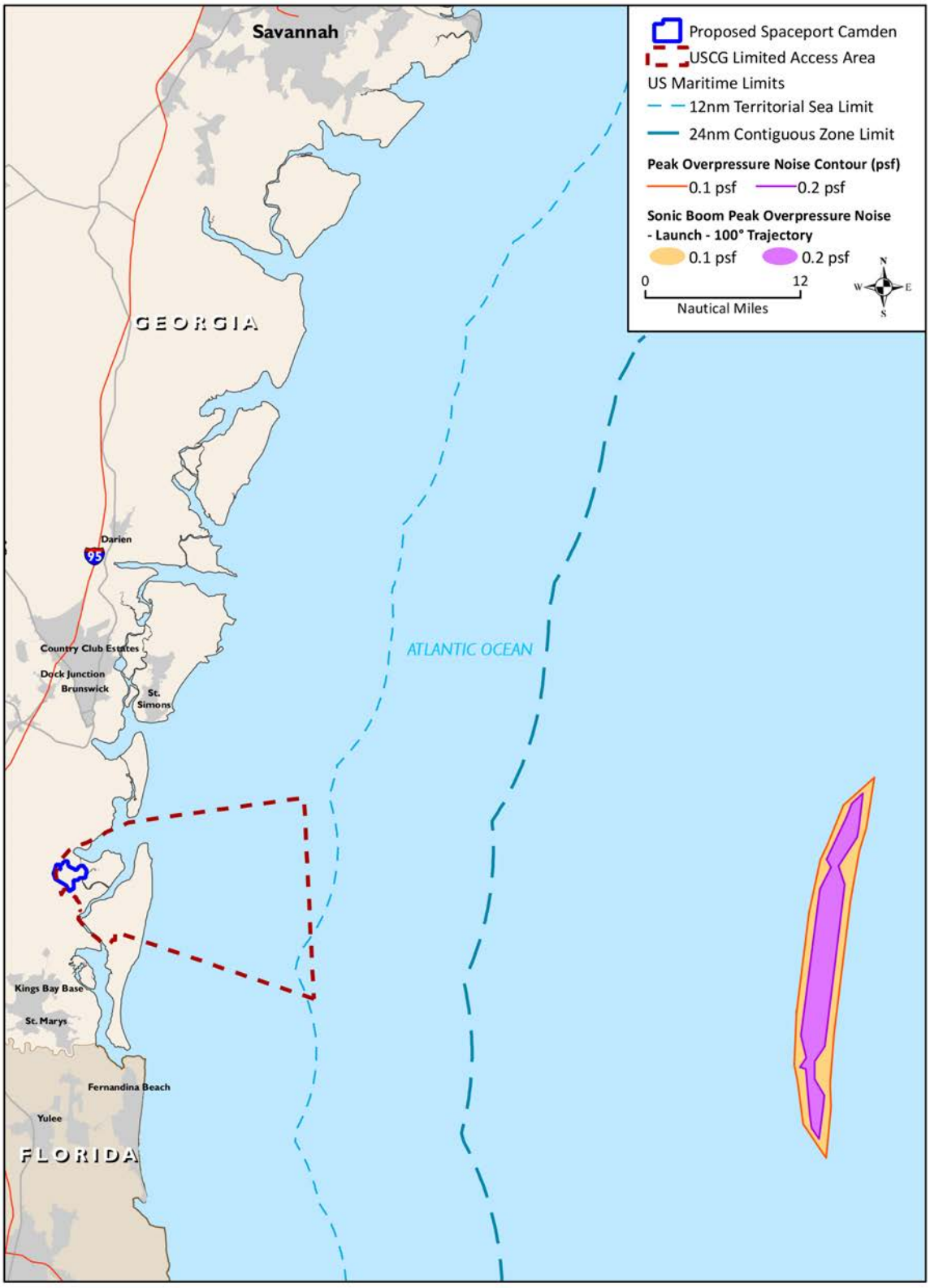

Exhibit 4.11-6. Sonic Boom Peak Overpressure Contours for a Launch from Proposed Spaceport Camden

Launches would not normally generate sonic booms on land. As shown in Exhibit 4.11-6, sonic booms would intersect the Earth's surface approximately 55 miles from shore. As listed in Table 4.11-4, approximately 99 square miles of the ocean's surface would experience overpressures above 0.1 psf during launches.

Table 4.11-4. Area Affected by Sonic Boom Overpressure During Launches

Overpressure (psf)	Area Affected (square miles)[1]
0.1 – 0.2	49
>0.2	50

Notes: > = greater than; psf = pounds per square foot.
[1] Launches would not normally generate sonic booms on land.

Noise at Cumberland Island National Seashore would be of particular concern because of the expectation among visitors of a completely natural soundscape. The Settlement was selected as a representative location on Cumberland Island National Seashore for detailed analysis. During launches, noise levels at the Settlement would be high enough to interfere with speech (i.e., exceeding 66 dBA) for slightly less than a minute. Noise would exceed median ambient sound levels (i.e., approximately 40 dBA) for slightly more than a minute. Over the course of a year with the maximum number of launches and static fire events, 66 dBA would be exceeded for a total of 12 minutes and 40 dBA would be exceeded for a total of 18 minutes. Up to one launch per year would be conducted between 10:00 p.m. and 7:00 a.m., resulting in an 8 percent chance of outdoor sleepers at or near the Settlement being awakened. During launches, noise-induced structural vibrations experienced in the Plum Orchard Historic District, High Point-Half Moon Bluff Historic District, and Brickhill Campground would be well below impact criteria for all frequency bands. Other structures that are farther from the launch pad would experience lower noise-induced vibration levels with minimal risk of structural damage. Sonic booms generated during departure would not be audible on Cumberland Island.

Visitors to Cumberland Island National Seashore can be assumed to appreciate the quiet natural setting of the island and to be particularly sensitive to nonnatural sound events. People at Cumberland Island National Seashore during rocket launches may or may not be representative of typical backcountry National Park visitors in this respect. Because visits to Cumberland Island National Seashore are typically planned far in advance, and launch times are subject to change, island visitors may or may not be able to observe a launch. While many variables would influence whether visitor expectations align with actual events, it is certain that nonnatural noises would be inconsistent with wilderness characteristics and would interfere with natural quiet. Only "authorized persons" (see Section 1.4.2, *Other Licenses, Permits, and Approvals*) would be on the island and all would be aware that a rocket launch was planned. Also, it is possible that some visitors to the island may view the rocket launches in a positive light and therefore may be less likely to be annoyed by the noise than they would be if the noise source were more commonplace. Because rockets generate such a distinctive sound, and because listener's feelings about rocket launches can be expected to have a strong effect on their reactions to the rocket's noise, previous social surveys conducted on people's reactions to aircraft noise in National Parks would not be good predictors of people's reactions to rocket noise. Although it is likely that some fraction of visitors to Cumberland Island National Seashore would be bothered by the disruption of the wilderness soundscape that would occur during Spaceport Camden launch events, research conducted to date does not support accurate estimates of a specific percent of visitors that would be annoyed.

In summary, noise levels during launches and static fire events would be quite high in areas surrounding Spaceport Camden, but each event type would occur only up to 12 times per year. No land area outside of Spaceport Camden would be exposed to noise levels of 65 dBA DNL. Although individual noise events would temporarily alter the quiet setting that is a defining feature in surrounding areas (e.g., Cumberland

Island), rocket noise events would be infrequent. Activities other than rocket launches (e.g., construction, loudspeaker announcements, etc.) would result in temporary localized noise level increases primarily affecting the area on and immediately surrounding Spaceport Camden. Because the sound environment in noise-sensitive locations near Spaceport Camden would be unchanged during the vast majority of the year, current land uses (e.g., recreation, residences, commercial, etc.) would remain compatible. Because the area exposed to greater than 115 dBA $L_{A,max}$ is entirely within the proposed spaceport boundaries, the potential for noise-induced hearing loss would be negligible. Structures in portions of unincorporated Camden County would be exposed to noise-induced vibration levels below potential damage criteria for all frequency bands. Sonic booms of approximately 0.2 psf would occur in open water areas approximately 55 miles from shore in the Atlantic Ocean. Booms of this intensity may be noticeable to people on boats but would pose no risk of damage to structures (e.g., windows on boats). At the closest residence and the Settlement on Cumberland Island, noise would be expected to disrupt normal speech (i.e., 66 dBA) for less than 36 seconds during each noise event. In cumulative total, over the course of a year, these two locations would be exposed to noise levels exceeding 66 dBA for up to about 9 minutes. Subsonic and supersonic noise events would occur at NSB Kings Bay, but events would not be at an intensity that would be of concern. Certain people exposed to elevated noise levels during launch and static fire events could become annoyed by the noise. There would be a very low risk of damage to structures due to noise. However, the noise events would be infrequent and would not be expected to result in significant impacts.

4.11.1.3 Launch Failures

Types of launch failures and their likelihood of occurrence are discussed in Section 2.1.2.7, *Launch Failures*. In the event of a catastrophic launch failure, noise levels generated and areas affected would depend on the exact location and nature of the failure event. Noise generated by a launch failure on the launch pad or immediately following launch would most strongly affect the OEZ (see Section 2.1.2.5, *Pre-Launch Activities*). After launch, the launch vehicle moves rapidly upward, reaching 72,000 feet AGL prior to beginning overflight of Cumberland Island. A catastrophic failure more than a few seconds into flight would occur relatively distant from the Earth's surface with correspondingly lower noise levels.

4.11.1.4 Summary

Based on noise modeling analysis, the Proposed Action would not increase noise by 1.5 dB DNL or more for a noise-sensitive area that is currently exposed to noise at or above the 65 dB DNL noise exposure level. Neither would any noise-sensitive areas be exposed at or above the 65 dB DNL level due to a 1.5-dB DNL or greater increase when compared to the No Action Alternative for the same timeframe. Supplemental noise metric analyses show that the Proposed Action would result in localized temporary, intermittent noise levels that could be annoying to some persons. However, the degree to which some persons could be annoyed is difficult to quantify, and any noise annoyance would be of extremely short duration. Impacts to wildlife, Section 4(f) and historic properties, and wilderness associated with noise are addressed in the respective EIS section and have been shown to have no significant adverse impacts. Therefore, FAA has determined that the Proposed Action would not result in significant adverse impacts associated with noise and compatible land use.

4.11.2 No Action Alternative

Under the No Action Alternative, FAA would not issue a Launch Site Operator License. The proposed construction and launch activities would not occur, and no changes to existing noise levels would occur. Noise levels at the location would continue to be affected by ongoing activities unrelated to spaceport activities. There would be no significant noise impacts under the No Action Alternative.

4.12 Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks

The socioeconomics impact analysis focuses on the local and regional economic impacts, both direct and indirect, of construction and operation of Spaceport Camden. In addition to those issues/resource areas identified in Section 3.12, *Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks*, potential socioeconomic impacts that were identified by commenters during the public scoping period are also addressed, which include the following:

- Potential negative impacts to local ocean-based commerce (fisheries, crabbing, oysters, and shrimping) due to possible OEZ closures and limited USCG LAA access (described in Section 2.1.2.5, *Pre-Launch Activities*)
- Financial viability of the Proposed Action and the effect on the local economy
- Changes to employment, including the potential types and longevity of jobs created
- Financial impacts, including costs and returns to taxpayers
- Potential changes to county services or funding
- Environmental and health impacts to children and pregnant women from noise and air pollutants
- Potential effects to schools
- Beneficial impacts to tourism and other economic activity
- Property values to homes located under the trajectory
- Costs to the public (i.e., taxes, damages, liability, insurance rates, evacuations)

Many concerns expressed by members of the public were potential costs to taxpayers and the public. Costs and benefits associated with construction, operation, and maintenance of the spaceport are not available at this time because designs are still in the notional phase. Therefore, only a qualitative assessment of the potential economic impacts associated with the Proposed Action is discussed in this section. The economic impacts analysis divides effects into three components: direct, indirect, and induced. Direct effects are the change in employment and income generated directly by the expenditures of the incoming or outgoing personnel. To produce the goods and services demanded by the incoming personnel, businesses, in turn, may need to purchase additional goods and services from other businesses. The employment and incomes generated by these secondary purchases would result in the indirect effects. Induced effects are the increased household spending generated by the direct and indirect effects. The overall effect from the economic impact analysis is the total number of jobs created throughout the ROI by the direct, indirect, and induced effects.

To determine whether the local housing market could support the full-time employment of the incoming population associated with the Spaceport Camden, several assumptions were made. The first assumption was that any full-time employment positions would be filled by persons migrating into the area. The second assumption was that the total number of homes required to support the incoming population would be equal to the total number of direct full-time positions associated with the Proposed Action. This number was compared with the number of vacant housing units in the ROI as defined by the ACS 5-year estimate for 2014–2018. If the number of incoming full-time employees would not exceed the number of vacant housing units as defined by the ACS estimates, the housing market in the ROI was anticipated to be able to support the incoming population. Other housing impacts considered in the analysis are the potential changes in property values for homes in proximity to the spaceport or under the potential

trajectory. Many factors influence housing prices; therefore, published research on potential impacts associated with spaceport operations was reviewed to determine potential impacts on housing values.

Population, employment, and public services were analyzed by considering the overall percentage change to the county baseline conditions. Public services were analyzed by considering the capacity, staffing, and infrastructure available to support the permanent and temporary incoming populations and potential change in the demand in services during construction and operation.

Limited access within the USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*) and changes in noise could potentially impact recreational and commercial participants in the ROI, which could affect economic activities. To assess potential impacts associated with access limitations, the scope, duration, and frequency of limitations were considered. For noise, the potential for noise interruptions to affect the visitors' experience is considered. Nature-based economic activity in the ROI is a significant contributor to local and regional economies; therefore, potential adverse impacts to environmental conditions could subsequently have adverse impacts to economic activity. Determinations of environmental consequences in the EIS were evaluated for their potential to impact economic activity.

NEPA emphasizes that the environmental justice populations need to have opportunities to provide community input, and for this EIS, the public scoping meeting for community input was conducted with extensive notice in Camden County, Georgia (see Section 1.5, *Public Involvement*). In addition, as explained in Section 1.5, *Public Involvement,* FAA requested input from government agencies, Native American tribes, organizations, interest groups, and the public on issues of concern and alternatives to be analyzed.

Potential impacts that constitute a disproportionate impact on minority and low-income populations and that also pose environmental or health risks to children include an increase in noise from construction and operation of the spaceport, changes in air quality and water quality, and additional health and safety risks associated with launches. To determine whether a disproportionate impact would affect environmental justice populations, the most recent ACS 5-year estimates for 2014–2018 demographic data were collected on the ROI and then compared to the community of comparison (COC). The ROI for this analysis is defined as those block groups wholly or partially within the composite USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*). The COC for this analysis was defined as the census tracts in which the block groups were located. If the percent of minority and low-income populations in the ROI were to exceed the percent of minority and low-income populations in the COC, then there would be potential for disproportionate impacts and mitigation measures would likely be necessary. If the proportion of minority and low-income populations in the ROI would not exceed the proportion of minority and low-income populations in the COC, then there would likely be no disproportionate impacts to environmental justice communities. Potential impacts from spaceport construction and operation to other resource areas were considered for the potential to disproportionately impact environmental justice communities or the potential to pose special environmental health and safety risks to children and elderly populations.

The magnitude of potential impacts can vary greatly depending on the location of the potential trajectory. If potential socioeconomic changes were to result in substantial shifts in population trends or a decrease in regional spending or earning patterns, those effects would be considered adverse. Factors to consider that may be applicable to socioeconomic resources, if they are interrelated with natural or physical environmental impacts (see 40 CFR §1508.14), include, but are not limited to, situations in which the Proposed Action would have the potential to do the following:

- Induce substantial economic growth in an area, either directly or indirectly (e.g., through establishing projects in an undeveloped area)

- Disrupt or divide the physical arrangement of an established community
- Cause extensive relocation when sufficient replacement housing is unavailable
- Cause extensive relocation of community businesses that would cause severe economic hardship for affected communities
- Disrupt local traffic patterns and substantially reduce the levels of service of roads serving an airport and its surrounding communities
- Produce a substantial change in the community tax base

4.12.1 Proposed Action

4.12.1.1 Construction

Socioeconomics

Employment and Income

As stated in Section 2.1.1.1, *Launch Site Construction Activities*, it is estimated 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 associated with Spaceport Camden. The employment associated with the construction activities would provide temporary benefits to the community from the direct and indirect employment and income from the use of local labor and supplies and expenditures. Benefits associated with the construction activities would be temporary, lasting for the duration of the construction activities, which are estimated to last up to 15 months. Potential impacts to economic activity from construction are discussed below.

Economic Activity

Tourism/Ecotourism

There would be no limited access to areas currently open to the public during construction activities that would limit tourism and ecotourism activities. Although construction noise would be minor, intermittent, and temporary (see Section 4.11.1.1, *Construction*), construction noise during the 15-month construction period could negatively affect visitors' experience of the National Park, particularly visitors who seek natural quiet and sounds of nature. A negative experience due to noise could reduce visitation and subsequently reduce contributions to local economies. In addition to noise, visual impacts and a change in the lightscape during construction activities may negatively affect a visitor's perception of solitude during their wilderness experiences, which may result in reduced visitation and, hence, economic activity. Advanced notification of when construction activities would be scheduled could reduce uncertainty and minimize the potential for startle effects to recreational users. As described in Section 4.13, *Visual Effects*, the impact to the visual landscape from new facilities would be minor and limited to those areas along the western shoreline of Cumberland Island National Seashore and Little Cumberland Island. Construction activities at night are expected to be infrequent and limited to possibly a few hours during the winter months when days are shorter. Park use during these months is the lowest and, therefore, impacts would be expected to be short-term and temporary, concluding each evening and eliminated after construction is completed. For these reasons, impacts from limited access, noise, and visual effects would not be anticipated to have a significant impact on tourism/ecotourism from construction-related activities.

Commercial and Recreational Fishing

Impacts to biological resources and water resources could have an impact on commercial and recreational activities that rely on the health and diversity of species and water quality. Additionally, a change in water quality or habitat from stormwater runoff during construction activities could adversely affect commercial and recreational fishing. No significant impacts to biological resources were identified in Section 4.2, *Biological Resources*; therefore, no significant impacts to commercial and recreational fishing resulting from impacts to biological resources would be anticipated because of construction activities. As discussed in Section 4.14, *Water Resources*, no significant impacts have been identified for water quality, and implementation of stormwater controls both before and after construction, as required through the NPDES permitting process, would serve to avoid or minimize any adverse impacts.

Overall, the construction of Spaceport Camden would not result in significant impacts to coastal resources, including marine protected areas, such as the Satilla River Marsh Island Natural Area and Cumberland Island National Seashore (see Section 4.4, *Coastal Resources*). Therefore, no significant impacts to coastal resources or commercial and recreational fishing would be anticipated due to construction activities.

Forestry

As detailed in Section 3.6.3, *Farmlands, Existing Conditions*, there are no existing agreements for either supporting forestry activities or post-crop harvesting within the construction ROI. The closest farmland land use is an area designated as agriculture forestry, approximately 1 mile west-southwest of the western spaceport site boundary; this is outside the construction ROI. Therefore, no significant impacts to forestry are anticipated from construction activities of Spaceport Camden.

Maritime Transportation

Due to the location of the proposed site of Spaceport Camden, ocean-based maritime transportation would not be impacted by construction activities.

Military

Construction activities would occur within the spaceport site boundary and would not be anticipated to impact NSB Kings Bay.

Aerospace

Construction activities associated with Spaceport Camden would not be anticipated to impact aerospace industries in the ROI.

Population and Housing

Population and housing would not be significantly impacted by the additional jobs associated with the construction of the spaceport, since these jobs would be anticipated to be fulfilled from the local workforce. However, if construction activities would require an in-migration of workers, then workers would need to obtain housing during the term of their employment, which would last for at least the duration of the construction activity. Any in-migration of workers would put additional demands on affordable housing. It would be anticipated that once the activity is complete, workers would leave the ROI; however, if all 70 construction and infrastructure workers decide to set up a permanent residence in Camden County, this population increase would represent approximately 0.13 percent of the total county population of 52,714.

Public Services and Social Conditions

Public service personnel in Camden County currently support a population of more than 52,714 people. It would be anticipated that additional construction employment would be filled by the local workforce and would not require additional public service personnel. However, in the event that the additional construction-related employment would be filled by personnel migrating to the area, there could be a potential increase in demand for emergency, medical, and other public services for the duration of approximately 15 months, which is the estimated length of the construction phase. Under the assumption that all 70 construction and infrastructure workers would be migrating to the area temporarily for the duration of the construction, the additional temporary population would not be expected to strain the capacity or affect the quality of public services and social conditions in the ROI.

Environmental Justice

Construction activities would take place on a portion of BG 3 of Census Tract 102.00 in Camden County. The construction site would remain with its current industrial land use designation and has no population residing on the site location. The project would result in ground disturbance of approximately 122 acres of land, located entirely within the boundaries of the existing industrial area. Standard construction practices would be implemented to minimize health and safety risks. During construction, there would be a temporary increase in noise. Construction noise could be audible in close proximity to construction sites, but construction noise would be temporary, lasting only the duration of the construction project and would be limited to normal working hours. The proposed construction activities would not be expected to result in significant community noise impacts (see Section 4.11, *Noise and Noise-Compatible Land Use*, for detailed discussion on the potential noise impacts associated with construction of Spaceport Camden). In addition to noise, there could be an increase in air emissions during construction, but there would be no exceedance of the NAAQS and Camden County would remain in attainment. Implementation of local, regional, and state regulations, along with BMPs, management plans, and recommended measures, would reduce potential health and safety risks. Therefore, construction activities associated with the Proposed Action would not be expected to cause disproportionately high and adverse human health or environmental effects on minority or low-income populations within the affected region.

Children's Environmental Health and Safety Risks

Impacts associated with construction would be similar to those described for environmental justice above and would not be expected to result in adverse impacts to children's health and safety. There are no children near the construction footprint, and access to the construction site (and spaceport, once completed) would be restricted. Implementation of local, regional, and State regulations, along with BMPs, management plans, and recommended measures, would reduce potential health and safety risks to the public.

4.12.1.2 Operation

Socioeconomics

Employment and Income

An estimated 77 full-time personnel would be required to support operations. The new jobs would represent an increase of less than 1 percent of total county employment. The full-time personnel and expenditures would represent a positive direct impact on the local economy and would generate additional indirect jobs and income, which would benefit the local economy. Given the current level of unemployment, it would be anticipated that an estimated 130 indirect or induced jobs, resulting from the

direct full-time personnel, would be filled by the local labor force. Thus, no in-migration would be anticipated as a result of indirect job growth.

Expenditures associated with daily operations of Spaceport Camden and additional expenditures and incoming temporary personnel during surge operations have not been determined at this time, but would be anticipated to result in benefits associated with increased tax revenue in the local community, including property tax, hotel occupancy tax, and gross receipts tax revenues.

Economic Activity

Tourism/Ecotourism

In general, access limitations could have a potential impact on various economic activities, most notably public activities within the USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*), where limited access to public areas would be required during operations. Based on Table 2.1-6, the estimated total access limitation time per nominal launch scenario within the composite USCG LAA would be up to 3.5 hours during each launch, which equates to a total of 42 hours per year. As stated in Section 2.1.2.3, *Representative Launch*, notifications announcing the launch and identifying any USCG LAA(s) could be made as much as a month in advance of the launch, although shorter notifications of 2 weeks or less are possible, depending upon launch-specific turnaround times or possible launch delays (see Section 2.1.2.5, *Pre-Launch Activities*). Advanced notifications would allow some recreational and commercial users to plan activities accordingly to avoid the limited access areas in most cases. However, visitors to Cumberland Island are allowed to make reservations up to 6 months in advance; thus, notice of closures a month or less in advance could result in adverse impacts to those visitors with reservations made several months in advance. The degree of the impact would be related to the individuals impacted and their specific circumstances. In other locations where launches occur, there is launch-generated tourism, where individuals recognize the short duration of the launch and schedule their vacations to try to witness a launch. Current residents and their guests, ticketed park visitors, government personnel, and other Spaceport Camden–designated persons would have the same rights of access on Little Cumberland Island and Cumberland Island as they currently experience. As described in detail below, public notification would be provided prior to the establishment of USCG LAAs and OEZs (described in Section 2.1.2.5, *Pre-Launch Activities*) for mission rehearsals, static fire engine tests, and launch operations.

The primary area on Little Cumberland Island and Cumberland Island National Seashore that would be impacted would be the northern end of the island, while the majority of the area to the south would remain unaffected. The St. Marys ferry typically drops and picks up at Sea Camp, which is on the southern part of the island. As of February 1, 2019, there were three docks available for day use, including Sea Camp dock inside the northern extension, the Dungeness dock on the northern extension, and all of Plum Orchard dock (NPS, 2019c). The three docks are located outside the composite USCG LAA. Areas within the composite USCG LAA would include Brickhill Bluff campground, Cumberland Wharf Ruins, High Point, the Settlement, and First African Baptist Church. However, the 24 allowed campers per day at Brickhill Bluff, plus other residents and potential persons at habitable structures on the north end of Cumberland Island (Squaw Town and Plum Orchard) and Little Cumberland Island would be considered “authorized persons” (see Section 1.4.2, *Other Licenses, Permits, and Approvals*, for discussion of “authorized persons”) and could remain if they wished. Should those persons wish to depart the area on Cumberland Island or Little Cumberland Island before a launch, Spaceport Camden personnel would facilitate transportation for those individuals to and from their houses or campsites on the day of the launch.

Other activities such as the Lands and Legacies Tour, a 5- to 6-hour motorized tour to the north end of Cumberland Island, also allows advanced reservations as early as 6 months. The Lands and Legacies Tour would traverse through the land-based portion of the USCG LAA. Visitors with reservations for the Lands

and Legacies Tour that occur on dates during a test or launch would be considered "ticketed park visitors" and would have the same rights of access as they currently experience on areas of Little Cumberland Island and Cumberland Island located within the land-based portion of the USCG LAA. Since ticketed visitors would be allowed the same rights of access as they currently experience, there would be minimal impacts expected to the Lands and Legacies Tour. However, if an individual with a reservation for the tour would prefer not to attend the tour during a launch, then they could cancel their tour and reschedule. Any cancellations made up to 14 days prior to the tour are refunded (NPS, 2016). Alternatively, tours that could witness a launch up close for the brief few minutes that the launch would be visible could be anticipated to be at a premium and fill up quickly.

The public has expressed concern regarding the potential impacts to the quality of life for residents resulting from the Proposed Action (see Appendix A). A poll by Anzalone Liszt Grover Research and commissioned by the Southern Environmental Law Center was conducted in May 2017. Four hundred registered voters in Camden County responded to the survey, which was conducted for the initial purpose of determining Camden County residents' support to rezone Cumberland Island for development (note that this Proposed Action does not involve any rezoning or development on Cumberland Island). The survey revealed that 88 percent of survey respondents felt that the Cumberland Island National Seashore was very or somewhat important to the county's economy, and 77 percent felt that Cumberland Island was very or somewhat important to the quality of life in Camden County (Anzalone Liszt Grove Research, 2017). The coastal recreation opportunities available at Cumberland Island have been identified as one of several contributing factors to the quality of life for residents (Camden County Joint Development Authority, 2018). Any disruption, limited access, delays, or additional threat to the island and the natural features or recreational opportunities available at Cumberland Island as a result of spaceport operations could be perceived by some as an adverse impact on their quality of life. Possible measures to minimize impacts to the natural, physical, and human environment are discussed in Chapter 6*, Mitigation*.

Commercial and Recreational Fishing

As described in Section 3.12, *Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks*, and shown in Exhibit 3.6-1, there are 8,724 acres of shellfish growing areas, 3,000 acres of inactive commercial shellfish lease area, and 1,658 acres of recreational shellfish harvest area within the composite USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*). Recreational shellfish harvest areas are exclusively for public use and for personal use only (Guadagnoli, 2020). Temporary restricted access within the area of an active OEZ or temporary limited access to "unauthorized persons" (see Section 1.4.2, *Other Licenses, Permits, and Approvals*) within the USCG LAA during launches may result in impacts to recreational shellfish participants' planning trips to those areas. Rivers and freshwater areas cannot support a stable molluscan shellfish population and are not considered or monitored for aquaculture due to the high variability in salinity (Guadagnoli, 2020). Based on Table 2.1-6, access limitations within the USCG LAA would occur for up to 3.5 hours during each launch, 12 launches a year, for a total of 42 hours per year. Recreational fishing participants may choose to delay their activities or change their plans and visit the recreational harvest area outside and south of the USCG LAA that would be open to the public during launches. Since recreational shellfish harvest areas are popular areas for residents and visitors, the open recreational shellfish harvest area outside the USCG LAA may be more crowded on days of launches, if recreational participants, who would have otherwise visited one of the other recreational shellfish harvest areas temporarily closed during a launch, choose to visit the open one.

The inactive commercial shellfish areas are being re-subdivided to allow multiple entities to use the water bottom in the future (Guadagnoli, 2020). Once the inactive commercial shellfish lease area within the composite USCG LAA is re-subdivided, then those entities may be subject to delay or access limitations for up to 3.5 hours per launch, 12 times per year. Advanced notification through NOTMARs and other

communication channels would be available for recreational and commercial participants. Potential commercial entities in the future would be able to submit a claim for a loss of income. Details for submitting claims would be available on the Spaceport Camden website prior to the first launch.

As stated in Section 2.1.2.5, *Pre-Launch Activities*, "authorized persons" (Section 1.4.2, *Other Licenses, Permits, and Approvals*) would have the same rights of access on Little Cumberland Island and Cumberland Island as they currently experience. Therefore, these "authorized persons" would not be restricted from fishing areas during a launch, since they would have the same rights of access as they currently experience.

To minimize the potential adverse impacts to commercial and recreational fishing participants, public notification would be provided prior to the establishment of USCG LAAs and OEZs for mission rehearsals, static fire engine tests, and launch operations (see Section 2.1.2.5, *Pre-Launch* Activities, for a detailed description of pre-launch activities). Implementation of measures outlined in Chapter 6, *Mitigation*, would minimize adverse impacts. As discussed in Section 2.1.2.5, *Pre-Launch Activities*, the GDNR Coastal Resources Division recommends avoiding or minimizing launch operations that require limited access on weekends, holidays, and during organized fishing tournaments in the vicinity, as well as posting limited access dates/times at all public access points within 10 miles of proposed USCG LAAs, including public boat ramps, 30 days in advance (O.C.G.A. 12-5-320, *Coastal Management Act*).

Operations of the proposed spaceport have the potential to impact water resources, which in turn could have possible impacts on commercial and recreational fishing. Impacts to wetlands, floodplains, and surface waters resulting from spaceport operations include potential increases in stormwater discharges from new impervious surfaces and the potential for those discharges to carry pollutants. Implementation of measures to minimize the accidental release of pollutants that could then enter stormwater runoff include the spill prevention plans (described in Section 4.7, *Hazardous Materials, Solid Waste, and Pollution Prevention*). The proposed Spaceport Camden would require an industrial stormwater permit in compliance with Section 402 of the CWA. The permit would include the creation of a SWPPP to control surface water runoff related to the operations of the spaceport. Implementation of management plans identified in Section 4.7, *Hazardous Materials, Solid Waste, and Pollution Prevention,* Section 4.14, *Water Resources*, and mitigation measures in Chapter 6, *Mitigation*, would minimize potential adverse impacts to water resources and subsequently to commercial and recreational fishing.

Forestry

As detailed in Section 3.6.3, *Farmlands, Existing Conditions*, there are no existing agreements for either supporting forestry activities or post-crop harvesting within the operational ROI. The closest farmland land use is an area designated as agriculture forestry, approximately 1 mile west-southwest of the western spaceport site boundary. This farmland is outside the operation ROI. Therefore, no significant impacts to forestry are anticipated from operational activities of Spaceport Camden.

Maritime Transportation

As shown in Exhibit 3.12-2, vessel traffic is present through the composite USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*). Potential delays and cancellations resulting from limited access to certain areas during tests and launches could have adverse impacts on maritime transportation. Based on Table 2.1-6, potential limited access for "unauthorized persons" (see Section 1.4.2, *Other Licenses, Permits, and Approvals*) would occur in the USCG LAA for up to 3.5 hours each launch, up to 12 times per year, for a total of 42 hours. Adverse impacts to maritime transportation from access limitations would be minimized through advance notice and issuance of NOTMARs. Also, as indicated in Section 2.1.2.5, *Pre-Launch Activities*, areas of the USCG LAA may have persons present or be available for transit with the permission of the Captain of the Port, pursuant to 33 CFR §165.20.

The County would coordinate with Glynn County, GDNR, law enforcement agencies, the USCG, the U.S. Navy at NSB Kings Bay, the Marine Corps Air Station Beaufort, the appropriate regional Air Route Traffic Control Center (Jacksonville Tower), and local commercial/general aviation airports. NOTMARs and Notices to Airmen would also be disseminated. Additionally, the County and the launch operator would notify the City of Brunswick, the NPS, Crooked River State Park, and other appropriate agencies of the test or launch operation and associated establishment of USCG LAAs.

The Emerald Princess Gambling Boat is a casino cruise that departs out of Brunswick, Georgia, and traverses 3 miles into international waters before returning to Brunswick. The regularly scheduled cruise is only offered at specific times from Thursday to Sunday. The Port of Brunswick is not within the composite USCG LAA, and the Emerald Princess (or any other ships out of the Port) would be able to circumvent the USCG LAA or request transit through via the Captain of the Port. Additionally, based on the duration and frequency of launches, along with issuance of NOTMARs and implementation of recommended measures, potential impacts to the cruise are not anticipated to be significant.

Military

An issue of concern identified by the public and the U.S. Navy is the potential for impact of the Proposed Action on NSB Kings Bay (see Section 1.5.1.1*, Scoping Meetings*). The U.S. Navy is considered a "coordinating agency" for this action and has provided input on the NEPA process in this regard (see Appendix A). One of the main siting criteria for the location of the Vertical Launch Facility was to be located as far north away from NSB Kings Bay as possible, while meeting the other evaluation criteria (Section 2.3.2.1*, Onsite Alternatives Siting Criteria*). Potential noise impacts to NSB Kings Bay during operations are discussed in Section 4.11, *Noise and Noise-Compatible Land Use.* No significant noise impacts would be anticipated to NSB Kings Bay during operations (see Section 4.11, *Noise and Noise-Compatible Land Use*). Pre-launch interagency coordination among local jurisdictions; the military; and local, regional, and State agencies would help identify and address any potential compatibility issues with NSB Kings Bay (Section 2.1.2.5*, Pre-Launch Activities*). Therefore, operation of Spaceport Camden would not be anticipated to significantly inhibit NSB Kings Bay daily operations and missions and would not be anticipated to have a significant adverse impact to economic activity related to NSB Kings Bay.

Aerospace

Operation of Spaceport Camden would contribute to the growing aerospace industry in Georgia. Based on information presented in Section 3.12, *Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks*, the potential direct, indirect, and induced impact from the additional jobs associated with operation of the spaceport are estimated and shown in Table 4.12-1.

Table 4.12-1. Estimated Economic Impacts of Spaceport Operations

Category	Direct	Indirect	Induced	Total
Employment	77	42	88	207
Wages and Salaries	$10,254,872	$2,470,919	$3,782,233	$16,508,024
Output	$28,029,426	$6,648,649	$12,093,344	$46,771,420

Note:
[1] Economic impacts are based on the 77 full-time personnel associated with spaceport operations and on multipliers derived from information for space companies as reported in the Georgia Institute of Technology, "2015 Economic Impact of Georgia's Aerospace Industry" (Georgia Institute of Technology, 2017).

Population and Housing

Regional

Population and housing during the operation of Spaceport Camden would not be anticipated to result in significant population growth in the area or result in shifts in the population. Assuming that all 77 permanent full-time personnel migrate to the area and using an average Camden County household size of owner-occupied units of 2.61 persons (USCB, 2015b), the maximum increase in population would be approximately 201 people, or less than 1 percent of the ROI population of 52,417. If, under a maximum-case scenario, all 77 permanent full-time personnel would migrate to the area and require housing at the same time, then it would be anticipated that there would be available housing based on the 2,510 vacant housing units in Camden County.

Local

The public has expressed concerns regarding the potential impacts to housing, particularly at Little Cumberland Island and Cumberland Island National Seashore, which are within the composite USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*). Noise impacts typically impact a property's value. The correlation between noise measured in DNL and property values has only been thoroughly studied for regularly occurring transportation noise sources, including highways, rail corridors, and airports. Studies used to develop DNL property-value relationships have not included rocket noise, which has historically been an irregularly occurring event. Thus, it is acknowledged that the suitability of DNL for the prediction of impacts on property values associated with infrequent rocket and sonic boom events is uncertain. There would be low risk of structural damage to properties due to noise from spaceport operations (see Section 4.11.1.2, *Operation*). The County will provide information on the damage claims process in the event of damage to houses or structures on the Spaceport Camden website.

Public Services and Social Conditions

During operations, there would be potential for increased demand for public services such as State and local police and emergency responders to set up additional security access control checkpoints to ensure controlled access to any USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*). Given that clearance requirements would be launch-specific, it cannot be determined at this time what the potential staffing or budget needs may be to support launch activities. The County and/or the launch operator would coordinate with State and local law enforcement agencies to ensure the needs of the community and launch are met (see Appendix B, *Health and Safety*). This would include reviewing the accessibility of police and emergency responders on the remote areas of Cumberland Island in the case of an emergency. The NPS, the Camden County Sheriff's Office, the USCG, Glynn County Sheriff's office, and the U.S. Navy, as well as private island dwellers with personal boats (if willing to participate) are all in the immediate area and could be included or relied upon to provide support in an emergency. As operations become functional, there would be potential for additional full-time law enforcement and fire protection personnel and support to protect facilities and Spaceport Camden assets during daily operations, which would likely require additional county funds and expenditures. These and other additional responsibilities and demands on local, State, and Federal agencies could result in a financial burden to the acting agency. Advanced planning, coordination, and securing funding sources would need to be addressed in order to meet the demands of public services required during operations.

There would be potential for an increase in the demand for public school services if full-time personnel, associated with operations, with school-aged dependents permanently migrate to the area. Dependents

would be anticipated to be of varying ages and would attend 1 or more of the 13 schools throughout the Camden County School District.

Environmental Justice

As described in Section 3.12, *Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks*, the affected environment for evaluating environmental justice includes those block groups that are within the composite USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*). These areas include BG 3 in Census Tract 102.00, BG 2 in Census Tract 101.00, and BG 1 in Census Tract 106.02. Only BG 1 in Census Tract 106.02 had residential populations within the portion of the block group within the composite USCG LAA. There are 55 addresses in BG 1 of Census Tract 106.02 that have been identified within the composite USCG LAA. Only one block group exists in Census Tract 106.02; therefore, demographic information for the block group is the same as that for the entire census tract. Most recent estimates indicate that the block group has 24.5 percent (259 people) of the population that identifies themselves as minority, compared to 30.1 percent (15,856 people) of the total population in Camden County. Approximately 4.2 percent (44 people) of the population of the block group are low-income, compared to 12.9 percent (6,546 people) in the county. During spaceport operations, "authorized persons" (see Section 1.4.2, *Other Licenses, Permits, and Approvals*) other than residents could be present within the USCG LAA and could include minority and low-income populations.

There would be potential for noise impacts associated with spaceport operations; these impacts are discussed in greater detail in Section 4.11, *Noise and Noise-Compatible Land Use*. Noise levels of 65 dBA DNL or greater would be within the spaceport site boundary, which is uninhibited. The impact of rocket noise with respect to hearing conservation, OSHA's upper limit of 115 dBA, would be contained within the spaceport site boundary. Likewise, the impact of rocket noise to the nearest sensitive structures, including the Settlement historic structure and the nearest residential structure, would result in structural vibration levels below threshold levels for sensitive structures and residential criteria, respectively, according to DIN standard 4150. Therefore, no vibrational building damage is expected to homes or historical and cultural buildings located on Cumberland Island.

Section 4.8, *Historical, Architectural, Archaeological, and Cultural Resources*, describes the potential impacts to culturally important aspects of the affected environment. Culturally important resources that are wholly or partially within the composite USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*) include, but are not limited to, the First African Baptist Church located on Cumberland Island and the Gullah Geechee Heritage Corridor. In consultation with the Georgia SHPO, a Programmatic Agreement that identifies mitigation measures to resolve any adverse effects will be developed, with the results provided in the Final EIS and/or Record of Decision, once available. These mitigation measures, which are identified in the Georgia SHPO's Section 106 consultation documentation provided in Appendix A and summarized in Chapter 6, *Mitigation*, have been found to be sufficient to ensure that operations do not physically damage any historic properties or substantially diminish their utility.

Opportunities for commercial and recreational fishing are available within the composite USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*). Fishing for subsistence purposes is also available. Subsistence involves the harvest of local resources for local consumption (USS, 2018). Subsistence fishing is prevalent among Native American communities across the country, as Native Americans view subsistence as a part of their culture (Burger & Gochfeld, 2011). Subsistence fishing also creates a potential environmental justice concern, since low-income and minority communities generally consume more wild-caught fish than society as a whole (Yang, 2020). A portion of the Satilla River is located within the composite USCG LAA (see Exhibit 3.12-4). As discussed in Section 3.4.3.1, *Satilla River Marsh Island Natural Area*, the Satilla River Marsh Island Natural Area was historically part of a transportation and subsistence network for the Creek Indian Nation. Based on Table 2.1-6, potential limited access for

"unauthorized persons," including unauthorized fishing participants (see Section 1.4.2, *Other Licenses, Permits, and Approvals*), would occur in the USCG LAA for up to 3.5 hours each launch, up to 12 times per year, for a total of 42 hours. Closures would be temporary and would not restrict fishing participants, including minority and low-income individuals, from accessing areas outside the USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*).

Spaceport operations associated with the Proposed Action would not be expected to cause disproportionately high and adverse human health or environmental effects on minority or low-income populations within the affected region, because no significant unmitigated impacts from operations would be anticipated to occur in surrounding communities.

Children's Environmental Health and Safety Risks

As described in Section 3.12, *Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks*, the affected environment for evaluating children's environmental health and safety risks includes those block groups that are within the composite USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*). This affected environment includes portions of three block groups in Camden County, including BG 2 in Census Tract 101.00, BG 3 in Census Tract 102.00, and BG 1 in Census Tract 106.02. As stated in Section 3.12.2.3, *Environmental Justice, Existing Conditions*, there are no residential populations located on the portion of BG 3 of Census Tract 102.00 or in BG 2 of Census Tract 101.00 that are within the composite USCG LAA. Approximately 55 addresses in BG 1 of Census Tract 106.02 have been identified within the composite USCG LAA. Approximately 21.7 percent of the population in BG 1 of Census Tract 106.02 is under 18 years of age, and 23 percent of the population is 65 years or older. During spaceport operations, "authorized persons" other than residents (see Section 1.4.2, *Other Licenses, Permits, and Approvals*) could be present within the USCG LAA and could include children (under 18 years of age) or elderly (65 years and older) populations. Children and elderly segments of the population are inherently disproportionately impacted by environmental health and safety risks. Therefore, potential health and safety risks associated with operation of Spaceport Camden could pose disproportionate environmental health and safety risks to children. Implementation of local-, regional-, and State-mandated requirements, as well as recommended measures outlined in Chapter 6, *Mitigations*, would minimize potential adverse impacts to the public during spaceport operations.

Methods used to calculate noise levels and assess potential noise impacts are discussed in Section 4.11, *Noise and Noise-Compatible Land Use, Proposed Action*. All processes used to calculate noise levels and assess noise impacts are current and have been reviewed and approved by FAA. The National Institute of Occupational Safety and Health hearing protection criteria referenced in the EIS take into account both the level and duration of noise exposure. Noise levels would not be of sufficient intensity and/or duration to pose any risk to hearing, except on Spaceport Camden and adjacent uninhabited lands. Little Cumberland Island and Cumberland Island National Seashore would not be exposed to noise levels that have the potential to damage hearing. Camp Jekyll, schools, and public gatherings, where children make up a large fraction of the population, would experience noise qualitatively different from anything experienced previously; launches of small launch vehicles would generate maximum noise levels at Camp Jekyll between 65 and 70 dBA for short periods. However, areas affected by noise levels with the potential to damage hearing (for children and adults) would be limited to within the spaceport boundaries. Public notification would be provided prior to each launch event. Knowledge of launches ahead of time would allow camp leaders to maximize educational benefits to campers witnessing a rocket launch, while minimizing potential for disruptions to other camp activities. Minimizing night launches would reduce the potential for disruption of sleep among children and others.

4.12.1.3 Launch Failures

Types of launch failures and their likelihood of occurrence are discussed in Section 2.1.2.7, *Launch Failures*. Failures on the launch pad would be expected to be confined to the immediate area around the launch site; therefore, a launch pad failure would not be expected to cause additional delays or access limitations to ocean-based maritime transportation. A launch failure over water resulting in potential components or debris impacting the water would be expected to land within the USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*) and could result in additional delays and access limitations to these areas. In the event of a launch failure, potential socioeconomic impacts would vary depending on the type of failure, location of the failure, and the specific type of socioeconomic resource-affected and associated damages incurred, the extent of which would depend on a variety of factors specific to each launch.

The area where a launch pad failure or flight failure would occur would not be expected to occur near NSB Kings Bay. Development and implementation of emergency management plans and continued interagency coordination between Spaceport Camden and NSB Kings Bay would minimize the potential impacts to military operations and missions in the event of a launch failure.

Emergency response measures, such as a Fire Mitigation Plan (described in Section 2.1.2.5, *Pre-Launch Activities*) have been developed and would be implemented in the event of a launch failure to minimize potential adverse impacts. As stated in the Fire Mitigation Plan, the Camden County Fire Rescue Department and law enforcement will utilize marine landing craft that will ensure uninterrupted ingress/egress to Little Cumberland Island, day and night in support of all first responders, to include the Georgia Forestry Commission. Additional investments in restoring the existing water buffalo (a type of portable water tank) to an operational status and adding a new water buffalo, with all-terrain vehicle deployment capability for use by Georgia Forestry Commission or Camden County Fire Rescue, emergency medical services, and/or law enforcement, will ensure a timely response onto Little Cumberland Island in support of all-hazards threats (e.g., fire, medical, evacuation, search and rescue). In the event of a launch failure, public service personnel would follow emergency management procedures as outlined in emergency and mitigation plans to minimize potential adverse health and safety impacts to the public. A description of the pre-launch activities, including activities in an emergency situation such as those resulting in a launch failure, are provided in Section 2.1.2.3, *Representative Launch*, through Section 2.1.2.7, *Launch Failures*.

A concern expressed amongst the public was the potential increase in insurance rates due to incidents associated with spaceport operations. Insurance companies assess risk according to many variables. In the event of a launch failure, the insurance company may reassess the risk and raise insurance rates or cancel any further insurance plans. Additionally, citizens incurring a loss of income due to spaceport operations would be able to contact the County for established procedures to file a claim. Camden County intends to provide a means for submitting damage claims on the Spaceport Camden website, prior to the first launch. Emergency and contingency planning and response measures would serve to minimize potential adverse impacts, and emergency consultation with regulatory agencies (e.g., USFWS, Georgia SHPO, USACE, etc.) would be required should a launch failure result in impacts to sensitive resources.

4.12.1.4 Summary

Based on socioeconomic analysis and given the scope of the proposed spaceport, the Proposed Action would not be expected to induce substantial economic growth, either directly or indirectly (e.g., through establishing projects in an undeveloped area). Potential growth in the area associated with the proposed spaceport would be expected to be moderate, but the extent of resultant potential growth is speculative.

The Proposed Action would not disrupt or divide the physical arrangement of an established community; would not cause extensive relocation when sufficient replacement housing is unavailable; would not cause extensive relocation of community businesses that would cause severe economic hardship for affected communities; would not disrupt local traffic patterns or substantially reduce the levels of service of roads serving the spaceport or its surrounding communities; and would not be expected to produce a substantial change in the community tax base.

The Proposed Action has not been determined to result in significant impacts in other environmental impact categories or result in impacts on the physical or natural environment that affect an environmental justice population in a way that is unique to that population. Additionally, the Proposed Action has not been shown to result in situations in which the spaceport-related activities would have the potential to lead to a disproportionate health or safety risk to children.

Therefore, FAA has determined that the Proposed Action would not result in significant adverse socioeconomic or environmental justice impacts or impacts to children's health and safety.

4.12.2 No Action Alternative

Under the No Action Alternative, FAA would not issue a Launch Site Operator License for operation of Spaceport Camden and no spaceport facilities would be constructed. As a result, there would be no changes to the population, employment, income, public services, and economic activity in the ROI associated with the construction or operation of Spaceport Camden.

Under the No Action Alternative, there would be no impacts to minority or low-income populations from construction or operations of Spaceport Camden, and there would be no environmental health and safety risks to children associated with the Proposed Action.

The affected environment condition of socioeconomics, environmental justice, and special risks to children would continue to be influenced by ongoing activities within the ROI now and into the future.

4.13 Visual Effects

The analysis of visual resources depends upon the visual character of the surroundings, individual viewer's perceptions and experiences, the public value or role of the affected landscape (as assessed by an authorized management entity). It also depends on a variety of other contextual factors (such as angle of observation, distance, time of day, cloud cover, atmospheric humidity, etc.).

Visual changes may cause impacts to other resources that are addressed separately, as appropriate, in their respective sections of this EIS, including Section 4.2, *Biological Resources*; Section 4.4, *Coastal Resources*; Section 4.5, *Department of Transportation Act, Section 4(f)*); Section 4.8, *Historical, Architectural, Archaeological, and Cultural Resources*; and Section 4.9, *Land Use* (i.e., wilderness resources). The visual resource analysis only briefly addresses the potential impact on these cross-cutting areas of concern.

Based on inspection of publicly available maps of state and national scenic byways, the proposed spaceport site is not visible from any state or National Scenic Byways or Trails within the designated National Trails System (NPS, 2010; Georgia DOT, 2015); therefore, these topics will not be explored further in the following sections. There are also no nearby astronomical observatories. However, the Satilla River is listed in the NRI by the NPS and visual impacts are considered in the analysis. Although not designated by Congress as a National Wild and Scenic River, the NPS requires protection of the river until its status is determined and consultation on projects that may affect outstanding natural and cultural values. Visual impacts on the river are further addressed in the analysis and in Section 4.5, *Department of Transportation*

Act, Section 4(f), and Section 4.14, *Water Resources*. Impacts to viewshed on Cumberland Island National Seashore are addressed in the analysis.

Methodology for Visual Resources

Methods developed by other land management agencies (such as the U.S. Forestry Service, BLM, and FHWA) use a systematic process to evaluate landscapes and to describe and estimate visual impacts of proposed projects and activities. These management agencies use visual quality ratings to guide decisions and actions that may alter visual character or viewsheds within their land. The basic principle of the process is to assess the visual contrast (i.e., the visibility) created between a proposed project and the existing landscape (BLM, 1986). In the analysis, the degree of contrast is measured by comparing the project features with the major features in the existing landscape. The basic design elements of form, line, color, and texture are used to make the comparison and to describe the visual contrast created by the project (BLM, 1986). Other key physical factors include distance of the changes from viewers, frequency of viewing (such as viewers on roadways commuting to work), unobstructed line-of-sight to the site from specific locations (visual access), and the value of the altered landscape or viewshed.

This assessment considers impacts to visual resources for both the construction and operational phases of the Proposed Action. The analysis follows these steps:

- Describes and locates the construction elements of the project (Section 2.1.1, *Construction – Activities and Facility Descriptions*)
- Establishes a general line-of-sight envelope to the project site in the surrounding area using terrain as the defining criteria (Section 3.13, *Visual Effects*)
- Identifies representative viewing locations based on line-of-sight analysis, land use, and accessibility of viewing locations (such as highways, campgrounds, residential areas) (Section 3.13, *Visual Effects*)
- Describes the current visual character and quality of the site and views from the surrounding areas (Section 3.13, *Visual Effects*)
- Analyzes satellite imagery (Google Earth, 2017), photography, and geometric analysis, to interpret the extent of views to the Spaceport Camden site and how these are screened or blocked by terrain, vegetation, and structures
- Identifies the visual value of the site and affected views from the surrounding area (Section 4.13, *Visual Effects*)
- Assesses the noticeability (degree of change) from the new construction at the selected locations based on contrast with the existing visual context (considering size, forms, color, texture of the new feature and the surrounding visual resources and/or visual character in the study area, size of the viewing window to the proposed site) (Section 4.13, *Visual Effects*)
- Considers how applicable State and local regulations, policies, and zoning ordinances protect against light pollution and visual changes (and whether the project changes align with these management frameworks)
- Considers visual quality of the viewshed based on designated or locally recognized visual resource values (as documented in applicable State and local regulations, policies, plans, and zoning ordinances, and public values and input)
- Identifies affected viewers, their relative numbers, and the expectations they have about their visual experience based on their activities and purposes

- Assesses the degree of impact of changes on the visual character of the viewshed and on viewers based on the sensitivity of the viewshed considering its value (above) and ability of the landscape to absorb change
- Determines the degree of impact (low, moderate, or high) based on the degree of change and the value of the affected visual resource

Visual value considers the sensitivity of representative viewsheds based on the visual character of the area, including the importance, uniqueness, and aesthetic value of the affected visual resources; ecological and cultural sensitivity; regulatory directive and management plans (such as ordinances, special land designations, and resource management goals); agency-designated visual resource values; and agency and public input expressed during scoping and EIS comment periods.

The analysis concludes with an assessment of overall impact as high, moderate, or low (minimal) at the representative observation points. Where possible, these points are used to extrapolate and describe impacts at other similar settings. Analysis considers the extent to which the Proposed Action may affect visual character and viewsheds based on their importance, uniqueness, and value; contrast with the existing visual character or resources; and block or obstruct views from other locations. Input from agencies and the public during scoping is considered in estimating the degree of impact on visual resources and from light emissions. Light pollution was the primary issue of concern for the public. The NPS noted particularly the potential effect on dark skies in proximity to the wilderness areas of the Cumberland Island National Seashore.

Methodology for Light Emissions

The evaluation considers the effect of light emissions from the project on activities in the affected area. The analysis follows these steps:

- Describes and locates the sources of lighting used during construction and operations of the spaceport, including information on the direction, type, frequency/duration, and intensity of fixtures at the site, to the extent known
- Identifies and locates light-sensitive activities and land uses near the site (such as airfields, observatories, residential areas, special management areas)
- Identifies potential conflicts between light emissions from the project site on light-sensitive human activities and uses (such as residential and recreational uses, sensitive protected areas). Impacts of light emissions on terrestrial, avian, and aquatic species are addressed in Section 4.2, *Biological Resources*. This assessment determines, to the extent possible, the degree to which the action would create annoyance or interfere with normal activities considering the intensity of the light trespass, inherent safety criteria required for other activities, and existing policies and management mechanisms for light emissions (such as local ordinances and special designations).
- Evaluates potential for light pollution in the form of light trespass, sky glow, and glare

The evaluation addresses the issue of “dark skies” and sky glow, focusing on current conditions of dark skies in the surrounding region. It identifies any specific dark sky initiatives, policies, and objectives of Federal, State, and local agencies to manage and maintain dark skies in the region. The analysis concludes with an assessment of the level of light emissions impact of high, moderate, or low, based on the degree of change and sensitivity of the area to nighttime light.

For adverse effects, the analysis identifies possible mitigation measures to decrease the impacts. These measures draw upon recommendation and guidelines from management agencies (including the NPS) and organizations such as the IDA and U.S. Green Building Council. Based on the factors above, FAA has

identified minor to high impacts associated with visual resources and light emissions under the Proposed Action as reported in the Section 4.13.1, *Proposed Action*.

4.13.1 Proposed Action

4.13.1.1 Construction

Visual Resources

This following analysis focuses on changes to the visual environment. The degree or significance of these changes depends on who or what is affected by the change. A description of the proposed construction for the spaceport facilities and infrastructure is provided in Chapter 2, *Proposed Action and Alternatives*, with maps showing the location and descriptions of the extent of each component. Essentially the proposal includes development of four complexes within the proposed spaceport site boundary, three on vegetated areas (the Launch Control Center Complex, Mission Preparation Area, and Vertical Launch Facility), and one (for the Alternate Control Center and Visitor Center) on an existing developed site. The proposed water tower and four launch pad lightning towers at the Vertical Launch Facility, at 250 feet in height, are the tallest proposed features. In accordance with FAA AC 70/7460-1L, *Obstruction Marking and Lighting* (FAA, 2016), features above 200 feet are aviation hazards and for safety purposes, require permits, markings, and continual lighting to mark their location. The tallest and largest building is the 65-foot-tall Vehicle Integration Building at the Vertical Launch Facility site. This facility would not require obstruction markings.

The County's UDC does not directly address the land use relationship between a spaceport industrial use and adjacent lands that are mostly forested, undeveloped, or rural residential (Camden County, 2014). It does require certain land uses to provide adequate separation to maintain compatibility and visual cohesion. As the zoning enforcer and proponent, the County would have responsibility for ensuring adequate landscape buffering at the site as per the Camden County UDC, Article 4, *Buffers, Landscaping, and Tree Conservation*, and for avoiding conservation land and wetlands (Camden County UDC Article 9, *Environmental Protection*). The Camden County UDC includes overlays to protect sensitive lands, including the Satilla River corridor, land bordering rivers and creeks, and wetlands. These areas have special restrictions on construction to protect their natural and visual character. Following Camden County UDC ordinances (specifically Article 9, *Environmental Protection*), the project would avoid disturbing the shorelines of Satilla River delta waterways and preserve its natural character and visual quality.

The primary focus of this evaluation is the impact on the views to the spaceport site from surrounding areas because the very limited amount of onsite viewers that work on the site would not be negatively affected by visual changes at the site. It is assumed that proposed structures and infrastructure would express the functional requirements and purpose of the spaceport and would have an industrial appearance. To assess visual changes to surrounding views, the analysis uses several representative locations to describe the current and anticipated future views. Exhibit 3.13-3 shows the location of the 15 selected representative observation points for the analysis. These points are not comprehensive but can correlate to viewing conditions for nearby locations with similar vantage point or locations with similar sensitivity to viewshed. This evaluation considers the visual effects from activities during construction and the visual effects of the facilities following construction.

During construction, typically occurring in daylight hours, additional traffic would use local roads to the site. The activity of these vehicles, particularly larger trucks, would likely be visually noticeable to local residents who are not familiar with larger commercial vehicles. This impact (and associated noise and

traffic effects) would last for about 15 months. Local drivers would likely notice the additional traffic volume, but that would not change the visual environment.

The proposed spaceport site has a history of prior industrial activity and is zoned for industrial use. While parts of the site are natural and visually harmonious, the landscape qualities are not unique or distinctive (see Table 3.13-1). Notwithstanding, industrial equipment, stockpiling areas, and the erection of large-scale facilities would contrast strongly with the surrounding vegetation and the scale of most of the residential and small community buildings in the local area.

Development of the spaceport would fall under the regulatory review of the County, and current zoning restrictions would apply. Screening from existing vegetation would mostly obstruct offsite views to the construction activities at three of the four construction project areas, as described below.

- The Launch Control Center Complex site is close to the west spaceport site boundary. The density of the existing forest along the west spaceport site boundary fence line is inconsistent. Users of the logging road along that fence line may have limited visual access to that site. Some viewers may find these visual changes undesirable, detracting from the more natural vegetated landscape.
- The Mission Preparation Area is set back from the external spaceport site boundary and not visible from any offsite locations. None of the construction activities would be visible offsite.
- Union Carbide Road leads directly to the current entry onto the spaceport site and the site for the Alternate Control Center and Visitor Center. Construction and demolition activities at this complex would be highly visible but the viewing population is relatively small, consisting of site personnel, construction workers, and travelers on Union Carbide Road. This site is surrounded by the remnants of former industrial facilities. The construction activities would conform to the highly modified surrounding visual context.
- The tallest structures are planned for the Vertical Launch Facility. The forest surrounding this site would provide partial screening, but use of tall cranes for installation of the higher elements of the site (such as the water tower and launch pad lighting system, up to 250 feet in height) would be visible above the tree canopies, particularly for persons using the adjacent waterways. Because the water tower and four lightning towers are above 200 feet high, FAA AC 70/7460-1L, *Obstruction Lighting and Marking*, and FAA AC 150/5345-43J, Specification for Obstruction Lighting Equipment, would apply. Under these ACs, these structures would require medium-intensity, flashing white light (with 360-degree horizontal and 3-degree vertical coverage, with 20,000 candela daytime/twilight intensity and 2,000 candela nighttime intensity, with 40 flashes per minute cycle). The towers may require other painted markings as well (FAA, 2015b; FAA, 2019). FAA has discretion to review the context of obstructions and make exceptions to the requirements based on achieving safety for navigable airspace at the specific location. The visibility of these construction activities may detract somewhat from the visual surroundings for some persons during the construction phase.

Upon completion of construction, impacts of new construction on views and viewsheds are summarized in Table 4.13-1 for 15 observation points. For each observation point, the table summarizes the visual quality of the view to the site, viewers, viewshed sensitivity, visual change from the new features, and overall impact. Twelve of the representative observation points have views to some part of the proposed site.

Using Google Earth satellite imagery, it was determined that most facilities on the site would not be visible, except for the tall water tower and launch pad lightning towers at the Vertical Launch Facility complex. The water tower on the proposed Vertical Launch Facility is used as the reference point in the

analysis. Viewing distances are referred to as foreground (up to half-mile from new features,) middle-ground (from half mile to about 4 or 5 miles), and background or distant (beyond about 5 miles). Vegetation would block views of proposed new buildings on the site. The lack of any substantial changes in elevation or terrain also reduces the potential for visual vantage points onto the site. Of the 15 representative observation points, 9 have at least partial views to the ground level at the proposed site (see Exhibit 3.13-3).

Table 4.13-1. Summary of Visual Impacts from Spaceport Facilities at Representative Observation Points

ID/Observation Point	Distance (miles)[1]	Future Day-time Viewshed (During and Post Construction)	Operations Phase-Launch Events and Light Emissions
1. Brickhill Bluff	5.1	Viewshed quality: Views westward moderate to high, mostly natural but lacking distinctive landforms. Viewers: NPS personnel, some residents on LCI, and park visitors and recreationists. Viewshed sensitivity: High due to protected status of wilderness area. Viewshed changes: Tall constructed elements (water tower, lighting structures at VLF) visible above treeline in middle-ground to background distance, but subordinate to the surrounding viewshed. Overall impact: Moderate to high (due to sensitivity).	Launch visibility: Rocket launch flight path highly visible overhead for short duration about once per month. Impact temporary and no lasting change to viewscape. Light emissions: Some sky glow from security and task lighting during construction and operational phase; noticeable but not glaring safety lighting on tall towers at VLF; minor but noticeable LED lighting glow from blue-rich LED fixtures at facility sites; lighting more noticeable when lights positioned to illuminate assembled rocket on launch pad and ground tasks at VLF for one or two nights (dusk to dawn) during monthly launch window. One night launch annually could have visible high-intensity LED launch pad lighting generating noticeable sky glow and potential glare spots. Presence of new visible light sources could be annoying to some distant viewers and residents accustomed to nighttime views without artificial lights in this segment of the viewshed. Sky glow effects more noticeable with low cloud cover. Less visible when foggy, high humidity. Overall impact: Moderate to high due to sensitivity of dark sky values for CUIS and wilderness.
2. Bridge to Jekyll Island	8.8	Viewshed quality: Moderate to high due to panorama vantage point, but highly modified in fore- and middle-ground, more natural character in distant views to north, west, and south, and views to ocean to east. Viewers: Relatively high volume of drivers and pedestrians crossing Jekyll	Rocket launch flight path easily visible for short duration about once per month, particularly for annual night launch. Could distract drivers. Impact temporary and no lasting change to viewscape. Light emissions: Similar to observation point 1 but less noticeable due to foreground lighting and glow,

Table 4.13-1. Summary of Visual Impacts from Spaceport Facilities at Representative Observation Points (Continued)

ID/Observation Point	Distance (miles)[1]	Future Day-time Viewshed (During and Post Construction)	Operations Phase-Launch Events and Light Emissions
		Island bridge, including local residents and tourists. Viewshed sensitivity: Moderate due to local value for landscape and tourism. Viewshed changes: Higher constructed elements visible above treeline (water tower, lightning towers on launch pad) but visually subordinate to the overall viewshed. Block-like forms of taller structures on the site may be visible but subordinate to the surrounding viewshed. Overall impact: Minor due to distance and other features human-made features in viewshed.	Overall Impact: Moderate due to modified context, and concern for driver safety.
3. Crooked River State Park	7.7	Viewshed quality: From shoreline, moderate to high views to surrounding waterways, with mostly natural settings dominated by marsh and sky, with distant treeline canopies. Viewers: Park users, residents along shoreline. Moderate numbers. Viewshed sensitivity: Moderate due to mix of natural setting with rural residential. Viewshed changes: From a shoreline position, highest towers at launch pad may be visible but insubordinate in overall viewshed. Other new facilities on Spaceport Camden masked by vegetation. Overall impact: Minor impact due to distance and narrow view to spaceport site.	Launch visibility: Rocket launch flight path easily visible for short duration about once per month. Impact temporary and no lasting change to viewscape. Light emissions: Glow from ambient LED lighting minimally noticeable due to distance and other interspersed light sources in viewshed. More noticeable during low cloud conditions. Safety lighting on tall towers noticeable from viewing points without foreground vegetative screening. Overall impact: Minor to moderate depending on viewer location and atmospheric conditions.
4. Cumberland Wharf, CUIS	3.8	Viewshed quality: Similar to observation point 1. Historic context of ruins. Viewers: Similar to observation point 1. Viewshed sensitivity: High due to historic context and CUIS values. Viewshed changes: From a shoreline position, highest towers at launch pad easily visible with contrasting form to natural elements. Noticeable (due to lighting) but not dominant in middle-ground viewshed. Top portion	Launch visibility: Similar to observation point 1. Light emissions: Similar to observation point 1. Overall impact: Moderate to high due to sensitivity and dark sky values of CUIS.

Table 4.13-1. Summary of Visual Impacts from Spaceport Facilities at Representative Observation Points (Continued)

ID/Observation Point	Distance (miles)[1]	Future Day-time Viewshed (During and Post Construction)	Operations Phase-Launch Events and Light Emissions
		of Vehicle Integration Building visible over tops of surrounding trees. Overall impact: Moderate to high due to viewshed sensitivity.	
5. Deep Water Access Dock	0.7	Viewshed quality: Low to moderate due to industrial use and existing modifications in foreground. Surrounding waterways are natural. Viewers: Dock users (including workers and sport fishing persons), nearby recreational boaters in waterways. Relatively low numbers. Viewshed sensitivity: Low due to existing modifications and uses at the observation point, low numbers of viewers. Viewshed changes: Similar to current views to west. Looking north from this location and nearby water channel, open views to foreground forest, and prominent view of tall structures at VLF and launch pad in middle-ground. Overall impact: Low to moderate due to existing modifications in immediate surroundings, low viewer numbers, and screening by foreground vegetation.	Launch visibility: Rocket launch flight path highly visible. Impact temporary and no lasting change to viewscape. Light emissions: Sky glow from spaceport sites minimal due to light dimming at night and masking by immediate lighting at the dock. LED lighting glare during pre-launch periods noticeable. Overall impact: Low to moderate due to low sensitivity but close proximity.
6. First African Baptist Church, CUIS	4.7	Viewshed quality: Moderate due to naturalness and surrounding historic structures, but limited views due to vegetative screening and local terrain. Viewers: Park users and personnel. Viewshed sensitivity: High due to CUIS and historic context values. Viewshed changes: New facilities on the Spaceport Camden site and launch site not visible from this site due to vegetation and terrain. Overall impact: Low since low visibility.	Launch visibility: Similar to observation point 1. Light emissions: Similar to observation point 1 but less noticeable due to limited view. Overall impact: Moderate due to high sensitivity but low visibility.
7. I-95 Overpass from 10th Street	10.5	Viewshed quality: Low quality viewshed due to modification to landscape by roadway. Viewers: Relatively high number of drivers. Viewshed sensitivity: Low due to transportation corridor features and	Launch visibility: Launch vehicles temporarily visible for eastbound travelers about once per month. May distract drivers causing safety concern. Light emissions: Spaceport security lights not directly visible from this location, but safety lighting on tall

Table 4.13-1. Summary of Visual Impacts from Spaceport Facilities at Representative Observation Points (Continued)

ID/Observation Point	Distance (miles)[1]	Future Day-time Viewshed (During and Post Construction)	Operations Phase-Launch Events and Light Emissions
		limited viewshed due to vegetation along roadway. Viewshed changes: Views to the Spaceport Camden site blocked by intervening terrain and trees. Highest towers at the VLF discernible but mostly unnoticeable to viewers or drivers. Overall impact: Low due to lack of sensitivity and limited view to site.	towers may be visible at night but not glaring due to distance. Sky glow from the site may be discernible depending on cloud conditions but masked by other sources of glow such as suburban glow of Woodbine and Jekyll Island. Overall impact: Low due to surrounding context.
8. Ice House Museum, CUIS	13.4	Viewshed quality: Moderate due to modifications in viewshed westward toward NSB Kings Bay and St. Marys. Viewers: park visitors and personnel. Popular area in CUIS. Viewshed sensitivity: Moderate to high, due to CUIS viewshed values. Viewshed changes: View similar to current conditions. The high tower features at the VLF site may be distinguishable above treeline on the distant horizon on clear days due to safety lighting, but minimal change in the overall viewshed quality. Overall impact: Low due to distance.	Launch visibility: Rocket launch flight path visible for short duration about once per month. Impact temporary and no lasting change to viewscape. Light emissions: Minor visible sky glow observable from this location at night when viewing the horizon in the direction of the proposed spaceport site. LED blue-rich glow tends to disperse quickly. Glow intensity for isolated light sources from this distance is likely noticeable but low. Overall impact: Low to moderate due CUIS dark sky values.
9. Lodge at Cabin Bluff	3.5	Viewshed quality: Mostly pleasing natural surrounding views, altered by forestry and some anthropogenic features (roads, utility lines); moderate quality. Viewers: Lodge visitors and staff, boaters along waterways. Viewshed sensitivity: Moderate due to modified context of the foreground area, but sensitive due to importance of context for resort ambiance. Viewshed changes: Views similar to current views from the lodge, swimming pool, and tennis courts. Tops of new water tower and lightning towers may be visible from fairways and in the nearby water channels, particularly with the safety lights at night. The Alternate Control Center and Visitor Center may be visible from some locations at the resort but not dominant given visual context has	Launch visibility: Rocket launch flight path easily visible for short duration about once per month. Temporary visual intrusion may be of interest to some lodge visitors. Light emissions: Sky glow intermittently noticeable during launch windows when lighting at VLF is operating 24x7, and when cloud cover low. Masked by lighting at the observation point site which causes measurable sky glow (see Exhibit 3.13-4). LED blue-rich lights may cause minor glare to viewers at this distance. Overall impact: Low considering lighting at the observation point would mask the effect of the spaceport lights.

Table 4.13-1. Summary of Visual Impacts from Spaceport Facilities at Representative Observation Points (Continued)

ID/Observation Point	Distance (miles)[1]	Future Day-time Viewshed (During and Post Construction)	Operations Phase-Launch Events and Light Emissions
		existing structures at the site for these new facilities. Overall impact: Low to moderate due to current context and narrow viewshed limited by foreground vegetation and structures.	
10. NPS CUIS Visitor Center (VC), St. Marys	15.7	Viewshed quality: Mixture of small town urbanscape with views to natural waterways to south around the CUIS VC. Mostly pleasing visual character. Viewers: High number of tourists and park visitors, park personnel, local residents in nearby areas. Viewshed sensitivity: Moderate sensitivity due to modified context. Does not include view to proposed spaceport site. Viewshed changes: No view to the proposed Spaceport Camden site from the CUIS VC; therefore, no change. Overall impact: No visual impact from development on the spaceport site.	Launch visibility: Launch events may be visible with unaided eye from this site once per month. Some visitors may find interest in launch events. Light emissions: Light emissions causing glare from spaceport not visible at this location. Any regional contribution to sky glow (night radiance) from Spaceport Camden would not be distinguishable from sky glow of St. Marys and other regional sources. Overall impact: Minimal direct impact from launches and light emissions due to distance and intervening light sources. May provide beneficial impact for tourists interested in viewing and learning about launches.
11. Residence west of proposed Spaceport Camden site	3.9	Viewshed quality: Moderate visual quality with natural and planted forest surroundings modified by small scale rural residential development, fences, structures, back county roads, with relatively dark sky context. Viewers: Small number of residents, Logging personnel. Viewshed sensitivity: Low to moderate due to residential use and scale. Viewshed changes: Views to the Spaceport Camden site blocked by intervening forest, but partial views to tops of tallest structures at the VLF above treeline from some viewing locations without foreground vegetation. Small viewshed to impacting features. Overall impact: Minor to moderate due to limited viewshed, but residential sensitivity.	Launch visibility: Rocket launch flight path highly visible for short duration about once per month. Augmented by accompanying noise. Only temporary change in visual context. Light emissions: Sky glow from ambient lighting at spaceport site, particularly during launch windows, dependent on weather and atmospheric conditions. Glare possible from launch pad lights depending on position of lights and shielding. Overall impact: Minor day-to-day operations, but moderate during launch windows due to proximity and intrusion on rural residential context.

Table 4.13-1. Summary of Visual Impacts from Spaceport Facilities at Representative Observation Points (Continued)

ID/Observation Point	Distance (miles)[1]	Future Day-time Viewshed (During and Post Construction)	Operations Phase-Launch Events and Light Emissions
12. River Oaks at Harrietts Bluff	6.6	Viewshed quality: Moderate visual quality; park and residential areas mixture of natural forest and small-scale rural enclaves, generally appealing but typical surrounding coastal and estuarine visual character; views over natural waterways from shoreline pleasing quality. Viewers: Residents, park visitors, recreationists, boaters in waterways. Viewshed sensitivity: Low to moderate due to overall natural qualities but context modified by shoreline homes and infrastructure. Viewshed north toward site limited window Viewshed changes: Similar to observation point 11. Spaceport features in background, subordinate to view. Overall impact: Minor to moderate due to residential sensitivity but limited background views.	Launch visibility: Rocket launch flight path easily visible for short duration about once per month. Short duration and temporary visual intrusion. Light emissions: Glow and glare from spaceport lighting minor depending on atmospheric conditions, masked by local sky glow from surrounding context of NSB Kings Bay and minor ambient lighting from shoreline residences. Overall impact: Minor due to distance and limited view to spaceport site.
13. Satilla River Marsh Island SNA	2.0	Viewshed quality: High due to natural, quiet surroundings, riparian habitat and wetlands and tidal marsh. Viewers: Boaters, recreationists, naturalists, bird watchers, low to moderate numbers. Viewshed sensitivity: Moderate to high due to the mix of rural development with the natural surroundings and sensitive ecology, NRI and local conservation status of Satilla River and the SNA. Viewshed changes: Tall elements at VLF easily visible from this location when looking toward the site, and along the Satilla River, St. Andrews Sound, Todd Creek, Floyd Basin and Floyd Creek. Lack of nearby tall foreground vegetation in most locations. Overall impact: High due to visual sensitivity.	Launch visibility: Launch operations highly visible, but observers not allowed in the OEZ (see Section 2.1.2.5, *Pre-Launch Activities*). Temporary visual intrusion. Light emissions: Light emissions from security and task lighting at VLF prominent at nighttime during launch windows (once per month), and annual night launch contribute to local sky glow and glare in some locations. Day-to-day lighting minor due to dimming at night. LED lights and sky glow may impact wildlife and estuarine species circadian rhythms and processes. Most river viewers not present at night when lighting most apparent. Overall impact: Lighting impacts moderate to high due to sensitivity of protected waterways.
14a. Structure Little Cumberland Island	5.7	Viewshed quality: Moderate to high, views over ocean and surrounding natural dunes and coastal island	Launch visibility: Rocket launch flight path highly visible for short duration about once per month.

Table 4.13-1. Summary of Visual Impacts from Spaceport Facilities at Representative Observation Points (Continued)

ID/Observation Point	Distance (miles)[1]	Future Day-time Viewshed (During and Post Construction)	Operations Phase-Launch Events and Light Emissions
		habitat. Few human intrusions except for home sites. Viewers: Residents (seasonal and permanent). Viewshed sensitivity: Moderate due to sensitivity of residential use and coastal protection values of local population and CUIS. Viewshed changes: No visible changes as viewshed to the Spaceport Camden site blocked by intervening forest and terrain from east side of LCI and (and CUIS). Overall impact: Minimal due to lack of visibility from east side of outer islands.	Light emissions: No direct visual access to view of spaceport site lighting, but minor sky glow may be visible to west during some atmospheric conditions, similar but less intense than glow from Jekyll Island and other intermittent pockets of rural development along the coast. Overall impact: Minimal impact due to orientation of viewshed from east coast of outer islands.
14b. Northwest Shoreline of Little Cumberland Island	4.7	Viewshed quality: Similar to observation points 1 and 4. Views westward moderate to high quality, mostly natural but lacking distinctive landforms. Viewers: Some residents, CUIS visitors and personnel. Viewshed sensitivity: High due to CUIS values. Viewshed changes: From an unobstructed shoreline position, highest towers at launch pad easily visible with contrasting form to natural elements. Noticeable (due to lighting) but not dominant in middle-ground viewshed. Overall impact: Moderate to high due to viewshed sensitivity.	Launch visibility: Similar to observation points 1 and 4. Light emissions: Similar to observation points 1 and 4. Overall impact: Moderate to high due to sensitivity and dark sky values of CUIS.
15. Residence on Dover Drive	5.1	Viewshed quality: Viewshed to site mostly natural, but surrounding context modified by small-scale rural residential development. Viewers: Rural residents, tourists, drivers. Viewshed sensitivity: Moderate to high due to residential-scale development along the protected Satilla River corridor. Viewshed changes: Views to south similar to current view but with tall structures on VLF visible but	Launch visibility: Rocket launch flight path easily visible for short duration about once per month, but temporary intrusion. Light emissions: Similar to observation point 11, but more LED glare from lighting at VLF due to less obstructed views. Overall impact: Minor day-to-day operations, but moderate during launch windows due to proximity and intrusion on rural residential context.

Table 4.13-1. Summary of Visual Impacts from Spaceport Facilities at Representative Observation Points (Continued)

ID/Observation Point	Distance (miles)[1]	Future Day-time Viewshed (During and Post Construction)	Operations Phase-Launch Events and Light Emissions
		subordinate to overall view due to distance and vantage point. Overall impact: Moderate due to sensitivity of the Satilla River corridor, but more distant views from residences.	

Notes: CUIS = Cumberland Island National Seashore; LCI = Little Cumberland Island; LED = light-emitting diode; NPS = National Park Service; NRI = National River Inventory; SNA = State Natural Area; VC = Visitor Center; VLF = Vertical Launch Facility.
[1] Measured from observation point to proposed VLF water tower site.

Some views to the site from offsite locations are more sensitive to visual change than others. Sensitive viewing locations include the local waterways because the views tend to be less obstructed and users frequently value the natural surroundings. From the historic lighthouse on Little Cumberland Island, viewers would be able to see the light from the lightning towers approximately 6.6 miles to the west on a clear night. These would be a new point source in the night sky, similar to others closer to the lighthouse to the north. The towers would likely be unnoticeable in the daytime due to atmospheric moisture and distance. Other facilities at the spaceport would be essentially indistinguishable to most viewers. Residential areas are sensitive to industrial-scaled development and to intense lighting levels. Views from parks and protected wilderness of the Cumberland Island National Seashore are also sensitive to visual changes that degrade the quality of viewsheds. An evaluation of impacts on wilderness values is provided in Section 4.9, *Land Use*.

The following paragraphs provide a more detailed description of the current and anticipated visual conditions and viewsheds from the selected observation points. This evaluation assumes viewers with average visual acuity and relatively clear conditions (unobscured by fog or mist). The impact of light emissions and rocket launches in the operational phase are included in Table 4.13-1. However, except for the Cumberland Island National Seashore Visitor Center (observation point 10), the discussion of launch and light emissions impacts is discussed separately, in Section 4.13.1.2, *Operation* (Visual Resources). The following discussion for the 15 observation points focuses on impacts to viewsheds resulting from physical development of the proposed spaceport facilities.

Brickhill Bluff is an accessible viewing location on the west shore of Cumberland Island with direct line-of-sight to the proposed Spaceport Camden. Foreground views are dominated by water and salt marsh, low-lying landscape with a line of distant forest canopies bordering the marshland. This location is within the Cumberland Island National Seashore wilderness, so the viewshed sensitivity is high. The NPS would consider the viewshed an important attribute for visitors who come to the island to enjoy the pristine wilderness experience. From this location and along the western shoreline of the island, the launch pad lightning towers and water tower would be visible, rising above the surrounding forest on the Spaceport Camden site. These features would contrast with the background sky, surrounding water, and horizontal bands of vegetation (similar to the view looking westward in photograph J). At a distance of about 5 miles, these upright elements would be moderately noticeable because they contrast with natural features and the sky. They also would have hazard markings and lighting to increase their visibility. Nonetheless, they would occupy a very small area in a viewer's cone of vision and viewing plane, low on the horizon. Although visible, they would not dominate the viewshed and would mimic the forms of other tall towers in the viewshed, such as cellular towers, the closest of which is situated at Harrietts Bluff

(CellReception, 2017). The overall impact on the viewshed is estimated as moderate due to the sensitivity of the wilderness viewshed.

Bridge to Jekyll Island is selected because it has a slightly elevated vantage point compared to most locations in the surrounding area. From this position, travelers can see developed areas on either side of the bridge on Jekyll Island and wide views to the southeast in the direction of the project site. The Spaceport Camden land may be visible but not distinguishable from other surrounding forested areas for most viewers. The viewshed is open to the south over the inland waterways and marshland west of Cumberland Island. The tops of the higher constructed Spaceport Camden elements (the water and lightning towers at the Vertical Launch Facility) may be visible, but subordinate to the overall viewshed, due to vegetation masking and distance. Locations like this have a higher volume of viewers, including tourists that expect attractive surroundings; therefore, the viewshed sensitivity is moderate. Overall, the visual impact is low due to the distance from the site and other human-made features in the foreground viewshed.

Crooked River State Park. Views to the Spaceport Camden site are limited from this State Park and shoreline residences in the vicinity due to intervening terrain, forests and developments. The view northwards is over low-lying marshland and water, with moderate viewshed sensitivity due to the mix of naturalness and rural residential features. The tops of the tallest new structures at the Vertical Launch Facility may be visible but subordinate to the overall view. Vegetation, structures and terrain would limit the size of the viewshed toward the site. The proposal would have minimal impact on the visual surroundings from this location and other similar locations along the east shore of the mainland south of the proposed Spaceport Camden site (see discussion below for River Oaks at Harrietts Bluff).

Cumberland Wharf, within the Cumberland Island National Seashore, is co-located near ruins and lies just outside the wilderness boundary. The viewshed sensitivity from this site is high, but not as high as from locations within the wilderness. The views from this site are similar to those described for Brickhill Bluff, although the wharf is 35 feet high, which gives a viewer a vantage point over intervening vegetation at the site and the distant shore, providing a line-of-sight to the top of the Vehicle Integration Building on the Spaceport Camden site. Because this location is closer to the proposed Spaceport Camden site, the visibility of the tall towers would be greater, although not dominant in the viewshed. Hazard lighting on the new towers would make it more of a visual focal point, however. Isolated residences on the west shore of Little Cumberland Island would experience similar views. Overall, the visual impact on the viewshed is moderate to high due to viewshed sensitivity.

Deep Water Access Dock is on the edge of the proposed Spaceport Camden site along Floyd Creek. The dock would continue to support industrial uses at the site with deliveries of materials and launch vehicle components, but no physical changes are proposed. Looking west from the dock, former facilities and power lines are highly visible, surrounded by a backdrop of forest in foreground. To the north, viewers see the edge of forest, mostly planted pines. The forest blocks views to the proposed Vertical Launch Facility site, but after construction, the tall lightning towers and water tower at this complex would be highly visible from the dock (see Exhibit 2.1-2 and Exhibit 2.1-9 for the location) and locations along Floyd Creek and the Intracoastal Waterway farther east. The industrial features would contrast with the environment preferred by area visitors for recreation on the waterways. Considering the mixture of uses at this observation point, the visual intrusion of the new towers would conform to current anthropogenic features, but the change to the viewshed would be highly visible and contrast with the existing viewshed. Overall, the impact on views at the dock and nearby waterways are estimated as low to moderate due to relatively low numbers of viewers, existing modifications, and foreground screening vegetation.

First African Baptist Church on Cumberland Island is surrounded by mixed forest with variable density of understory vegetation that blocks views of the Spaceport Camden site. Due to the historic context, the

viewing sensitivity at this site is high. However, new facilities at the proposed spaceport would not be visible to viewers from this location. Overall the visual impact at this site and other locations on Cumberland Island away from the shoreline is low because views of the spaceport site are blocked by terrain and vegetation.

I-95 Overpass from 10th Street is a typical road in the surrounding area. In Exhibit 3.13-1, photograph M shows how bordering forests and vegetation limit the area visible to travelers along most roadways. Vegetation close to the viewer obstructs more of the viewer's cone of vision than when vegetation is farther from the viewer. There may be direct line-of-sight from some southbound-oriented locations along I-95 from which the tallest structures on the proposed site (lightning towers with hazard lights and water towers) could be visible if the viewer/driver looked to the east. The viewshed sensitivity is relatively low, as the roadway modifies the natural context. At this location, there are no views to the proposed Spaceport Camden site. Consequently, the visual impact from this location and most roadways in the area is low.

Ice House Museum on Cumberland Island, and nearby ferry dock for visitors to Cumberland Island National Seashore, has wide open views to the north and northwest over the salt marshes and water channels of the inner coastal shorelines. The viewshed sensitivity from the Cumberland Island National Seashore is high since visitors expect to find natural surroundings that are dominated by nature and some historic features. The proposed Spaceport Camden site is situated in the distance, but the forested edges of the site would not be distinguishable from the overall low-lying band of forest canopies surrounding the marshlands along the edges of the mainland. After construction, the tallest towers on the site may be discernable if a viewer knows where to look, but the towers would have little impact on the viewshed. Overall, the visual impact of the spaceport development is estimated as low due to distance.

Lodge at Cabin Bluff is a resort situated on the edge of the Intracoastal Waterway, due south from the proposed Spaceport Camden and Vertical Launch Facility. From the main lodge area, trees block views looking north towards the proposed Spaceport Camden. From the open fairways on the golf course and out in the waterway, a viewer may see the forest edges on the Spaceport Camden site. The viewshed sensitivity is moderate to high in this natural or landscaped setting where visitors expect attractive surroundings. After construction, viewers would likely be able to see the upper part of the tall towers on the Vertical Launch Facility from some locations at the resort, but forest vegetation would block views of most of the facilities. The proposed Alternate Control Center and Visitor Center, at the entry to the spaceport facilities may also be visible from some locations. This facility is designed with an industrial and technological appearance that displays the spaceport image. Overall, the viewshed impact is low to moderate due to current context and the narrow viewshed, limited by foreground and middle-ground vegetation and structures.

NPS Cumberland Island National Seashore Visitor Center has no visual line-of-sight to the proposed Spaceport Camden site. Due to distance, vegetation, and intervening development, views to the site are blocked. Visitors may catch glimpses of launch events if directed where to look. Motion of the launch vehicle may assist in locating the launch trajectory. Launches may not be visible from distant locations during dense fog or low cloud cover conditions. Launch events may be of interest to many visitors and not perceived negatively. For some tourists and park visitors, viewing launches may provide a beneficial educational benefit, unique to the southeastern coastal region.

Residence west of proposed Spaceport Camden site is relatively close to the proposed Spaceport Camden site and is representative of typical views from residential enclaves in the area. The viewing experience from this site is similar to the Cabin Bluff site. The viewshed is mostly natural vegetation intermixed with planted forests, with clearing for rural residential enclaves. Forested lands provides a visual buffer, but where trees are cleared, a viewer may have line-of sight to the forested edges of the Spaceport Camden

site. This location is relatively close to the proposed Spaceport Camden, and taller structures at the Vertical Launch Facility would likely be visible above the surrounding forest and contrast with the forest and scale of rural residential structures. Views would likely be narrow and intermittent due to the pattern of forest in the surroundings. Overall, minor to moderate visual impacts are anticipated for this location and other local residents to the west and south of the spaceport site.

River Oaks and State Park at Harrietts Bluff, located to the south, would limit visual access to the Spaceport Camden site. Most of the residences in this location have views to the south, rather than to the north, due to masking by surrounding vegetation. The visual setting is pleasing with a mixture of natural vegetation, waterways, and residences along the shoreline. The visual context at this location reflects transition from rural to suburban, with cellular towers and small commercial enclaves. The viewshed sensitivity is low to moderate due to the presence of anthropogenic features. Overall, the visual impact at the location is minor to moderate due to limited background views of the site and existing modifications to the landscape.

Satilla River Island Marsh State Natural Area is very close (about 2 miles) to the Vertical Launch Facility site with low-lying marsh in the foreground, allowing relatively wide unobstructed views from the shorelines of the island. This site represents conditions along the Satilla River delta and other smaller waterways adjacent to the north of the spaceport site boundary. The context is visually sensitive to change due to its naturalness and protected status as a State Natural Area, NRI-listed river, and conservation status in the Camden County UDC. The foreground vegetation is relatively low, allowing high visual access to the edges of the Vertical Launch Facility site from the viewers on the island, boat operators along the Satilla River, Floyd Cut and Floyd Creek, and viewers along the shores of these waterways. Forest around the Vertical Launch Facility site would screen most of the facilities, but the tall towers would rise visibly above the tree canopy. These towers would contrast strongly with the natural setting. Overall, the visual impact at this observation point and along the nearby waterways is high due to its sensitivity and proximity.

Structure on Little Cumberland Island (east shore) has wide views over the ocean and foreground natural setting of the island, but no line-of-sight to the proposed Spaceport Camden site. The proposed spaceport facilities would have no impact on viewing locations on the east side of the island or Long Point on Cumberland Island National Seashore.

The northwest shoreline of Little Cumberland Island is within the Cumberland Island National Seashore but outside the wilderness boundary. Several residences are located along this shoreline and are generally set back from the shore and surrounded by low coastal forest vegetation. Along the shore, viewers have open views westward over the Intracoastal Waterway to salt marshes and forests surrounding the proposed Vertical Launch Facility site. Vegetation would largely block views of the buildings. However, the tall structures (water tower and lightning towers) would be visible, mostly at night due to the hazard lighting on these structures. These features would contrast with the current natural conditions of the mainland shoreline. Persons familiar with the view would notice the new structures, but the structures would not dominate the view. Due to distance and atmospheric conditions, the hazard lights would not cause glare at locations along the northwest end of Little Cumberland Island. Similarly, from the historic lighthouse on Little Cumberland Island, viewers would be able to see the light from the lightning towers approximately 6.6 miles to the west on a clear night. These would be a new point source in the night sky, similar to others closer to the lighthouse to the north. The towers would likely be unnoticeable in the daytime due to atmospheric moisture and distance. Other facilities at the spaceport would be essentially indistinguishable to most viewers. Overall, the visual impact from the northwest side of Little Cumberland Island on the viewshed is moderate to high due to viewshed sensitivity.

Residences on Dover Drive north of the Satilla River, have unobstructed views across the Satilla River and low-lying, salt marsh and estuarine wetlands to the Spaceport Camden site. Due to a lack of any appreciable elevation along the shoreline, current views towards the site are limited and forest hides most of the industrial features of the site. This would be similar after construction of the spaceport facilities, except for the tall towers and lighting at the Vertical Launch Facility. These would be prominent at locations with unobstructed views, particularly due to their markings and lights. This situation would be typical for several viewing locations to the north of the Spaceport Camden site on Piney Bluff and along the Satilla River. Because the current context combines rural residential development and the natural context of the protected Satilla River corridor, the viewshed sensitivity is moderate to high. Overall, the visual impact is moderate due to the distance from the site and existing modifications in the foreground residential enclaves.

As noted above, the spaceport facilities would contrast strongly with the surrounding vegetation. Solid block massing of the buildings and the tall linear forms of the water tower and lighting structures at the Vertical Launch Facility would contrast with surrounding vegetation and would dominate the visual setting at each of the four discrete functional areas within the spaceport site boundary. Appropriate peripheral landscape buffering as required by the County would limit the visibility of most facilities from the landside of the site. Many visitors to the site may experience the visual aspect of the spaceport positively due to the scientific and educational context.

Although there is mostly adequate vegetation to screen most of the proposed new facilities, future development around the spaceport may result in clearing of forests. It is recommended that the site development plans for each complex within the spaceport site provide a solid border of tall trees and suitable understory to ensure a visual barrier to offsite viewers and activities (see mitigations in Section 6.13, *Visual Effects*). This would reduce incompatibility between existing and future land uses, particularly residential areas. This would also conform to the intent of the County's Ordnance for maintaining attractive vegetated separations between industrial and other sensitive uses. It would also benefit site security by reducing visual access to the site.

Overall, daytime views to the site are blocked by intervening vegetation and in some cases, minor undulations in the terrain. Several shoreline locations (without nearby vegetation blocking the view) have visual connection to the edges of the site but not the facilities within the site due to peripheral trees and forest. Exceptions are the tall water and lightning towers at the Vertical Launch Facility that would be visible from many locations. These features would range from highly to minimally noticeable depending on the distance to the viewer and the size of the viewer's unobstructed cone of vision. Views from nearby residences and waterways nearest the Vertical Launch Facility site have the highest potential for visual impact from changes to the visual character from these features. It should be noted that weather and atmospheric conditions (cloud cover, humidity) have a marked effect on visibility in the coastal southeast region. Views and visibility are frequently obscured by these physical conditions.

Light Emissions

During construction, the majority of activity would occur during the day. Some construction may occur at night, particularly during the shorter daylight hours in the winter. However, this would be an infrequent and temporary occurrence and not typical of normal construction activities. Infrequent tasks undertaken at night would require illumination. LED lighting for these tasks may be noticeable, particularly if there is low cloud cover reflecting the light from the work site, causing localized sky glow. More discussion of light emissions impacts follows in Section 4.13.1.2, *Operation*. For most of the construction sites on the proposed Spaceport Camden site, vegetation would screen any light or direct glare from neighboring properties. To ensure this, a Light Management Plan (developed by the construction contractor) should specify lighting types and appropriate directional controls, lighting types, and dimming mechanisms to

minimize unnecessary light and light trespass outside of the Spaceport Camden site. This is included as a mitigation measure in Section 6.13, *Visual Effects*. The NPS, FAA, and the County should approve this lighting plan. Overall, only minimal light emissions impacts on human activities and uses are anticipated during the construction phase.

4.13.1.2 Operation

Visual Resources

As described for the construction phase of the Proposed Action, offsite viewers would have limited views into the functional areas due to intervening forest and vegetation. Day-to-day activities at the ground level would be mostly unviewable except for the Alternate Control Center and Visitor Center at the entry to the proposed spaceport. In accordance with County ordinances, the spaceport site development would incorporate suitable buffering landscaping where the existing vegetation is not adequate to screen the facilities from offsite areas (see Section 4.13.1.1, *Construction*).

Site personnel would continue to augment traffic on local roads. While added traffic may annoy some local residents, it would not modify the visual surroundings.

Launch operations would be visible in the surrounding areas due to the high altitude of the airborne components, above the elevation of any vegetative screening in most situations. Table 4.13-1 summarizes the visibility and visual impact of launch events at the 15 representative observation points. Due to their altitude, sound, and motion, launches would be visible from most local areas if the viewer is facing toward the trajectory pathway. The trajectory to the east would result in only a short window during which a launch vehicle is visible. These operations are temporary and sporadic and would not change existing landscapes; therefore, they would not cause permanent visual impacts. The occurrence of a launch is inconsistent with wilderness values for naturalness and lack of any imprint of humans. However, launches would not cause any lasting imprint or permanent impairment to the Cumberland Island National Seashore (observation points 1, 4, 6, and 8). The associated issues for wildlife, coastal zone lands, historical resources on Cumberland Island National Seashore, and park visitors are addressed in the appropriate resource sections of this EIS. As with viewsheds, weather conditions (low cloud cover, fog, and high humidity) could partially or totally obscure the visibility of a rocket trajectory soon after lift-off.

The launches would be highly visible from most residences in the vicinity (observation points 3, 11, 12, 14, and 15) of the Vertical Launch Facility, particularly on Piney Bluff (observation point 15) and Jekyll Island (observation point 2). As described above, these would occur sporadically and not impair the landscape. These operations would be infrequent and cause no long-term change to views in the area. The temporary visibility of the rocket launch contrasts with the normal aspect of the sky and is identified as an impact. Some viewers would find this impact adverse to naturalness in this sensitive coastal area. Other viewers would find the events visually spectacular on an occasional basis and perceive them positively.

Of more concern is the potential for a launch event to startle or distract someone from a particular activity, such as driving on local roadways or working on a crane. Startle effects from witnessing a launch without prior expectations are usually a response to noise, but may have a visual component as well. Appropriate signage (with warning lights) along local routes and I-95, notices in local media, and published schedules of launch events can provide warning to drivers, local residents, and visitors in the area to minimize startle effects and distraction.

For some persons and visitors to the area, launches could generate positive responses. Tourists and Cumberland Island National Seashore visitors may have an interest in viewing these intermittent events. Providing designated observation points to view launches could bring educational and scientific opportunities to the public. This can have associated economic benefits as well.

Light Emissions

Light emissions can cause glare and sky glow. Glare from unshielded or misdirected light sources, whether direct or reflected, is rated as blinding (as the sun), disabling, or discomforting. Sky glow, caused by reflected light from illuminated surfaces or upward directed light, is reflected back to the earth. Sky glow is seldom described as uncomfortable, but it can cause indirect effects that are bothersome and potentially unhealthy. Human exposure to artificial light at night has been linked to disruption of natural circadian rhythms, suppression of melatonin, and sleep disturbance. In the human body, melatonin has been shown to induce sleep, boost the immune system, lower cholesterol, and help the functioning of several glands. Most research indicates that exposure to light in the blue spectrum is the most disruptive (IDA, 2020).

As described in Chapter 2, *Proposed Action and Alternatives*, the four complexes would have area lighting (for parking areas and pathways) and security/perimeter lighting. All external lighting would be LED lighting. For typical non-launch weekday operations, external lighting would go into dim mode after 9:00 p.m., and security lights would only illuminate when triggered by a security alert after 9:00 p.m. The site operator would consider using smart lighting measures to the extent practical and safe for spaceport operations. For this evaluation, it is assumed that for launch operations, external lighting may be active from dusk until dawn due to the potential for three-shift operations at all four facilities. This could happen for one or two nights each month. During launches, area floodlights may be used at all four complexes but would be dimmable when appropriate. During a launch event, lighting at the launch pad is a matter of safety and security, so safety rather than conservation would govern their use. As mentioned in Section 2.1.1.6, *Infrastructure*, although dimmable, floodlighting at the launch pad would not meet new IDA guidelines for blue-rich LED white lighting (IDA, 2016). In addition to functional lighting, the tall water tower and lightning towers over 200 feet in height would have markings and lighting to identify them as aerial obstructions. These lights would operate at all times. Additional parameters for site lighting are described in the Biological Assessment provided in Appendix A. A Lighting Management Plan will detail 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. These measures, identified during consultation with USFWS, would minimize glare and sky glow, reducing impacts on human and animal receptors (i.e., marine, terrestrial, and avian species).

Sky Glow. As previously described, sky glow results from illuminated surfaces reflecting up into the atmosphere. This means that all the area lighting is a potential light source for sky glow. Dimmable fixtures and shut-off mechanisms would help to minimize the light intensity and duration of light emanating upwards on normal (non-launch) nights. However, night radiance is generally measured as an average over a period of time, so that lights during launch windows would contribute to Spaceport Camden's sky glow footprint. Currently, the site has very low nighttime radiance. Nearby locations within the rural setting are already producing radiance footprints (see Exhibit 3.14-4) within a couple of miles of the site (see Section 3.13.3, *Existing Conditions*, and Exhibit 3.13-4). It is likely that the Spaceport Camden would produce visible and measureable radiance during the operational phase to the degree that it would measure above low on a nighttime radiance map that averages radiance data from satellite imagery over time, such as the one in Exhibit 3.13-4.

For offsite viewers, sky glow from the site or other urban areas may appear as isolated brighter areas on the horizon or in the sky canopy, with darker areas in between. This change would also likely appear as a new, measureable, low-intensity spot location on night radiance maps, surrounded by existing darker areas. The amount of luminescence from the proposed site would likely be visible but not as bright as from some of the larger urbanized areas along the seashore. From any viewing location, sky glow is

augmented under certain weather conditions (such as low cloud cover) because light is reflected by cloud and water particles in the atmosphere and is more visible than dispersed light that does not reflect off a surface. In the past, the proposed site contributed to local sky glow from onsite manufacturing facilities and activities, as addressed in Section 5.3.13, *Visual Effects*; however, the current context at the site is relatively dark, so that new light sources would appear as a noticeable change in current nighttime radiance level from the site. This would range from minor to moderate depending on the distance of the viewer and humidity and cloud conditions.

Sky glow is likely less annoying to nearby residents than glare but would contribute to the eroding dark skies in the region. The impact on dark skies would range from low to moderate in the local area, depending on factors such as the frequency of launch events, distance of the viewer, type of light fixture, atmospheric haze, or cloud cover. Sky glow effects would be greatest during infrequent nighttime launches and augmented by cloudy conditions. Many local residents value the quiet and dark surroundings that still exist in the rural coastal areas of Georgia. Also, dark sky is a value promoted by the NPS management policies. The depletion of darkness in the night sky is at odds with wilderness values and the NPS responsibility to keep the imprint of man to a minimum. Hazard lights on the proposed lightning towers and occasional use of lighting at the launch pad in preparation for launches and during night launches would be visible from Cumberland Island National Seashore, but would not likely cause the degree of sky glow as from built-up locations in the region. These lights may contribute a minor amount to regional sky glow and would be visible as distant point sources in the dark skies. Although the lights would be visible and annoying to some viewers in wilderness settings and to residents familiar with the viewshed, they would not likely cause severe impairment to dark skies.

Overall, sky glow could cause low to moderate impacts to the sensitive dark sky character of sensitive and protected coastal areas and low impacts for the rest of the surrounding region. Effects of light emissions on terrestrial, aquatic, and avian wildlife is addressed in Section 4.2, *Biological Resources*.

Glare. The area lighting at the four facility enclaves at the proposed spaceport may be on (without dimming) from dusk to dawn for about one to two nights per month as part of pre-launch activities (for an estimated 12 to 24 nights per year). Most of the site's outdoor lighting would not be directly visible offsite due to surrounding barriers of vegetation that is higher than the near-ground level fixtures, structures, and distance. However, residents in nearby locations may be annoyed by the glare of the Vertical Launch Facility's high-wattage LED lighting and hazard lights on the lightning towers. The spaceport would use FAA-compliant lighting fixtures for tall structures that would meet safety specifications to minimize hazards to airborne navigation systems. Direct glare is incompatible with some activities such as driving and aviation, depending on the intensity and precise location of the viewer. The impact of glare could range from disabling to discomfort for the affected person. Glare can be more disabling for older viewers (or drivers) since retinal light scattering increases with age, making it more difficult to discern objects. Light trespass in the form of direct glare on surrounding properties could cause annoyance, particularly if it interfered with daily activities such as sleeping and use of outdoor areas. Direct glare would be visible from the Cumberland Island National Seashore wilderness, but at much lower intensity due to the distance from the light source and atmospheric absorption and scattering of light. High intensity LED lighting, especially at the launch pad, would only operate during launch windows, sometimes for up to a few days, but likely not more than a couple of nights each month.

A report published by the IDA on the effects of blue-rich white outdoor lighting describes how glare from LED lighting can produce feelings on a spectrum of discomfort. Individual responses may range from mild, where a viewer may blink or avert their gaze, up to disability from blinding glare that reduces visual performance (IDA, 2010a). Commonly noticed by most persons in the new blue-light headlights, sources of intense light in the 350 to 450 nanometers range can be uncomfortable and cause physical impacts on

the lens of the eye that cause it to fluoresce, resulting in a veiling luminance within the eye, reducing visual acuity (IDA, 2010b). In this case, it is expected that the viewer would also avert their eyes or fixate on the glare source. This response can be more exaggerated in aging eyes and, therefore, older drivers and viewers are more adversely affected. This impact on vision is a safety concern for drivers. This ocular effect would also inhibit a person's ability to observe their surroundings and viewsheds. Viewers at some locations in close proximity to the Vertical Launch Facility (up to 2 or 3 miles) where there is no intervening vegetation could experience these effects from a direct source of glare from the spaceport site (if unshielded). While residents can avert their eyes from the glare source, drivers or navigators may be at risk if blinded by high wattage white LED lighting. Nonetheless, this impact could adversely affect some residents in the area. Visual barriers (screens or vegetation) close to the affected locations could provide the most effective method for managing direct glare. Since the impact is very site and context-specific, it is difficult to identify the exact locations where the impacts may occur. In addition, use of IDA-approved LED fixtures with the "Fixture Seal of Approval" and color temperature no higher than 3000 Kelvins is a recommended mitigation measure (see Section 6.13, *Visual Effects*).

Both exterior and indoor lighting can create glare that attracts birds, causing collision with glass surfaces of buildings. Conditions for bird collisions are highest during bird migration season in spring and fall, and more pronounced for tall buildings. Lighting for onsite buildings and infrastructure will comply with the Lighting Management Plan. Bird collision impacts are addressed in more detail in Section 4.2, *Biological Resources*.

In addition to the measures proposed to minimize light emissions in Section 2.1.1.6, *Infrastructure*, and the Biological Assessment provided in Appendix A, additional mitigation measures are proposed in Section 6.13, *Visual Effects*, including the preparation of an Artificial Light Management Plan (ALMP) by the site contractor that covers all the construction and operational activities, light fixtures and luminaires, and lighting controls at the site. This plan should undergo approval by relevant agencies, (e.g., NPS, FAA, USFWS, and the County) and use of Fixture Seal of Approval approved fixtures that meet the IDA standards for outdoor LED lighting (IDA, 2015). The proponent could also commit to a commissioning process to initially and periodically review all lighting equipment to ensure it is functioning according to specifications and monitor actual performance. This should occur on a regular basis. During this process, the site manager can incorporate adjustments into the plan using input from data collected onsite and input from other agencies and the public. The U.S. Green Building Council LEED® program has developed methods and integrative process for the commissioning of facilities. The ALMP would include a LEED®-type commissioning process with regular evaluation and monitoring (see Section 6.13, *Visual Effects*).

Glare can also reflect off new buildings such as the Launch Control Center Complex (Exhibit 2.1-6) and Alternate Control Center and Visitor Center (Exhibit 2.1-7) that are depicted with large glazed exterior window walls. The former building is mostly screened by forest vegetation, but the latter is planned for a more open site. At certain times of day, these surfaces may reflect light. Depending on the orientation of these facilities, some viewing locations offsite may experience glare from these structures at certain times of day. To reduce this glare, non-reflective coatings, slight angling of the exterior panels, and use of shading systems with tracking devices can minimize glare and also help control bird strikes.

Overall, glare from nighttime lighting could have high, localized effects for viewing locations with unobstructed views to site, particularly in the foreground and middle-ground distance. These are most critical where they could impair task safety such as driving and boat/vessel operations along the Intracoastal Waterway. Similarly, glare reflected off large glazed panels on buildings could cause glare at certain times of day for specific viewing locations. Mitigation measures to address these impacts are described above and in Section 6.13, *Visual Effects*.

4.13.1.3 Launch Failures

Types of launch failures and their likelihood of occurrence are discussed in Section 2.1.2.7, *Launch Failures*. Launch spectators would witness a highly visible cloud of fire, smoke, and steam. The size, height, and duration of this fireball would depend on the nature of the catastrophic failure. A smoke plume could form and drift from the site depending on the speed and velocity of wind. In all cases, the visual effect from this event would be short term. The spaceport operator would immediately manage the recovery of all offsite (and onsite) debris, leaving no long-term visible evidence of the launch failure. Revegetation of any vegetation lost near the launch failure location would follow as soon as feasible after the event. Overall, a launch failure would cause immediate visual impact, ranging from low to high depending on the scope of the failure, the distance of a viewer, and the presence or lack of intervening visual obstructions (terrain or vegetation). Long-term visual impacts would not be anticipated from a launch failure event. Emergency and contingency planning and response measures would serve to minimize potential adverse impacts, and emergency consultation with regulatory agencies (e.g., USFWS, Georgia SHPO, USACE, etc.) would be required should a launch failure result in impacts to sensitive resources.

4.13.1.4 Summary

Overall, adverse visual impacts, ranging from low to high, may result from the visible changes from construction of new facilities and light emissions at the proposed Spaceport Camden. The completed facilities would mostly be screened and not visible from most offsite locations except at the main gate and Alternate Control Center and Visitor Center, where the facility displays its function to the public. The tallest tower elements of the construction situated at the Vertical Launch Facility would rise above surrounding forest and vegetation. These elements would be visible from several locations and from open waterways. These structures would contrast with a backdrop of surrounding forest or sky. Depending on the distance of the viewer and atmospheric and weather conditions, these features would generally be visually subordinate to the larger viewshed except from near and middle-distance locations. Notably, these elements would be noticeable but not dominant in the viewshed from the western shoreline of the wilderness areas on the Cumberland Island National Seashore. Because these towers would have hazard lighting and markings, they could be annoying to some residents in proximity to the site and to persons at locations where naturalness and dark skies are anticipated (such as local and Cumberland Island National Seashore camping areas).

Lighting at the launch pad during the pre-launch and launch event would be noticeable at nighttime for about one or possibly two nights each month on average. Depending on the direction of task lights around outdoor work areas, light could be intrusive at nearby locations and could cause glare depending on the exact position of the viewer. Glare can conflict with activities such as driving, aviation, and residential outdoor activities. Farther from the light sources, the intensity would diminish. Nighttime area lighting 12 to 24 nights per year would contribute to local sky glow caused by reflected light into the atmosphere. Intermittent effects on sky glow from onsite, nighttime lighting during launch windows may have temporary, moderate impacts on wilderness values for Cumberland Island National Seashore but would not cause substantial or irreparable impairment to the wilderness due to the distance and temporary duration of nighttime lighting during launch windows. For day-to-day operations at the spaceport, measures such as dimming and shut-off efforts would lessen the amount of light emissions from the site and thus contribute minimally to sky glow. Overall, the Spaceport Camden site would likely create a measureable, small, and isolated new spot location on night radiance maps in a currently dark area (see Exhibit 3.13-4).

Through use of best practices for outdoor lighting described in Section 2.1.1.6, *Infrastructure* (such as auto-shut offs and dimmers on area lighting and shielded and directed lighting), normal day-to-day light

emissions would not trespass outside the site. Light reflected off illuminated pavements and upward from outdoor work areas may contribute to localized sky glow, particularly during times of low cloud or high humidity. Due to the sensitivity of the viewshed and efforts of the NPS to preserve dark skies for protected lands (such as Cumberland Island National Seashore), proposed mitigation measures are recommended in Section 6.13, *Visual Effects*, to further control the impacts of sky glow and glare.

Given the analysis and implementation of identified mitigations, FAA has determined that the Proposed Action would not result in significant adverse impacts from lighting effects on visual resources and visual character. The degree to which the action would have the potential to create annoyance or interfere with normal activities from light emissions is minor, as is the degree to which the action would have the potential to affect the visual character of the area due to the light emissions, including the importance, uniqueness, and aesthetic value of the affected visual resources. The degree to which the action would have the potential to contrast with the visual resources and/or visual character in the study area, and the degree to which the action would have the potential to block or obstruct the views of visual resources, including whether these resources would still be viewable from other locations, is also minimal.

4.13.2 No Action Alternative

Under the No Action Alternative, FAA would not issue a Launch Site Operator License for operation of Spaceport Camden and no spaceport facilities would be constructed. The site use would not change and the proposed construction and operations would not take place. Visual resources and light emissions would continue to be affected by ongoing baseline and future activities at or near the site, but no impacts resulting from spaceport development or operation would occur.

4.14 Water Resources

This section describes the potential impacts of the Proposed Action and the No Action Alternative on water resources (wetlands, floodplains, groundwater, surface water, and Wild and Scenic Rivers) and identifies any associated permitting requirements for the Proposed Action.

The impact analysis for water resources includes potential direct and indirect impacts. Direct impacts are impacts that are caused by the action and occur at the same time and place. Indirect impacts are later in time or farther removed in distance but are still reasonably foreseeable.

Direct impacts were quantitatively evaluated when the amount of water resources lost or used could be reasonably calculated. Quantitative analysis of direct impacts to wetlands, floodplains, and surface waters was conducted where permanent infrastructure would be built or where temporary construction-related activities would occur. Impacts were identified by calculating the amount of surface water features that would be affected by these ground-disturbing activities under the Proposed Action. Losses were calculated by overlying the proposed spaceport facility boundaries with field-delineated wetland boundaries and surface water maps. Floodplain encroachment was evaluated by overlaying the facility boundaries with the 100- and 500-year FEMA Flood Insurance Rate Map boundaries. Groundwater drawdown impacts were assessed by comparing the authorized use rates of groundwater extraction wells on the property with the anticipated usage rate for the proposed spaceport facilities and operations. Indirect impacts were qualitatively assessed based on factors such as alterations of hydrology, sedimentation, new impervious surfaces, and petro-chemical spills.

4.14.1 Proposed Action

4.14.1.1 Construction

Wetlands/Salt Marsh

Up to 0.78 acre of the 3.61 acres of the wetland delineated in the vicinity of proposed construction areas, may be directly impacted as a result of the placement of fill material during construction and roadway improvements; this assumes that all optional/alternate roadways and sites are constructed as initially envisioned (Table 4.14-1; Exhibit 3.14-2). No salt marsh habitat is located within the proposed construction zone.

Table 4.14-1. Delineated Wetlands

Wetland Area	Wetland Type	Total Acres in Field Survey Area	Estimated Impacted Wetlands (acres) (Proposed Action)	Preliminary Jurisdictional Determination[1]	WRAP Score
3A	PFO	0.184	0.043 (Regular Road)	Jurisdictional	0.72
3B	PFO	0.141	0.041 (Regular Road)	Jurisdictional	0.72
3C	PFO	0.477	0.081 (Regular Road)	Jurisdictional	0.72
3D	PFO	0.172	0	Jurisdictional	0.72
3E	PFO	0.366	0.134 (Regular Road)	Jurisdictional	0.72
6	PUB	0.002	0.002 (Vertical Launch Facility)	Jurisdictional	0.48
7	PEM	0.196	0.073 (Heavier Road)	Jurisdictional	0.65
9	PEM	0.121	0.015 (Heavier Road [Alternate Route])	Jurisdictional	0.65
10	PFO	0.644	0.267 (Heavier Road [Alternate Route])	Jurisdictional	0.63
11	PSS/PEM	0.082	0.012 (Heavier Road)	Jurisdictional	0.67
12A	PFO	0.048	0	Jurisdictional	0.63
12B	PFO	0.079	0	Jurisdictional	0.63
14	PEM	0.189	0.021 (Regular Road)	Jurisdictional	0.65
15	PEM	0.057	0.002 (Regular Road)	Jurisdictional	0.65
16	PFO/PSS/PEM	0.276	0.026 (Regular Road)	Jurisdictional	0.72
17	PFO/PSS/PEM	0.210	0.061 (Regular Road)	Jurisdictional	0.72
18	PFO/PSS	0.092	0	Jurisdictional	0.70
19A	PSS/PFO	0.078	0	Jurisdictional	0.70
19B	PSS/PFO	0.161	0	Jurisdictional	0.70
20	PFO	0.015	0	Jurisdictional	0.63
21	PEM	0.017	0.004 (Regular Road)	Jurisdictional	0.47
Total		**3.61**	**0.78 acre**		

Notes: CFR = Code of Federal Regulations; PEM = Palustrine Emergent, PFO = Palustrine Forested, PSS = Palustrine Scrub Shrub, PUB = Palustrine Unconsolidated Bottom; USACE = U.S. Army Corps of Engineers; USEPA = U.S. Environmental Protection Agency; WRAP = Wetland Rapid Assessment Procedure.

[1] Jurisdictional refers to wetlands and surface waters that are considered *Waters of the United States*, as defined by Clean Water Act regulations (USACE at 33 CFR §328.3 and USEPA at 40 CFR §230.3). All wetland observed during the field surveys were determined to be jurisdictional by USACE (see Appendix H, *Wetland Delineation*).

The evaluation of wetland impacts was conducted using the full extent of potential impacts and alternate routes. Therefore, these wetland impacts are a conservative estimate based on a preliminary facility design. In some cases, such as the impacts to Wetland 10, the alternate route is not likely to be included in the final design. The footprint for actual impacts may be smaller, and the overall wetland impacts may

be less than 0.78 acre. The actual total extent of wetland impact will be determined during final permitting and design. A Section 404 permit will be required from USACE prior to any work in the jurisdictional wetland areas. Compensatory mitigation would be required for any unavoidable wetland impacts (see Chapter 6, *Mitigation*).

A WRAP conducted during the wetland delineation documented the functional condition of the wetlands (Table 4.14-1). The index score is shown in the "WRAP Score" column of Table 4.14-1 as a number from 0 to 1. A higher WRAP index number represents higher functionality, whereas a lower number represents poor functionality. Wetlands potentially filled during construction have WRAP scores ranging from 0.48 to 0.72. Higher functioning wetlands included Wetlands 3, 16, and 17, which were either forested wetlands (PFO) or partially forested (PFO/PSS/PEM) wetlands while the lower-functioning wetland was a small pond (PUB).

Most of the impacted wetlands within the proposed construction areas would be partially filled. For the area of wetland that is permanently filled, water quality, hydrology, and habitat functions would be completely lost. The functions of the remaining wetland could be affected through the potential alteration and degradation of wetland vegetation, which could affect wildlife use of the wetland area. The remaining wetland area would also have a smaller storage capacity for overland runoff, resulting in reduced water quality and hydrology functions. The wetland acreage impacted (0.78 acre) is a small percentage of the hundreds of acres of wetlands within the proposed Spaceport Camden boundaries (Exhibit 3.14-1) and is not anticipated to result in a substantial loss of overall wetland functions.

Additional indirect impacts could occur to wetlands/salt marsh that are located immediately adjacent to construction activities. These impacts could include sedimentation and slight alteration of hydrology. Sedimentation and alteration in hydrology could affect vegetation by smothering plants and by changing plant species composition if the wetland hydrology regime becomes wetter or drier; this would result in a corresponding loss or alteration of wildlife habitat. Impacts are anticipated to be minor as the hydrology of wetlands adjacent to proposed roadways has already been historically modified by those roadways. Sedimentation would occur only in the areas bordering proposed construction projects and implementation of erosion and sedimentation practices would minimize these impacts. Consistent with recommendations from NMFS to minimize potential impacts to EFH in adjacent marshlands, where there is sufficient distance to do so, vegetated upland buffers between the proposed developed areas and wetlands, generally 75 feet or more, would be incorporated into the site design plans.

Construction equipment would be refueled at the construction site in designated construction staging areas. These areas would not be located in wetlands, and it is unlikely that fuel spills would occur in a wetland. All spills would be managed in accordance with spill plan and response requirements as outlined in Section 4.7, *Hazardous Materials, Solid Waste, and Pollution Prevention* and Section 4.2.1.1 *Construction*. Should a spill occur in a wetland, then impacts would be dependent upon the amount of material spills and the effect of cleanup efforts. Impacts could include loss or alteration of vegetation, which would impact the wildlife habitat function of the wetland.

Indirect disturbance of wetlands could result in an increase in invasive plant species. Increases in invasive plants could impair wetland functions by outcompeting existing native plants, which can result in altered vegetation structure, reduction in plant species richness, and overall reduction in wildlife habitat value.

Floodplains

The Vertical Launch Facility, Alternate Control Center and Visitor Center, and proposed roads would be constructed in the 100- and 500-year flood zone (Exhibit 3.14-1). The main gate area of the Proposed Action is also within the 500-year flood zone. Approximately 82 acres of proposed facilities would be

constructed within flood zones (19 acres in the 100-year flood zone, and 63.1 acres in the 500-year flood zone). This represents 0.9 percent of the approximately 9,470 acres of flood zones within the ROI.

The Vertical Launch Facility is a critical facility under Camden County's definition in the County's UDC, as the facility would store and use flammable and volatile chemicals. Construction in the floodplain would require an exemption to the County's UDC, which states that critical facilities shall not be constructed in a floodplain. County development codes in this case are stricter than Federal guidelines, which under EO 11988, *Floodplain Management*, states that agencies funding and/or permitting critical facilities are required to avoid the 0.2 percent (500-year) floodplain or protect the facilities to the 0.2 percent chance flood level. The storage of flammable and volatile chemicals at the Vertical Launch Facility would be above the 0.2 percent base flood elevation.

The County is a participant in the National Flood Insurance Program and complies with the standards of FEMA's National Flood Insurance Program regulations, including the National Flood Insurance Program criteria found in 44 CFR §60.3. The final design of the proposed facilities would comply with Camden County floodplain regulations for construction in a floodplain and would require a floodplain permit.

Construction in the floodplain would require the following general standards:

- Construction should be anchored to prevent flotation, collapse, or later movement of the structure.
- Construction should occur with materials and utility equipment resistant to flood damage.
- Construction should use methods and practices that minimize flood damage.
- Buildings should be elevated above the base flood elevation and buildings designs certified by a professional engineer, in compliance with the County standards.
- All heating and air conditioning equipment and components (including ductwork), all electrical, ventilation, plumbing, and other service facilities shall be designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.
- New and replacement water supply systems shall be designed to minimize or eliminate infiltration of flood waters into the system.
- New and replacement sanitary sewage systems shall be designed to minimize or eliminate infiltration of flood waters into the system and discharges from the system into flood water.
- Onsite waste disposal systems shall be located and constructed to avoid impairment to them or contamination from them during flooding.

Additional standards required for development in the floodplain can be found in the Camden County UDC, Article 11, Division 4, *Flood Damage Prevention*.

FAA determines significant floodplain encroachment by evaluating three possible flood-related impacts, as described in DOT Order 5650.2. These impacts are (1) a considerable probability of loss of human life; (2) likely future damage associated with the encroachment that could be substantial in cost or extent, including interruption of service on or loss of a vital transportation facility; and (3) a notable adverse impact on "natural and beneficial floodplain values." If significant floodplain encroachment occurs, then FAA is required to prepare a written finding of no practicable alternatives and confirmation that the action is applicable to all relevant standards.

The construction of the proposed Spaceport Camden within the 100- and 500-year flood zones would not pose a considerable probability of loss of human life. The proposed facilities are not designed as a human

dwelling. The design of the facility would not prohibit people from leaving the area should a flood event occur. Road improvements in floodplains would most likely occur on the existing roads and would use existing culvert systems to minimize changes in floodplain hydrology.

Likely future damage associated with encroachment is not anticipated to be substantial or result in the loss of vital transportation facility because the proposed facilities would be constructed to be above base flood elevations and any facilities closures due to a 100-year or greater flood event would be temporary. Hazardous materials stored at the site would be stored in areas above the 500-year flood elevations to minimize potential impacts.

The Proposed Action is not anticipated to have a notable adverse impact on "natural and beneficial floodplain values." Some minor benefits resulting from the filtering capacity of the floodplain and to wildlife habitat would be lost due to the proposed construction. These impacts are not considered significant as the habitat lost is not unique or rare and represents only a small percentage of similar habitat located within the floodplain. Similarly, the portion of the floodplain removed from performing a filtering function is a small percentage of the overall Satilla River floodplain and stormwater facilities constructed as part of the planned facilities would restore some of this capacity. A small loss of flood storage capacity would also occur.

The Proposed Action would not result in significant floodplain encroachment as defined in DOT Order 5650.2. Alternatives to the Proposed Action were considered and it was determined that there are no practicable alternatives to the proposed location (see Section 2.3, *Alternatives Considered but not Carried Forward*). In accordance with DOT Order 5650.2, public notification of this potential floodplain encroachment was conducted as part of the scoping process and public release of this EIS.

Surface Water Resources

Approximately 1,043 linear feet of jurisdictional ephemeral streams could be impacted as a result of the Proposed Action (Exhibit 3.14-2). Table 4.14-2 summarizes the impacts to these resources by project facilities.

Table 4.14-2. Surface Water Impacts by Project Facilities

Ephemeral Stream	Disturbance	Acres in the Field Survey Area	Potentially Impacted Linear Feet	Acres
1	Mission Preparation Area	0.152	660	0.1524
2A	Heavier Road	0.009	107	0.0069
2B	Heavier Road	0.003	53.962	0
3A	Heavier Road	0.007	109.492	0.0002
3B	Heavier Road (Alternate Route)	0.015	112.571	0.0062
	Total	**0.186**	**1,043**	**0.166**

Note: Jurisdictional refers to wetlands and surface waters that are considered *Waters of the United States*, as defined by Clean Water Act regulations (U.S. Army Corps of Engineers [USACE] at 33 Code of Federal Regulations [CFR] §328.3 and U.S. Environmental Protection Agency at 40 CFR §230.3). Jurisdictional status is pending final USACE determination of these features.

As with wetland impacts, a conservative estimate was made based on the preliminary facility design. To provide the conservative estimate, the entire facility area was used as the extent of potential impacts, the entire stream was assumed to be filled, and alternate routes were considered in the stream impact total. In some cases, such as the impacts caused by the "heavier road (alternate route)," the alternate route is not likely to be included in the final design. The footprint for actual impacts is, therefore, anticipated to

be smaller and the overall surface water impacts may be less than those described. The actual total extent of stream impacts will be determined during final permitting and design. A Section 404 permit will be required from USACE prior to any work in jurisdictional surface waters. All the surface waters shown in Table 4.14-2 are considered jurisdictional waters. Compensatory mitigation would be required for any unavoidable impacts to jurisdictional waterways (see Chapter 6, *Mitigation*). No direct impacts are anticipated to Floyd Creek in the vicinity of the deep water dock. No in-water dock improvements or modifications are planned at this time. Use of this dock or any work on the dock, including maintenance, must be coordinated with the GDNR Coastal Resources Division and USACE to obtain applicable permits/permissions (O.C.G.A. 12-5-280, *Coastal Marshlands Protection Act*, and O.C.G.A. 50-16-61, *Administrative Procedures Act/Revocable License Program*), to include a USACE Section 404 and Section 10 permit, and Coastal Marshlands Protection Committee permit.

Potential indirect impacts from proposed construction activities could result in additional sediment loads being transported to surface waters in the vicinity of proposed construction. Increased sedimentation would result in a short-term reduction in water quality through an increase in turbidity, which may reduce sunlight to aquatic vegetation. Excessive sedimentation has the potential to cover aquatic vegetation and reduce aquatic habitat by clogging waterways. During construction, a SWPPP and Sediment and Erosion Control Plan would be prepared in compliance with Georgia NPDES requirements and Georgia's Erosion and Sedimentation Act of 1975. The final design and permitting of the facility would require that stormwater management infrastructure comply with requirements of Sections 4.4.3, 4.4.5, and 4.5.1 of the Georgia Coastal Stormwater Supplement. The SWPPP and Sediment and Erosion Control Plan would implement the use of management practices to minimize erosion and sedimentation. Implementation of these management practices would minimize indirect impacts and no significant adverse impacts to surface waters would be anticipated.

Construction equipment would be refueled at the construction site in designated construction staging areas. These areas would not be located near surface water features, and it is unlikely that fuel spills would occur in a surface water feature. All spills would be managed in accordance with spill plan and response requirements as outlined in Section 4.7, *Hazardous Materials, Solid Waste, and Pollution Prevention* and Section 4.2.1.1, *Construction*. Should a spill occur, then impacts would be dependent upon the amount of material spills, the distance from water resource, and the effect of cleanup efforts. Impacts could include degraded water quality, which would impact the aquatic habitat and the loss of aquatic species due to exposure to pollutants. Impacts would be short-term in nature.

Significant indirect loss of hydrologic function of streams is not anticipated from the project. For road improvements that would occur on existing roads, the existing culverts would be extended as necessary. Placement of a new culvert has the potential to restrict flow upstream of the culvert and increase the width and depth of the stream downstream of the culvert. Therefore, construction of new roads, if necessary, would include sufficient culverts to minimize impacts to floodplain hydrology.

Groundwater Resources

Potential impacts to groundwater are assessed if the Proposed Action could result in exceedances of groundwater quality standards or contamination of the public drinking water supply. As described in Section 3.14, *Water Resources*, groundwater in the ROI occurs in three main aquifers, two of which are major sources of potable water.

Due to the depth of the Brunswick and Floridan aquifers potentially used for potable water in the ROI (greater than 300 feet) and the confined nature of these aquifers, it is highly unlikely that proposed construction activities would impact these aquifers. Two existing drinking water wells are located on the site and withdraw water from the Floridan aquifer. No construction activities would occur in the vicinity

of these wells. Proposed construction activities would not occur in any areas in or near water bodies that have a direct, known relationship with groundwater recharge. As described in Section 3.14, *Water Resources*, groundwater recharge for the Brunswick and Floridan aquifers in the ROI occurs outside of the ROI to the north and west. No impact to groundwater within these aquifers is anticipated from construction-related activities.

Potential impacts to groundwater in the surficial aquifer from construction include contamination from spills or leaks associated with construction vehicles and machinery. Fuels and other petroleum products would be stored and transferred onsite during construction activities. As discussed in Section 4.7, *Hazardous Materials, Solid Waste, and Pollution Prevention* and Section 4.2.1.1, *Construction*, spill prevention plans would be in place to minimize the potential for spills and to quickly clean up any spills that would occur.

As noted in Sections 3.7, *Hazardous Materials, Solid Waste, and Pollution Prevention*, and 3.14, *Water Resources*, a number of contamination sites and potentially contaminated sites occur within the ROI. Section 4.14, *Water Resources*, describes the construction-related impacts in these sites and the risk minimization procedures (i.e., surveys) required to reduce impacts at these sites. Section 4.14 also describes how these sites would be managed under the Georgia Brownfields Program. In this case, the new owner (the County) would be responsible for soil and groundwater investigations and cleanup of soil and source material to Georgia risk-reduction standards.

Wild and Scenic Rivers

The closest Wild and Scenic River to the ROI is the Wekiva River in central Florida. Therefore, no further analysis of Wild and Scenic Rivers was conducted. The NRI lists the Satilla River as a river with potential outstanding resource values. No construction-related impacts to the Satilla River are anticipated that would adversely impact this river system. The main channel of the Satilla River is located more than 1 mile from proposed construction activities. Floyd Basin and Todd Creek are located closer to construction sites. These surface waters are part of the Satilla River Estuary and would be separated from construction sites by vegetated buffers. The potential for the offsite migration of sediments would be low, given the distance to surface waters, the associated vegetative buffer, and implementation of sedimentation and erosion control measures as required by permit.

4.14.1.2 Operation

Wetlands/Salt Marsh

Operations of the proposed spaceport have the potential to impact wetlands through potential increases in stormwater discharges from new impervious surfaces and the potential for those discharges to carry pollutants. Increases in pollutants and stormwater discharges could potentially impact wetland function through the loss or alteration of vegetation and degraded wetland water quality. Stormwater retention has been built into the proposed spaceport facilities, which will minimize changes in stormwater runoff. As discussed in Section 4.7, *Hazardous Materials, Solid Waste, and Pollution Prevention* and Section 4.2.1.2, *Operation*, spill prevention and hazardous waste management plans will be implemented to minimize the accidental release of pollutants that could then enter stormwater runoff.

Floodplains

Operations of the proposed spaceport are anticipated to have minor indirect impacts on floodplains. Potential impacts could result from additional stormwater runoff from impervious surfaces at the spaceport facility locations. Stormwater retention has been built into the proposed spaceport facilities, which will minimize changes in stormwater runoff.

Surface Waters

Operations of the proposed spaceport have the potential to indirectly impact surface waters through potential increases in stormwater discharges from new impervious surfaces and the potential for those discharges to carry pollutants. Increases in discharge could result in increased erosion, and increased pollutants could impair or degrade surface waters. Stormwater retention has been built into the proposed spaceport facilities, which will minimize changes in stormwater runoff. As discussed in Section 4.7, *Hazardous Materials, Solid Waste, and Pollution Prevention* and Section 4.2.1.2, *Operation,* spill prevention plans will be implemented to minimize the accidental release of pollutants that could then enter stormwater runoff. The proposed Spaceport Camden will require an industrial stormwater permit in compliance with Section 402 of the CWA. This permit will include the creation of a SWPPP to control surface water runoff related to the operations of the spaceport.

Surface waters in the vicinity of the Vertical Launch Facility have the potential to be affected by the condensation of the vapor cloud resulting from the deluge water system. The vapor cloud resulting from the use of liquid oxygen and RP-1 propellants would consist of water only and would not contain hazardous materials (U.S. Air Force, 2011). Deluge water that is not released in the vapor cloud would be captured in a retention tank at the Vertical Launch Facility. This water would be sampled and analyzed to determine if the water can be discharged under Georgia water quality standards. Should potential contaminants be present, then the water would be disposed of at an approved, offsite, industrial waste facility.

After launch, the first stage of the rocket system would drop into the Atlantic Ocean. First stages that are dropped into the Atlantic Ocean may spill residual quantities of RP-1 and liquid oxygen. Larger quantities of RP-1 may form a film on the surface of the water that, under the right conditions, could inhibit oxygen from entering the water. The film would dissipate within hours (FAA, 1999). Liquid oxygen could have a localized impact on water temperature, but it would be anticipated to rapidly volatilize into oxygen gas. The small volume of these chemicals in a large open water environment would be anticipated to have minimal impacts (FAA, 1999).

As noted in Sections 3.7, *Hazardous Materials, Solid Waste, and Pollution Prevention*, and 3.14, *Water Resources*, a number of contamination sites and potentially contaminated sites occur within the ROI. Section 4.7, *Hazardous Materials, Solid Waste, and Pollution Prevention,* describes how these sites would be managed under Georgia regulatory requirements. In this case, the new owner (the County) would be responsible for soil and groundwater investigations and cleanup of soil and source material to Georgia risk-reduction standards. A former hazardous landfill is located within the northwest corner of the site; however, this landfill is not part of the proposed land purchase, is closed, and has been operating under a RCRA post-closure care permit (#HW-063[D]) since 2011. The closed landfill will be monitored through the post-closure care period which ends on June 6, 2021. Section 5.2, *Past, Present, and Reasonably Foreseeable Future Actions*, further details the past industrial usage of the site.

Groundwater

The operation of the proposed Spaceport Camden is anticipated to annually withdraw 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). This represents less than 0.8 percent of the current annual groundwater withdrawals in Camden County (U.S. Geological Survey, 2018). The site is currently authorized to withdraw 1.7 million gallons of water daily from two existing groundwater wells. A deed restriction currently prohibits groundwater use from the Union Carbide Corporation property.

Other potential impacts to groundwater during operations include contamination from spills or leaks of hazardous materials stored at the site. The impacts of these spills would be limited to the groundwater in the upper part of the surficial aquifer. Should a severe enough spill occur, then the groundwater in the vicinity of the spill could become contaminated, degrading the water quality in the vicinity of the spill. The confined nature and depths of the aquifers in the vicinity of the ROI limits the potential for spills to migrate into the lower portions of the surficial aquifer and to the Brunswick and Floridan aquifers. As discussed in Section 4.7, *Hazardous Materials, Solid Waste, and Pollution Prevention* and Section 4.2.1.2, *Operation,* spill prevention plans and hazardous waste management plans would be in place to minimize the potential for spills and to clean up quickly any spills that would occur. Proposed storage of hazardous materials would not occur in any areas in or near water bodies that have a direct, known relationship with aquifer recharge nor would storage of these materials occur in the vicinity of existing groundwater drinking wells.

As noted in Sections 3.7, *Hazardous Materials, Solid Waste, and Pollution Prevention*, and 3.14, *Water Resources*, a number of contamination sites and potentially contaminated sites occur within the ROI. Section 4.7, *Hazardous Materials, Solid Waste, and Pollution Prevention,* describes how these sites would be managed under the Georgia Brownfields Program. In this case, the new owner (the County) would be responsible for soil and groundwater investigations and cleanup of soil and source material to Georgia risk-reduction standards. The depth and confined nature of the Brunswick and Floridan aquifer in the ROI make it unlikely that any contaminants in the soils would migrate to these aquifers.

An analysis of the potential effects of ground vibration on the landfill site located 1.65 miles from the launch site concluded that launches would result in peak ground accelerations (i.e., the maximum amount of ground shaking) equivalent to a minor earthquake (magnitude 3.9) and is approximately equivalent to vibrations produced by a passing truck (TetraTech, 2017). Vibrations at this level would not be anticipated to contribute to the migration of contaminants in the soil.

No significant adverse impacts to groundwater are anticipated from activities related to the operations of Spaceport Camden.

Wild and Scenic Rivers

The Satilla River is listed on the NRI. As described in the *Surface Water* sections, no significant adverse impacts to surface waters in terms of water quality are anticipated from construction activities and the normal operations of the spaceport. This would include adverse impacts to the Satilla River. Operational impacts to the Satilla River would primarily be related to noise and the possible impacts to recreational use of the river. As discussed in detail in Section 4.11, *Noise and Noise-Compatible Land Use*, individual noise events would temporarily alter the quiet setting that is a defining feature in surrounding areas (e.g., Satilla and Cumberland Island). Because the sound environment in noise-sensitive locations near Spaceport Camden would be unchanged during the vast majority of the year, current land uses (e.g., recreation, residences, commercial, etc.) would remain compatible.

4.14.1.3 Launch Failures

Types of launch failures and their likelihood of occurrence are discussed in Section 2.1.2.7, *Launch Failures*. Should a launch failure occur on the launch pad, there would be a potential for water resources located within the OEZ (see Section 2.1.2.5, *Pre-Launch Activities*) to be impacted. This would include Floyd Cut, Floyd Creek, and Floyd Basin. Should a failure occur during ascent, then impacts could extend into water resources to the north and east, including the Cumberland and Satilla Rivers and the Atlantic Ocean. Overall, emergency and contingency planning and response measures would serve to minimize potential adverse impacts associated with launch failures, and emergency consultation with regulatory

agencies (e.g., the USFWS, Georgia SHPO, USACE) would be required should a launch failure result in impacts to sensitive resources.

Wetlands/Salt Marsh

Should an accident occur, either on the launch pad or during ascent, it is possible that rocket propellant and payload fuel containers could fail and leak hazardous chemicals into wetland areas. These chemical could be released as direct spills or as burning byproducts. Direct spills and fire could result in the loss or alteration of vegetation and a corresponding loss of wetland habitat function. Chemicals that reach wetlands could also degrade wetland water quality. The degree and the scope of the impact and associated cleanup effort would be dependent on the type of chemical, weather conditions, the conditions of the accident, and type of wetlands impacted.

Floodplains

Impacts to floodplains are assessed based on encroachment into the floodplain and the effect of that encroachment on the floodplain's function of storing and transporting water. The function of any floodplains within the ROI would not be impacted by launch failures.

Surface Waters

Should an accident occur, either on the launch pad or during ascent, then it is possible that rocket propellant and payload fuel containers could fail and leak hazardous chemicals into surface water resources. These chemical could be released as direct spills or as burning byproducts. Direct spills and fire could result in degradation of water quality through chemical contamination, thereby resulting in the potential for loss of vegetation, loss of wildlife, and a corresponding loss of the wildlife habitat. Some spills could be cleaned up, but the degree and the scope of the impact and cleanup effort would be dependent on the type of chemical, weather conditions, the conditions of the accident, and type of water resource impacted. Any launch vehicle debris landing in tidally-influenced marsh or State waters out to 3 miles must be recovered when feasible and may require authorization from the GDNR Coastal Resources Division (O.C.G.A. 12-5-230, *Shore Protection Act*, and/or O.C.G.A. 12-5-280, *Coastal Marshlands Protection Act*, and/or O.C.G.A. 50-16-61, *Administrative Procedures Act/Revocable License Program*).

Groundwater

Launch failures would not have the potential to impact groundwater resources and, therefore, no impacts to these resources are anticipated.

Wild and Scenic Rivers

No Wild and Scenic or NRI rivers are located within the project area potentially impacted by launch failures; therefore, no impacts to these resources are anticipated.

4.14.1.4 Summary

Overall, the Proposed Action would not adversely affect a wetland's function to protect the quality or quantity of municipal water supplies, including surface waters and sole source and other aquifers; would not substantially alter the hydrology needed to sustain a wetland system's values and functions or those of a wetland to which it is connected; and would not substantially reduce a wetland's ability to retain flood waters or stormwater runoff, thereby threatening public health, safety or welfare. Additionally, the Proposed Action would not result in an encroachment of floodplains resulting in adverse impacts to natural and beneficial floodplain values.

There are no Wild and Scenic Rivers potentially impacted by the Proposed Action. The Satilla River is the only river in the water resources ROI that is listed on the NRI, which includes rivers or segments of rivers that may meet Wild and Scenic River Act eligibility but have not been categorized as a Wild and Scenic River. (Section 7 of the Wild and Scenic Rivers Act does not apply to NRI-listed rivers; however, Federal agencies are directed to avoid or mitigate actions that adversely impact these rivers.) With regard to surface waters, the Proposed Action has not been shown to result in impacts associated with exceedances of surface water or groundwater quality standards established by Federal, State, local, and tribal regulatory agencies or result in the potential to contaminate public drinking water supplies or aquifers such that public health may be adversely affected. Analysis has not identified potential impacts that would affect natural and beneficial surface water or groundwater resource values to a degree that substantially diminishes or destroys such values; adversely affect surface waters or groundwater quantities such that the beneficial uses and values of such waters are appreciably diminished or can no longer be maintained and such impairment cannot be avoided or satisfactorily mitigated; or present difficulties based on water quality impacts when obtaining a permit or authorization.

Given the analysis and implementation of identified mitigations, FAA has determined that the Proposed Action would not result in significant adverse impacts to water resources.

4.14.2 No Action Alternative

Under the No Action Alternative, FAA would not issue a Launch Site Operator License for operation of Spaceport Camden and no spaceport facilities would be constructed. The site use would not change and the proposed construction and operations would not take place. No impacts are anticipated to wetland, surface water resources, or floodplains as the site would remain in its current state. Less groundwater would be withdrawn through the existing wells under the No Action Alternative.

5 CUMULATIVE IMPACTS

The CEQ regulations define a cumulative impact as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions" (see 40 CFR §1508.7). Cumulative impacts can be viewed as the total combined impacts on the environment of a proposed action or alternative(s) and other known or reasonably foreseeable future actions.

The depth of a cumulative impacts analysis is commensurate with the potential for significant impacts. Cumulative effects may occur when there is a relationship between a proposed action or alternative and other actions expected to occur in a similar location or during a similar time period. This relationship may or may not be obvious. The effects may then be incremental (increasing) in nature and result in cumulative impacts. Actions overlapping with or in proximity to a proposed action or alternative can reasonably be expected to have more potential for cumulative effects on "shared resources" than actions that may be geographically separated. Similarly, actions that coincide temporally will tend to offer a higher potential for cumulative effects.

5.1 Region of Influence

The ROI for the cumulative impacts analysis is the same ROI defined for the Proposed Action's direct and indirect impact analysis for operations. Thus, the ROI is different for each resource category. Analysis is conducted by first identifying past, present, and reasonably foreseeable future actions as related to the ROI for the particular resource. Cumulative impacts are then identified if the combination of proposed activities and past, present, and reasonably foreseeable future actions interact with the resource to the degree that incremental or additive effects occur.

5.2 Past, Present, and Reasonably Foreseeable Future Actions

Past, present, and reasonably foreseeable future actions are considered in determining whether there are potential cumulative impacts. Actions can be initiated by any entity (i.e., other Federal agencies, State, tribal, or local governments, or private entities). In this EIS, FAA has made an effort to identify actions on or near the action areas associated with the Proposed Action that are under consideration and in the planning stage at this time. These actions are included in the cumulative analysis sections to the extent that details regarding such actions exist and the actions have a potential to interact with the Proposed Action and associated "shared" resources. Although the level of detail available for those future actions varies, this approach provides the decision maker with the most current information to evaluate the consequences of the alternatives. The EIS addresses cumulative impacts in order to assess the incremental contribution of the alternatives to impacts on affected resources from all factors.

Past actions are actions that occurred within or near the Proposed Action ROI in the past and may warrant consideration in determining the environmental impacts of an action. Overall, past actions are typically considered part of the baseline affected environment because they have occurred in the past and have become a part of the existing condition. While not a comprehensive list of all past projects that have occurred within the region, FAA has identified the following past actions as representative and relevant to cumulative impact analysis within the context of this EIS, which include but are not limited to the projects described in the following subsections:

Past Industrial Use of the Project Site

As discussed in Section 3.7.3, *Hazardous Materials, Solid Waste, and Pollution Prevention, Existing Conditions*, of this EIS, the proposed project site was previously used for industrial activity, including shipbuilding in the 1800s; production and testing of solid rocket motors in the early 1960s; the manufacture of military hardware and supplies, including mortar ammunition, illuminating ordnance devices (trip flares), tear gas, and assorted chemicals in the late 1960s–early 1970s; and Temik pesticide manufacturing from the mid-1970s to 2012. Until 2015, the site contained industrial facilities associated with the Temik manufacturing facility (see Appendix F for detailed information regarding historical context of the site). The proposed Vertical Launch Facility overlaps two historical contamination sites, the MRA-2, also known as SWMU 9, and the Empty Drums Area. The proposed Mission Preparation Area overlaps two historical contamination sites, Loop Road Site and SWMU 6. The Proposed Action also includes improvements to several existing roads. These roads traverse the following historical contamination sites: MRA-1 (SWMU 8), MRA-2 (SWMU 9), Loop Road Site, and SWMU 6.

Camden County Kings Bay Joint Land Use Study (2014)

The *Camden County Kings Bay Joint Land Use Study* provides an overview and discussions about past and present growth trends in the area and provides recommendations to ensure compatible land use between the county and the military. The study establishes smart-growth land use and development procedures for vacant and redevelopment sites near Kings Bay; identifies existing and future noncompatible uses and recommended mitigation measures for NSB Kings Bay, Camden County, St. Marys, Kingsland, Woodbine and other appropriate agencies; and develops enhanced communication and access management plans involving various highway and waterway linkages between the community and NSB Kings Bay. Chapter 5 of the study identifies such activities creating roadway buffers, amending local ordinances to apply structural height restrictions close to Kings Bay, and other less tangible actions, such as a study and plan for affordable housing improvements, maintaining coordination for waterway channel access, and other planning efforts. The entire document is available on the Camden County government website (https://www.camdencountyga.gov/).

Closure of St. Marys Airport

In September 2017, the St. Marys airport was closed by FAA due to safety and security issues associated with NSB Kings Bay. The public-use airport, located approximately 2 miles north of the central business district of St. Marys and 1 mile south of the naval base, covered an area of approximately 286 acres and served an average of 10 aircraft operations per day. The City maintained ownership of the land after the airport closed. A new replacement airport is expected somewhere in the region; however, no specific plans have been developed at this time. More information regarding the St. Marys Airport closure can be found in the 2014 *Camden County Kings Bay Joint Land Use Study* located on the Camden County government website (https://www.camdencountyga.gov/).

Present and Reasonably Foreseeable Future Actions are any other actions that are or have a reasonable expectation of occurring within or near the Proposed Action ROI in the same general timeframe as the proposal or in the near future. Reasonably foreseeable future actions are actions that may affect projected impacts of a proposal and are not remote or speculative. An action may be reasonably foreseeable even in the absence of a specific proposal. However, future actions not grounded in planning documents, projected development trends, or regional or local plans are typically considered remote and speculative, and thus not analyzed. In addition, future actions may be considered improbable or remote even though they have been mentioned in planning documents (e.g., general statements about future growth opportunities and unrefined lists of potential projects). Camden County, as with most locales, experiences periods of dynamic growth, and it is not practical or possible to capture all present or potential future

development activities from private or public entities within or adjacent to Camden County. While not a comprehensive list of all ongoing and potential future projects that are occurring or may occur within the region, for the purposes of analysis, FAA has identified the following present and reasonably foreseeable future actions as representative and relevant to cumulative impact analysis within the context of this EIS:

Camden County Board of Commissioners Strategic Plan (2020–2025–2035)

The Strategic Plan outlines the Board of Commissioners' plans for future growth of Camden County through 2035. Planning for Camden County's future was based on the following principles: presenting and maintaining county gateways, buildings and facilities, and parks and open spaces in a "beautiful" manner; ensuring the safety of the county's residents; ensuring the viability of NSB Kings Bay; creating a successful spaceport; encouraging sports tourism; developing a technology corridor; providing quality residential opportunities; and allowing for abundant leisure choices. Proposed projects supporting these principles are numerous (more than 200) and outlined in the Strategic Plan. Many projects are relatively benign in terms of cumulative impacts, when considered with the Proposed Action; these projects include such things as upgrading computer systems and developing forms for certain approvals and activities. Other projects are more tangible and include removal of old and development of new facilities and upgrading of transportation systems. More information regarding the Camden County Strategic Plan can be found on the Camden County website at (https://www.camdencountyga.gov/).

Naval Submarine Base Kings Bay

NSB Kings Bay is a significant economic contributor to the local economy. NSB Kings Bay is a base of the U.S. Navy, located adjacent to St. Marys. The base is the East Coast home port of the Ohio-class submarine. Activities conducted at NSB Kings Bay are anticipated to continue and expand into the future.

Residential Growth on Cumberland Island

The Camden County Planning Commission granted a hardship variance on December 7, 2016, which approved the division of an 87-acre tract on Cumberland Island into a 10-lot subdivision. The private owner of the tract intends to build the lots for family members. The property is located adjacent to the Sea Camp Ranger Station and campground. The public had 30 days to appeal the decision. An appeal was submitted by conservationist groups on January 5, 2017.

Rezoning of St. Marys for Potential Barge Port

The St. Marys City Council approved rezoning of a former Durango-Georgia Paper Company site for its possible development as a logistics and industrial center and barge port. The barge port would be anticipated to result in employment gains from construction and operation of the port; however, it could also produce human health and environmental impacts from increased noise, air pollutants, and traffic, amongst other environmental impacts.

2015 Cumberland Island National Seashore Fire Management Plan

The Cumberland Island National Seashore Fire Management Plan "serves as a detailed and comprehensive program of action to implement fire management policy principles and goals, consistent with the unit's resource management objectives." The 2015 Cumberland Island National Seashore Fire Management Plan provides an update to the 2004 Fire Management Plan and includes more active fire management strategies, including prescribed burning, wildfire managed for resource objectives, and targeted herbicide use. In addition, the 2015 Fire Management Plan no longer bases management actions on the Hazardous Fuels Categorical Exclusion (NPS, 2015). The County and FAA would coordinate with the NPS to ensure there are minimal conflicts between NPS fire management activities and launch activities.

NPS Cumberland Island National Seashore Campground Movement

The NPS has indicated that a reasonably foreseeable future action is the movement of wilderness campgrounds at current locations and placing them at Toonahowie and Sweetwater lakes, both of which are within the identified USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*). The purpose is to provide opportunity for wilderness experience more in line with wilderness guidelines of solitude and better manage potential human impacts on the wilderness environment.

Ongoing Public/Commercial Use within the Operational ROI

Public and commercial use within the operational ROI includes use of the Intracoastal Waterway for recreational (boating, fishing, etc.) and commercial (tugboats, barges, etc.) activities, and use of Cumberland Island for recreational (camping, beach driving, etc.) activities. Commercial activities occur with the Greyfield Inn, which is a private business and is independent of the NPS. Other various activities within the operational ROI include recreational use of water bodies and state and local parks; industrial and commercial activities, such as paper mills and various enterprises; as well as ongoing development in the area associated with economic and population growth. Future growth around the proposed Spaceport Camden site may occur should the proposal move forward. However, there is no information at this time available to provide any specific analysis.

Amateur Rocket Launches

The proposed spaceport site has recently been used for amateur rocket launches, particularly from private spaceflight startup, Vector, which launched a 40-foot full-scale prototype of its Vector-R rocket in August 2017. The launch did not require construction of any supporting infrastructure. A NOTMAR was issued by the Port of Charleston to advise mariners to exercise caution when transiting the vicinity of the Satilla River and Fancy Bluff Creek. FAA defines amateur rockets as unmanned rockets that (1) are propelled by a motor or motors, having a combined total impulse of 889,600 Newton-seconds (200,000 pound-seconds) or less; and (2) cannot reach an altitude greater than 150 kilometers (93.2 statute miles) above the Earth's surface.

Amateur launches do not require FAA licensing but do require authorizations/waivers per Chapter 31, Section 2 of FAA order 7400.2. Chapter 31, Section 2, Part 3 of FAA order 7400.2 outlines the process by which FAA manages amateur rocket launches. FAA Order 1050.1F categorically excludes amateur rocket launch authorizations from the Environmental Assessment or EIS NEPA processes. Whether or not Spaceport Camden is ultimately approved, amateur rocket launches may continue in the future, provided that procedures outlined in Chapter 31, Section 2 of FAA order 7400.2 are followed.

Future Roadway Improvements

There are a number of large-scale roadway improvement/construction projects either currently underway or scheduled to begin in the near future throughout Georgia and northeastern Florida. These projects are listed below because of their potential to consume large quantities of energy or natural resources (asphalt and concrete) (Florida DOT, 2019; Georgia DOT, 2019):

Georgia:

- **I-85 Widening (I-985 to State Route [SR] 53).** This project widens I-85 from two to three lanes in both directions from I-985 to SR 53. Additional work on the project includes replacing three overpass bridges along I-85.
- **I-16/I-75 Interchange Project (Pleasant Hill Mitigation).** This is a reconstruction project to improve the safety of the corridor by widening and reconstructing I-75 from Hardeman Avenue to Pierce Avenue and I-16 from I-75 to Walnut Creek within the city of Macon.

- **I-16/I-95 Improvement.** This project improves traffic flow and safety at the busy I-16/I-95 interchange near Savannah. The project replaces two cloverleaf loop ramps with flyover bridges and adds a new collector-distributor lane on I-95 northbound.
- **I-285 and SR 400 Improvements.** This project aids in reducing traffic congestion and improves safety in the area surrounding the I-285/SR 400 interchange in metro Atlanta.
- **Rome-Cartersville Development Corridor.** This project provides a direct connection between U.S. Route 411, at its interchange with U.S. Route 41 west of Cartersville, and I-75.
- **U.S. Route 441 Improvements.** This project includes roadway improvements on U.S. Route 441, from Madison Bypass in Morgan County to Watkinsville Bypass in Oconee County.
- **SR 26/U.S. Route 80 Projects.** These projects relieve congestion, improve traffic conditions, and encourage transportation safety on the U.S. Route 80 bridges and roadway between Tybee Island and the mainland. Projects also include renovation of the Lazaretto Creek Bridge due to structural deficiencies.

Northeast Florida:

- **First Coast Expressway.** This project includes construction of a 46.5-mile, four-lane toll expressway that, once completed, will cross parts of Duval, Clay, and St. Johns Counties. Construction began in 2018 and will continue into at least 2023.

5.3 Cumulative Impact Analysis

Analyses of potential cumulative impacts considered the scope of the Proposed Action, as well as the context and intensity of impacts from the Proposed Acton and any actions identified under Section 5.2, *Past, Present, and Reasonably Foreseeable Future Actions* (as per 40 CFR Parts 1500–1508 and FAA Order 1050.1F). The significance of cumulative impacts was determined as per the FAA 1050.1F Desk Reference (FAA, 2020a) and in the same manner as the significance of direct and indirect impacts of individual resource categories presented in Chapter 4, *Environmental Consequences*.

5.3.1 Air Quality

Air quality changes over time with increasing/decreasing populations, industry, and other activities that result in air emissions (including NPS prescribed burning activities on Cumberland Island National Seashore). From a cumulative perspective, past activities do not impact current or future air quality, while present ongoing activities (such as those discussed in Section 5.2, *Past, Present, and Reasonably Foreseeable Future Actions*) are captured in current air emission numbers represented in the baseline shown in Section 3.1.3, *Air Quality*, *Existing Conditions*. Depending on the timing of future improvement projects occurring in the surrounding community (including those identified in Section 5.2, *Past, Present, and Reasonably Foreseeable Future Actions*), incremental increases in air emissions would result from construction activities. However, impacts and emissions associated with proposed spaceport construction and operational activities would be minor and, when taken in context with future activities, emissions from several, simultaneous projects are not likely to result in temporary or long-term combined emissions that would negatively affect county attainment status or otherwise adversely affect regional air quality. Emissions associated with construction activities are short-term and temporary. Operational activities would be approximately 12 per year, with these emissions being temporary and associated with individual launches, but occurring on an annual basis throughout the life of the Launch Operator License. However, given the scope of these emissions, they are unlikely to result in any significant, cumulative, adverse impacts when considered with other activities within the ROI.

5.3.2 Biological Resources

As discussed in Section 4.2, *Biological Resources*, there would be some adverse impacts to biological resources from the Proposed Action (e.g., permanent loss of habitat from the facility and infrastructure footprints). The construction ROI was previously disturbed from past industrial and development activities, with industrial activities ceasing in 2012 and buildings being removed as recently as 2015. Discontinuation of past industrial activities and removal of buildings may have contributed to habitat and species growth at the site over the past several years; however, currently the land area is mostly semi-improved with pockets of unimproved land area, with bush hogging and other maintenance activities regularly occurring on the semi-improved areas of the construction ROI. These gains may be offset in some manner by development and operation of the spaceport, as regular industrial activity returns to the site.

Actions described in Section 5.2, *Past, Present, and Reasonably Foreseeable Future* Actions, (as well as others not captured), such as military development and recreational uses within the operational ROI, would affect wildlife by disturbing individual animals. Also, population growth, development, and continued military requirements could lead to additional habitat loss or fragmentation. The Navy conducts various operations at NSB Kings Bay that generate noise, which can affect terrestrial and marine species. The NPS conducts habitat management activities on Cumberland Island National Seashore, which include prescribed burning activities that result in impacts to vegetation and wildlife. The Proposed Action would add to this type of effect on biological resources associated with disturbance from the presence of human activity and noise. Measures would reduce but not eliminate the potential for cumulative impacts to biological resources. For these reasons, there would be cumulative impacts on biological resources from additional human activity and noise associated with the Proposed Action, when combined with other present and reasonably foreseeable future actions within the operational ROI. Given the context and intensity of identified impacts, significant cumulative impacts on biological resources are not expected.

5.3.3 Climate

GHG emissions that would result from the Proposed Action would be very minute in comparison to current GHG emissions in the United States and within the ROI (see Section 4.3, *Climate*). Emissions of this magnitude are not likely to have any impact on global climate change, sea level rise, or any potential impacts of climate change. When considered with actions that contribute to GHGs, which are identified in Section 5.2, *Past, Present, and Reasonably Foreseeable Future* Actions, the Proposed Action would be insignificant and is not expected to result in any significant cumulative climate impacts. However, sea level rise and other climatological changes, such as increase in extreme weather events, may impact the Proposed Action in the coming years.

5.3.4 Coastal Resources

As discussed in Section 4.4, *Coastal Resources*, the Proposed Action would affect coastal resources by increasing the amount of impermeable surface, adding new structures, generating noise, and increasing lighting. Coastal resources in the operational ROI are currently affected by activities described in Section 5.2, *Past, Present, and Reasonably Foreseeable Future* Actions, which include military, development, and recreational uses. Population growth could impact water use and quality of the Satilla River watershed and coastal areas of Georgia (Alber et al., 2003). Continued military activities associated with NSB Kings Bay and ongoing public/commercial use of the coastal areas are not expected to significantly affect coastal resources, because these types of activities would not generate new types of impacts beyond those already considered as part of the affected environment. Cumulative impacts to

coastal resources from the Proposed Action would result when the impacts from the action overlap with impacts from other activities. The types of impacts to coastal resources analyzed in Section 4.4, *Coastal Resources*, would be unique to this Proposed Action and would not result in incremental impacts from other past, present, and reasonably foreseeable future actions. Therefore, cumulative impacts on coastal resources would be the same as those discussed for the Proposed Action, which would not be significant.

5.3.5 Department of Transportation Act, Section 4(f)

Cumulative impacts to Section 4(f) properties assessed in Chapters 3, *Affected Environment*, and 4, *Environmental Consequences*, may result from past, present, or reasonably foreseeable projects within the vicinity of the proposed spaceport. In general, ongoing economic development and continued activity, both recreational and commercial, in the area associated with the present and reasonably foreseeable future actions described earlier in Section 5.2, *Past, Present, and Reasonably Foreseeable Future Actions*, could have an impact on identified Section 4(f) properties. For example, residential growth on Cumberland Island and continued development in the area have the potential for impacts on visual resources (see Section 5.3.13, *Visual Effects*), which in turn could affect Cumberland Island National Seashore (a Section 4(f) property). The same may be said for other present or reasonably foreseeable future infrastructure or economic development projects, depending on the scope of the project and its vicinity to identified Section 4(f) properties. Ongoing public and commercial use of areas within the ROI also contribute to noise and visual effects to Section 4(f) properties, the extent of which is relative to scope and proximity of use.

As presented in the impact analysis in Section 4.5, *Department of Transportation Act, Section 4(f)*, FAA has made the determination that construction and operational activities associated with the Proposed Action would not result in permanent incorporation, temporary occupancy, or a constructive use of any Section 4(f) properties in the ROI. Although the Proposed Action operations would result in noise and visual impacts, the Proposed Acton would not result in substantial impairment of any Section 4(f) property. As a result, FAA does not anticipate that the Proposed Action would incrementally contribute to cumulative impacts that would result in substantial impairment of any Section 4(f) property, and any potential cumulative impacts on Section 4(f) properties associated with the Proposed Action would not be significant.

5.3.6 Farmlands

No adverse impacts to prime farmlands from the Proposed Action have been identified. Under the Proposed Action, there would be limited potential for short-term, temporary impacts to aquaculture areas if access to aquaculture harvesting areas was limited. Additionally, there would be a low chance of impacts to the aquaculture resources from pollutants if a launch failure should occur. Other activities identified in Section 5.2, *Past, Present, and Reasonably Foreseeable Future Actions*, are not known to affect aquaculture activities; as a result, the Proposed Action would not be expected to result in cumulative impacts to aquaculture.

5.3.7 Hazardous Materials, Solid Waste, and Pollution Prevention

Under the Proposed Action, there would be an increase in the quantity of hazardous and non-hazardous waste generated in the region. However, with the implementation of appropriate handling and management procedures for hazardous materials, hazardous wastes, and solid wastes generated during the construction and operation of the facility, there would be no significant onsite impacts. Offsite impacts from disposal of spaceport-generated hazardous and non-hazardous waste would be negligible to minimal

under the Proposed Action, due to the small quantities of waste in comparison to waste disposal capacity available in the region. When past, present, and reasonably foreseeable future projects, as described in Section 5.2, *Past, Present, and Reasonably Foreseeable Future* Actions, are considered in conjunction with the Proposed Action, no significant adverse cumulative impacts are identified.

5.3.8 Historical, Architectural, Archaeological, and Cultural Resources

Overall, adverse effects resulting in impacts to historic properties related to the Proposed Action are likely to add to the cumulative impacts of other actions (as described in Section 5.2, *Past, Present, and Reasonably Foreseeable Future Actions*) within the ROI and the region. Within the APE for direct impacts, adverse effects to the archaeological historic properties would be added to the overall loss of dateable sites from continued regional development. Mitigation actions as required by Section 106 of the NHPA (which requires the proponent resolve the adverse effect through avoidance, minimization, or mitigation [36 CFR §800.6(b)]) provide some relief, but the nature of archaeological sites means that even with data collection, an adverse effect to a site cannot be reversed. For architectural resources in the APE for direct effects, there would be no cumulative effect. Although the Anchor House ruins continue to naturally deteriorate, as do the Charles Rinaldo Floyd Burial Site and the Floyd Family Cemetery, no other actions would further reduce these resources' contribution to the complement of this site type. Within the APE for audible, vibratory, and visual effects, although vegetation and other structures would block the view of structures at the spaceport from the High Point-Half Moon Bluff Historic District and Main Road, visual and temporary noise intrusions (65- to 250-foot-tall structures and launch vehicles), in combination with potential project-induced growth and development and other increases in residential growth, would result in a cumulative effect on the viewshed and other aspects of the setting of historic properties in the Cumberland Island National Seashore. Visual and temporary, periodic noise intrusions are less likely to add to a cumulative effect to historic properties on Dover Bluff and Cabin Bluff, due to the more modern setting of these areas.

5.3.9 Land Use

Because the site proposed for Spaceport Camden has historically been used for industrial purposes, there would be no change in land use. The proposed spaceport would also not have any adverse land use impacts on the nearby communities of Woodbine, Kingsland, and St. Marys; Crooked River State Park; NSB Kings Bay; Jekyll Island; or Fort Clinch State Park on Amelia Island. Because operations are not expected to result in access or use restrictions at Cabin Bluff, portions of Cumberland Island National Seashore, and Little Cumberland Island, the past, present, or future actions discussed in Section 5.2, *Past, Present, and Reasonably Foreseeable Future Actions*, would not be expected to have a cumulative impact to land uses or recreational activities for these areas. Intracoastal Waterway users may experience intermittent and temporary closures; however, while there may be impacts to these areas as identified within Section 4.9, *Land Use*, the Proposed Action would not incrementally contribute to any cumulative impacts.

Cumberland Island Wilderness

All past and present actions with potential to impact wilderness qualities of Cumberland Island Wilderness are considered in the baseline description included in Section 3.9.3, *Land Use, Existing Conditions*. Untrammeled, undeveloped, and solitude and primitive or unconfined recreation qualities already experience some degree of degradation based on activities that currently occur within and around Cumberland Island Wilderness. As described in Section 4.9.1, *Land Use, Proposed Action*, untrammeled and undeveloped qualities of proposed Spaceport Camden activities would not be impacted; therefore, cumulative impacts to these qualities would not occur. However, proposed Spaceport Camden

construction and operations would introduce stressors that would impact the natural and solitude and primitive or unconfined recreation qualities of wilderness, specifically noise and light emissions. Increased military operations at NSB Kings Bay, rezoning of St. Marys for a potential barge port, continuation of ongoing public/commercial uses, and amateur rocket launches would also contribute noise to the surrounding soundscape, resulting in similar impacts to the solitude and primitive or unconfined recreation quality, as those described for the Proposed Action (Section 4.9.1, *Land Use, Proposed Action*). Impacts from anthropogenic noise sources outside wilderness would be short-term and minor. While visitors' perceptions of solitude may be temporarily degraded, cumulative impacts to solitude and primitive or unconfined recreation would not be significant. On the other hand, the 2015 *Cumberland Island Fire Management Plan* includes management considerations for Cumberland Island Wilderness. Some management actions may result in short-term impacts to the untrammeled quality; however, only the minimum necessary fire management actions would occur within wilderness that would protect and restore natural processes in wilderness. As a result, implementation of the Fire Management Plan is expected to enhance overall wilderness character on the island in the long term. Since the analysis in this EIS assumes that all wilderness qualities of Cumberland Island are weighted equally, short-term and minor-to-moderate impacts to two wilderness qualities from the Proposed Action and reasonably foreseeable future actions would not result in adverse cumulative impacts to the overall wilderness character of Cumberland Island.

5.3.10 Natural Resources and Energy Supply

Cumulative impacts to energy use and supply of natural resources could occur if projects near the proposed project area consume energy and/or natural resources.

As listed in Section 5.2, *Past, Present, and Reasonably Foreseeable Future Actions*, there are many ongoing and future construction and renovation projects, both private and public, associated with private and economic development throughout the ROI. While the implementation of the projects listed in Section 5.2, *Past, Present, and Reasonably Foreseeable Future Actions*, would require use of natural resources and result in "cumulative consumption," the Proposed Action is not expected to contribute in any substantive manner to adverse cumulative impacts to energy use and supply of natural resources. Resource providers are located throughout the state and beyond, and energy consumption associated with these projects would be expected to be short-term while development occurs. New facilities constructed over time would be more energy efficient, and energy providers plan for increased energy requirements over time.

5.3.11 Noise and Noise-Compatible Land Use

Impacts associated with noise resulting from construction and operational activities for projects within the region discussed in Section 5.2, *Past, Present, and Reasonably Foreseeable Future* Actions, would be as those identified in Section 4.11, *Noise and Noise-Compatible Land Use*. Construction and operational noise may result in incremental noise impacts, depending on the timing of construction and operational activities in conjunction with other proposed future projects. Construction noise would be temporary, and given the current land use of the site, distance to sensitive noise receptors, and distance of the site from other proposed future projects, construction noise would not be expected to result in any long-term, adverse cumulative impacts. Operational noise would be intermittent, with noise associated with launches and testing occurring only during these activities. There may be short-term incremental noise increases during these operational activities if there are other noise-generating activities within the ROI at the same time, such as those identified previously in this chapter. However, noise levels would return to baseline upon completion of the operational activity. As a result, any cumulative noise impacts would

be short-term and temporary and would not result in sustained, long-term cumulative impacts to the noise environment.

5.3.12 Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks

Past actions that are considered in determining potential cumulative impacts on socioeconomic resources include the actions identified in Section 5.2, *Past, Present, and Reasonably Foreseeable Future* Actions, including past industrial use of the project site, the *Camden County Kings Bay Joint Land Use Study*, and the closure of the St. Marys Airport.

The past industrial site of the proposed Vertical Launch Facility was used by the Bayer CropScience Corporation prior to 2012. Since that time, these facilities have been deconstructed and removed; restoration structures, utility infrastructure, roads, and concrete pads remain. The activities at the site prior to deconstruction and removal produced light emissions that, in the past, were noticeable sources of sky glow and glare. Given the proposed use of the site within the historical context of the site, the Proposed Action would not be expected to result in any cumulative impacts to socioeconomic resources from this past action.

Another past action includes the closing of the St. Marys airport in 2017, due to its proximity to NSB Kings Bay. The economic impacts of the closure include direct, indirect, and induced loss of airport jobs and revenue generated by business associated with the 10 aircraft operations per day. The Proposed Action in combination with the past actions could slightly offset some of the potential loss from the airport closure and industrial industry in jobs and revenue generated to the county.

Past and present actions include operations of NSB Kings Bay, an active military base and the largest employer in terms of jobs for the county, along with continued public and private construction, renovation, and maintenance of buildings; management of natural resources (which support tourism and commercial and recreational fishing); maritime transportation routes; and the aerospace industry. Past and present actions contribute to the affected environment described in Section 3.12, *Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks*, and include existing population and population trends, construction-related employment and unemployment, housing availability, economic industries, and public services and social conditions. The Proposed Action in combination with these actions would contribute to cumulative short-term and long-term economic conditions and trends.

Another present and reasonably foreseeable future action is the construction and operation of the Port of St. Marys Industrial and Logistics Center. The Port of St. Marys is a "modern barge terminal and dock on the North River capable of accommodating multiple barges and handling a diverse mix of waterborne cargo, connecting St. Marys to the deepwater ports in the region including Fernandina Beach, Jacksonville, Brunswick, and Savannah" (Port of St. Marys, 2015). Details on the economic impacts associated with the project can be found on the St. Marys website. As shown in Exhibit 3.12-2, high vessel traffic is present in the waterways surrounding St. Marys. Vessel traffic in the waterways, including any additional vessel traffic from the industrial barge port, would continue to be high. Vessel traffic from the port using waterways that are present within the USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*) may be delayed or rerouted during launches. The extent of delays and costs associated with delays would depend on various factors. Potential measures to minimize adverse impacts to commercial boating would include advanced notice of launches, issuance of NOTMARs, and interagency coordination.

Reasonably foreseeable future actions include activities described in Camden County's Strategic Plan (Camden County, 2020). Such activities would include maintaining an active naval submarine base,

development of a technology corridor, investments in outdoor and indoor sports and recreational centers, residential developments, and development of aerospace facilities in support of the anticipated spaceport. Specifics related to each project are not available at this time, but combined, are anticipated to generate up to 2,000 jobs. These jobs would contribute to the largest industries presently in terms of employment to the region, including the government and government enterprises, retail industry, and the accommodation and food services industry. New jobs associated with reasonably foreseeable future actions would also contribute to the construction industry; utilities industry; professional, scientific, and technical services industry; management of companies and enterprises; administrative and support and waste management remediation services industry; real estate; educational services; health care and social assistance; and arts, entertainment and recreation. Incoming population of that size would contribute to local, regional, and overall state earnings and output. Construction, renovation, and possible demolition activities associated with potential actions would also provide temporary employment and income benefits for the duration of the activity. Continued construction activities would maintain the level of construction-related employment, but would also contribute to localized noise and traffic. In addition, population growth from activities would result in competition for affordable housing, increased participation rates in tourism and ecotourism activities, encroachment with NSB Naval Base, and increased demand for public services and educational services. Economic growth stemming from job creation could also include consumption of nonrenewable resources, potentially higher levels of pollution, and possibly, loss of environmental habitats. Potential sustainable management practices that restrict fishing seasons and species could create additional access and participation conflicts with important commercial and recreational industries. The Proposed Action, in combination with reasonably foreseeable future actions, could amplify the potential impacts associated with economic growth, as discussed.

Other reasonably foreseeable future actions include the rezoning of private land on Cumberland Island, which would increase the number of full-time and part-time residents on Cumberland Island. Population growth on the island would likely result in the following: increased participation rates in tourism and ecotourism activities, consumption of nonrenewable resources, potentially higher levels of pollution, additional noise during construction and from the presence of more residents and guests, delays and additional traffic from more people entering and leaving the island, visual effects from construction equipment and the homes, and the loss of environmental habitats. No significant impacts to air quality, land use, tourism, noise, visual effects, water resources, and biological resources have been identified under the Proposed Action that would contribute to significant cumulative impacts from this action in combination with the Proposed Action. The 87-acre tract is located adjacent to the Sea Camp Ranger Station and campground and is outside the composite USCG LAA identified under the Proposed Action (described in Section 2.1.2.5, *Pre-Launch Activities*). Additional residents on Cumberland Island during launches may require updates to the Fire Mitigation Plan (described in Section 2.1.2.5, *Pre-Launch Activities*) and other emergency management plans and may require additional public service personnel, to account for and accommodate the additional residents and guests. Additional residents, visitors, and tourists associated with these actions could create control and access issues during launches. Continued cooperation from the State and local government, Federal agencies, and the public (through Joint Land Use Study programs, management plans, and communication) would be implemented to minimize adverse impacts.

The potential for the NPS to move wilderness campgrounds to areas within the identified USCG LAA (described in Section 2.1.2.5, *Pre-Launch Activities*) is not expected to result in adverse impacts. As stated previously, there would be no access restrictions or limitations to campgrounds and their permitted users on Cumberland Island National Seashore as a result of the Proposed Action.

A reasonably foreseeable future action is the use of the spaceport site for amateur rocket launches. A past amateur rocket launch required authorizations/waivers per Chapter 31, Section 2, of FAA Order 7400.2M. The rocket launch did not require construction or require temporary or restricted access to mariners. An amateur rocket launch in the future would be expected to be similar to the past launch, in which no construction was required, and a NOTMAR would be issued to advise mariners to exercise caution when traversing a certain area. Therefore, the Proposed Action in combination with this action would not be anticipated to result in significant cumulative impacts to socioeconomic resources.

The potential significance of the Proposed Action in combination with past, present, and reasonably foreseeable future actions would likely depend on the duration of activities and the timing. For instance, if all activities and construction projects were to occur at once, there could be additional delays with an insufficient number of hired employees or available equipment and supplies. Another example would be if an in-migration of people entered the workforce at the same time and were competing for houses or economic goods and services and educational services. In contrast, if activities were staggered, it would allow more time for the market to adjust. The Camden County Strategic Plan considers short-term and longer-term projects to account for this.

Although FAA has not established a significance threshold for socioeconomics, possible factors suggested in the FAA 1050.1 Desk Reference (FAA, 2020a) were considered for significance determination of cumulative impacts. Since the potential for the Proposed Action in combination with past, present, and reasonably foreseeable future actions would not likely induce substantial economic growth (such as establishing projects in an undeveloped area), disrupt or divide the physical arrangement of an established community, cause extensive relocation when sufficient housing is unavailable, cause extensive relocation of community businesses that would cause severe economic hardship for affected communities, disrupt local traffic patterns or substantially reduce the levels of service of roads serving an airport and its surrounding communities, or produce a substantial change in the community tax base, then there would be no significant cumulative impacts to socioeconomic resources.

The composite USCG LAA associated with the Proposed Action (described in Section 2.1.2.5, *Pre-Launch Activities*) lies within three block groups in three census tracts within Camden County, Georgia, which were defined as the affected region for environmental justice communities. These areas include BG 3 of Census Tract 102.00, BG 2 in Census Tract 101.00, and BG 1 in Census Tract 106.02. Only BG 1 in Census Tract 106.02 had residential populations within the portion of the block group within the composite USCG LAA. Only one block group exists in Census Tract 106.02; therefore, demographic information for the block group is the same as that for the entire census tract. Most recent estimates indicate that the block group has 24.5 percent (259 people) of the population that identifies themselves as minority, compared to 30.1 percent (15,856 people) of the total population in Camden County. Approximately 4.2 percent (44 people) of the population in the block group are low-income, compared to 12.9 percent (6,546 people) in the county. The block group had a lower percent of children under 18 years of age (21.7 percent or 229 people) than the county (24.5 percent or 12,939 people), but a higher percent of elderly population age 65 and older (23.0 percent or 243 people), compared to the county (12.2 percent or 6,435 people). Spaceport operations associated with the Proposed Action would not be expected to cause disproportionately high and adverse human health or environmental effects on minority or low-income populations within the ROI, because no significant unmitigated impacts from operations would be anticipated to occur in surrounding communities. Therefore, past, present, and reasonably foreseeable future projects with the Proposed Action would not be anticipated to result in cumulative and disproportionate impacts to minority or low-income populations within the affected region.

Past, present, and reasonably foreseeable future projects that would involve continued and increasing usage of waterways for a variety of purposes could affect the types and levels of noise and contribute to

changes in water quality, viewshed, and quantity of accessible land. The Proposed Action in combination with past, present, and reasonably foreseeable future impacts to these resources could amplify environmental health and safety risks to minority, low-income populations, children and elderly populations, and others. Implementation of local, State, and Federal regulations, along with continued interagency coordination and communication and measures outlined in Chapter 6, *Mitigations*, would minimize potential environmental health and safety risks to the public.

5.3.13 Visual Effects

Visual Resources

In the foreseeable future, no other large-scale projects are anticipated for Camden County in the vicinity of the spaceport site. It is likely that over time the area will experience residential developments on a small scale in the rural areas and expand out from nearby communities such as Woodbine and St. Marys, the bluffs north of Satilla Creek, and on Cumberland Island. Other infrastructure may include road improvements and additional cellular towers.

The proposed site was previously used for industrial uses by the Bayer CropScience Corporation prior to 2012. During this phase of industrial use, the site had several industrial-scaled facilities, which have since been demolished. Visually, most of these were not noticeable in the surrounding area due to vegetation screening, with the exception of the 300-foot-tall Temik manufacturing facility and a water treatment plant. These taller structures were visible and prominent from some offsite viewing locations. Prior to 2012, these facilities were deconstructed and removed, and restoration structures, utility infrastructure, roads, and concrete pads remain. In addition, the activities at the site during the era prior to 2012 produced light emissions that in the past were noticeable sources of sky glow and glare.

The spaceport project would redevelop a previously used industrial site. This is a sound practice under U.S. Green Building Council LEED® evaluative criteria, as it would minimize the expansion of the local industrial footprint into new areas. The County would have permit authority for the spaceport and other future development in the surrounding area under its UDC. Local ordinances would apply to the construction and operations at the new spaceport and include standards for buffering industrial sites from adjacent areas and avoiding specific sensitive areas. Following the intent of this code, future development near the spaceport will also undergo site specific review and approval. This process can address new situations as they arise, with amendments to the code as necessary, and inclusion of appropriate measures to maintain visual compatibility near the spaceport site.

Light Emissions

The larger region (reaching about 25 miles around the site) includes radiance from urbanized areas, including St. Simons and Brunswick to the north, Woodbine to the west, and NSB Kings Bay, St. Marys, Fernandina Beach, and Yulee to the south. About 40 miles south, the suburbs of Jacksonville generate urban radiance. The spaceport project would introduce light emissions into an area that is dark and part of a valued viewshed for the Cumberland Island National Seashore.

The analysis of the proposal in Section 4.13.1, *Visual Effects*, *Proposed Action*, found that operation of the spaceport may add to local sky glow and glare from the lighting infrastructure proposed for the site. This current context of the site is relatively dark and unilluminated, although during its past use, the industrial sites were illuminated. Some future residential development and expansion of urbanized areas in the surrounding region may contribute to some gradual increase in light emissions at night, including the installation of new communications towers. Current night radiance mapping shows the proposed spaceport site as dark (see Exhibit 3.13-4), with isolated areas of night radiance in the surrounding region. Although the spaceport may appear as a new local pocket of low-intensity night radiance, it would remain

isolated. However, this continues a trend for the eventual infill and overlap of pockets of night radiance as more development occurs in the region. This effect is a long-term process. Efforts to shift industry use of blue-rich white LED lighting to lighting with a warmer color spectrum is beginning and could interrupt this trend (see mitigations in Section 6.13, *Visual Effects*).

Overall, considering past, present, and reasonably foreseeable future development expectations for the local area and region, the visual changes of the new spaceport are within the historic footprint of anthropogenic change. Nonetheless, the visibility of the proposed structures and associated lighting is not congruous with the goals for sensitive viewsheds of the Cumberland Island National Seashore and the NPS goals for maintaining a dark sky environment.

To minimize the contribution of Spaceport Camden lighting to regional night radiance and visible outdoor artificial lighting at night, the spaceport operator would implement mitigations identified in Section 6.13, *Visual Effects*. This includes the development and implementation of an Artificial Lighting Management Plan using a cooperative effort with Federal, State, and local agencies and local stakeholders.

5.3.14 Water Resources

The cumulative impacts on water resources should take into account all surface-altering actions that have occurred, or are likely to occur, within or adjacent to the ROI. The most frequent effect of surface disturbance in this region is accelerated erosion and sediment deposition, which may affect water resources by contributing sediment, introducing contaminants, or increasing flooding. Past industrial and development activities at the site have influenced the current condition of water resources at the site.

The primary cumulative impacts on surface water and wetlands from past, present, or reasonably foreseeable future actions (Section 5.2, *Past, Present, and Reasonably Foreseeable Future* Actions) would result from any increase in the acreage of earthmoving activities and accelerated erosion from infrastructure improvement projects that have the potential to increase sediment delivery and surface runoff downstream, or introduction of chemical contaminants into surface water bodies and wetlands. None of the projects listed in Section 5.2, *Past, Present, and Reasonably Foreseeable Future Actions*, have the potential to interact with water resources in such a manner.

The primary cumulative impacts on groundwater from past, present, or reasonably foreseeable future actions would result from an increase to groundwater usage that would exceed the sustainable yield of the groundwater source or contaminate the water supply. None of the projects listed in Section 5.2, *Past, Present, and Reasonably Foreseeable Future Actions*, have the potential to interact with groundwater resources in such a manner.

There are no Wild and Scenic Rivers located within the ROI. The Satilla River is the only river in the water resources ROI that is listed on the NRI. The primary cumulative impacts on the Satilla River from past, present, or reasonably foreseeable future actions would be impacts that would cause the loss of recreational value that would make the river ineligible for status as a Wild and Scenic River. None of the projects listed in Section 5.2, *Past, Present, and Reasonably Foreseeable Future Actions*, have the potential to interact with the Satilla River in such a manner.

No significant adverse impacts are anticipated to water resources as a result of implementing construction activities or operations at the proposed Spaceport Camden. Development activities require permitting for both wetland and soil disturbance; the intent of these permitting requirements is to ensure impacts to water resources are minimized or avoided to the extent practicable. A safety buffer would surround the developed Spaceport Camden. No additional construction would occur in this buffer area, further reducing the potential for erosion and sedimentation from future developments. As a result, cumulative

impacts resulting from implementation of the Proposed Action in conjunction with past, present, and reasonably foreseeable future actions on water resources in the ROI are not expected to be significant, given permitting requirements.

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6 MITIGATION

This chapter describes mitigation measures that may be implemented to avoid or minimize identified adverse impacts in Chapter 4, *Environmental Consequences*, associated with the Proposed Action. Some of these mitigation measures may be associated with permitting requirements (and in some cases, exact mitigations would be outlined during the permitting process), while others may be associated with consultation with the USFWS and Georgia SHPO or recommended as part of impact analysis.

As discussed in Chapter 4, *Environmental Consequences*, environmental management plans and permits identified in this chapter are not "mitigations" in the NEPA sense, but SOPs that are typical of operations and/or required by law to be implemented as part of construction activities or operations. In many cases, these SOPs and permits do serve to avoid or minimize impacts, but are inherent to the Proposed Action (i.e., part of the Proposed Action) and serve to inform the analysis in this chapter. For example, if an NPDES permit is required for construction covering more than an acre of land and is, therefore, inherent in the Proposed Action (that is, the Proposed Action cannot occur without the permit), the typical BMPs/requirements of an NPDES permit (such as use of silt fencing and development of a stormwater management plan) inform the analysis. If any additional impacts are identified over and above implementation of NPDES permit requirements, then mitigations are identified to avoid or minimize identified impacts. Therefore, the permits and associated SOPs are not called out separately as mitigations. All required permits are identified in Section 1.4.2, *Other Licenses, Permits, and Approvals*.

Mitigation measures to be implemented would be identified in the Record of Decision and incorporated into a Mitigation Plan that would indicate implementation and monitoring requirements, timelines for implementation, and roles and responsibilities with regards to mitigation measure implementation and monitoring.

6.1 Air Quality

While no significant adverse impacts to air quality have been identified, and no mitigation measures associated with operational activities for air quality are necessary, there are some mitigation measures that can be implemented to further minimize impacts from activities associated with construction, such as:

- Implementing dust abatement techniques (e.g., water application) on unpaved or vegetated surfaces to minimize airborne dust during construction
- Revegetating disturbed areas as soon as possible after disturbance, which could include interim revegetation along road beds, once heavy construction is completed
- Covering construction materials and stockpiled soils if they are a source of fugitive dust

Most of these mitigation measures are also tied to minimization of erosion and sedimentation and would likely be included in any NPDES permitting requirements.

Once the final construction plan is determined and facilities are constructed, an emissions inventory would be prepared in order to accurately determine if the facility will be required to obtain a Title V operating permit.

Spaceport Camden would prepare and implement a Hazardous Materials Emergency Response Plan to ensure that adequate and appropriate guidance, policies, and protocols regarding hazardous material incidents and associated emergency response are available to and followed by all personnel.

6.2 Biological Resources

Through consultation with the USFWS and NMFS, an extensive list of conservation measures designed to avoid, minimize, and mitigate potential effects to biological resources was developed. These measures are identified in the ESA consultation documents in Appendix A. The conservation measures would be implemented through coordinated efforts of FAA, the County, and future spaceport users. 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. FAA would require compliance with these conservation measures as part of maintaining an active Launch Site Operator License.

The measures below are examples of those provided in the USFWS consultation provided in Appendix A that would serve to avoid, minimize, and compensate for potential effects to biological resources due to the proposed construction and operation of Spaceport Camden. The Final EIS will include any additional measures included in the consultation with NMFS once completed.

6.2.1 Construction

1. At least 6 months prior to starting construction, the County would develop a comprehensive Protected Species and Habitat Management Plan (PSHMP) to address sensitive species protection and habitat management at the spaceport. This plan would include measures to protect wildlife from the impacts of artificial lighting at night.
2. The County would be responsible for conducting pre-construction sensitive species and associated habitat surveys. As part of ESA Section 7 consultation, the USFWS agreed with an FAA conservation measure to perform annual presence/absence surveys for sensitive species with the requirement to immediately reopen consultation with the USFWS if these species are detected. The surveys would be part of the comprehensive PSHMP to be developed by the County. As part of the PSHMP, the survey protocol would be reviewed and approved by the USFWS. Available USFWS guidance for survey protocols would be incorporated into the PSHMP. Otherwise, the County would work with the USFWS on an acceptable survey methodology.
3. Develop a Wildlife Lighting Management Plan in coordination with the USFWS and GDNR:
    a. Minimize to the extent possible visibility of facility glow, sky glow, or direct light to wildlife.
    b. Provide clear guidance to project and/or facility managers.
    c. Consult with the IDA or another similar professional organization when developing the lighting design and management plan for Spaceport Camden.
    d. Specifically, for the protection of sea turtles, the lighting plan would use fixtures and practices similar to those prescribed in the Jekyll Island Authority Code of Ordinances, Chapter 10, Article IV (*Beach Lighting*), Sections 10-81 and 10-83, specifically relating to sea turtle-safe lighting and protocols during nesting seasons.
4. Develop a Wildland Fire Management and Burn Plan in coordination with the USFWS and GDNR at least 6 months prior to Spaceport Camden development.
5. Follow National Bald Eagle Management Guidelines (USFWS, 2007):

a. A bald eagle nesting survey would be required prior to construction; if an active nest (i.e., nest with eggs or chicks) occurs within the construction ROI, then the nest would be protected until the chicks have fledged.

b. State and Federal permits for eagle take (disturbance) are required in order to avoid liability under the Bald and Golden Eagle Protection Act; the County is responsible for determining if a Bald and Golden Eagle Protection Act permit is necessary.

   i. Construction would follow the guidelines for the Georgia Power Avian Protection Plan developed in coordination with the APLIC and the USFWS (2005) to minimize impacts from power lines, unless structural or human safety would be compromised.

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

   iii. The 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.

6. For protection of EFH, to the extent practicable, a vegetated upland buffer of up to 75 feet would be developed and maintained between wetlands and developed areas to minimize impacts from construction (per NMFS EFH consultation [see Appendix A]), and a minimum vegetated buffer of at least 25 feet along all creeks and tidal marshes would be maintained (per O.C.G.A. 12-7-6[b]15[A] and 12-7-6[b][16] and 12-7-6[b][17][A]).

7. Appropriate pass-throughs for endangered and/or protected species (e.g., tortoises and snakes) in/under fencing would be installed pursuant to USFWS and GDNR recommended mitigation measures (see Appendix A). Some examples of designs to support wildlife movement at a boundary fence include leaving small gaps at the base of the fence, installing small culverts that burrow beneath fencing, using gauged wire to support passage along the base, and installing the fence with a 4- to 6-inch gap between it and the ground to allow wildlife passage.

6.2.2 Operations

1. Integrate the Wildlife Lighting Management module into the comprehensive site visual resource management plan as part of standard operational activities.

2. Establish a prescribed fire program in the Wildland Fire Management and Burn Plan that details the frequency, timing, and location of prescribed burns to reduce potential wildfires.

3. Develop the proposed USCG LAA in consultation with FAA, the USFWS, GDNR, and NPS to ensure the Cumberland Island National Seashore and the Satilla River, St. Andrews Sound, and Cumberland River areas are properly secured, with minimal impact to the USFWS, GDNR, and NPS activities and operations related to habitat and wildlife management.

4. Prior to static fire tests and launches, 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 lift-off, assuming primary radar is in use.

5. Following the Record of Decision and prior to construction, the proponent would develop a Protected Species and Habitat Management Plan. This plan would include a lighting module that includes and describes all mitigations agreed to in the consultation process, specifically to address impacts of night lighting on wildlife.
6. Beach driving for security sweeps would require a state authorization under O.C.G.A. 12-5-230 et seq., *Shore Protection Act*, prior to commencing. The rules and other BMPs associated with these authorizations include, but are not limited to:
    a. Law enforcement personnel should minimize their beach driving at night (a half hour after sunset to a half hour before sunrise) between May 1 and October 31.
    b. Drive only on the wet sand beach, except when necessary, to drive around a slough or other impassable area on the beach.
    c. Access the wet sand beach only from specifically designated points (two points are designated on Little Cumberland Island and eight on Cumberland Island).
    d. Limit the maximum speed to 25 mph from August 1 through March 31 and to 20 mph from April 1 through July 31, except in case of emergency.

6.3 Climate

GHG emission reduction is not mandated and may not be possible in all situations. However, changes to more fuel-efficient equipment, delay reductions, use of renewable fuels, and operational changes could serve to minimize GHG emissions.

With regard to impacts of climate change on the Proposed Action, ensuring critical facilities and storage areas are above flood level and that facilities are constructed to withstand severe storm activity would minimize any such adverse impacts.

6.4 Coastal Resources

No specific mitigation measures for coastal resources other than those identified for other resources throughout this chapter have been identified at this time. Any additional mitigation measures resulting from GDNR coastal consistency review will be included in the Final EIS.

6.5 Department of Transportation Act, Section 4(f)

No specific mitigation measures for Section 4(f) resources other than those identified for other resources throughout this chapter have been identified at this time. Section 4(f) compliance does not require that mitigation measures be developed unless the Proposed Action would result in a use of a Section 4(f) property. In such a case, and unless a feasible and prudent alternative can be identified that avoids the use of Section 4(f) properties altogether, Section 4(f) requires that the alternative with the least overall harm be selected after taking into consideration all possible planning to minimize harm and mitigate impacts. Because FAA has made the determination that the Proposed Action would not result in the use of a Section 4(f) property, no additional minimization or mitigation measures are required.

To ensure no use of the Cumberland Island National Seashore, there would be no operational restrictions or requested launch closure of the Cumberland Island National Seashore.

6.6 Farmlands

Impacts were identified for farmlands and aquaculture areas. To reduce these impacts, the following mitigations are recommended:

- Ensure that adjacent farmland property owners and aquaculture lease holders are included on the "authorized persons" list (see Section 1.4.2, *Other Licenses, Permits, and Approvals*), to allow their business operations to continue without interruption.
- Follow mitigation measures identified for the other resources, to ensure that impacts to aquaculture resources and harvesting activities are minimized.

6.7 Hazardous Materials, Solid Waste, and Pollution Prevention

Containment areas surrounding the fuel storage tanks and any fueling facilities must be designed to ensure adequate containment or catchment of fuel so that tidal resources would not be impacted by a fuel spill (O.C.G.A. 12-8-60, *Hazardous Waste Management Act*).

Spaceport Camden would prepare and implement a Hazardous Materials Emergency Response Plan to ensure that adequate and appropriate guidance, policies, and protocols regarding hazardous material incidents and associated emergency response are available to and followed by all personnel. Potential measures to mitigate impacts related to hazardous materials, solid waste, and pollution may include the following:

- Mitigation, monitoring, treatment and/or cleanup requirements applicable to prior or ongoing cleanup activities, as required through the Georgia Brownfields Program. (Note: The land acquisition process would not be contingent on the site's acceptance to the Georgia Brownfields Program.)
- Performing comprehensive surveys prior to construction to identify MEC-related hazards.
- Educating workers on the potential for MEC, including how to recognize MEC and what procedures to apply in case MEC are encountered.
- Employing signage and escorts to ensure that site visitors are not accidentally exposed to MEC.
- Educating workers on the potential for contamination (stained/discolored soil, odors, sheen on groundwater, etc.) to be encountered during construction, including what procedures to apply in case contamination is encountered.
- Developing a hazardous materials response plan and/or a SPCC plan to identify those precautions, training requirements, and response measures that would be taken to prevent and contain releases of hazardous materials.
- Coordinating sweeps after each event, as part of security patrols by Spaceport Camden personnel during launches, to recover materials that have been discharged from rockets. (Note: Removal of launch vehicle debris would be implemented for debris landing in tidally influenced marsh or State waters or in other areas, as required by applicable regulations.)
- Obtaining a hazardous waste generator operating permit from GDNR EPD.
- Employing source reduction strategies such as recovering, recycling, or composting waste materials.

- Finding markets for recovered, recycled, or composted products, or other wastes that are usable for producing energy or other activities.
- Recycling construction debris associated with the Proposed Action.
- Developing and incorporating an Environmental Management System.
- Incorporating recommendations provided by Federal, State, tribal, or local agencies responsible for managing any known contaminated sites.

6.8 Historical, Architectural, Archaeological, and Cultural Resources

Resolution of adverse effects to historic properties requires the avoidance, minimization, or mitigation of the adverse effects (36 CFR §800.6(b)). Where avoidance is not feasible, mitigation measures would be formalized in a Section 106 Programmatic Agreement document between FAA, the Georgia SHPO, the ACHP, and other parties as appropriate.

For historic properties, mitigations of adverse effects may take place at the location of the adverse effect, or at another location if all signatories to the Section 106 Programmatic Agreement document concur. Some or all of the following measures may be appropriate mitigations:

- Historic American Building Survey or equivalent documentation (for structures)
- Monitoring for damage from the proposed spaceport facility, with any necessary repairs addressed according to the Secretary of Interior's Standards for the Treatment of Historic Properties (36 CFR Part 68)
- Interpretive display(s) at the proposed spaceport Visitor Center or other appropriate location
- Ample notice of impending launches, wet dress rehearsals, and static firings to the NPS staff at Cumberland Island National Seashore
- Continued consultation with the SHPO, NPS, ACHP, and other consulting parties to determine additional appropriate mitigation measures
- Procedures for inadvertent discovery of additional archaeological or historical sites during construction, including reporting and consultation with the SHPO
- Preparation of new or updates to existing resource management plans for affected resources
- Phase II NRHP eligibility testing if construction will occur and sites cannot be avoided. If the sites are determined to be eligible for listing on the NRHP, then possibly require Phase III archaeological data recovery if the sites cannot be avoided by the proposed construction
- Data recovery excavations at an archaeological historic property, based on a research design, resulting in a technical study that documents the scientific data obtained

As discussed previously in Section 4.8, *Historical, Architectural, Archaeological, and Cultural Resources*, NHPA Section 106 consultation with the Georgia SHPO is currently ongoing (see Appendix A). Any additional mitigation measures for any potential adverse effect to cultural resources identified through agency consultation will be included in the Record of Decision.

6.9 Land Use

Closures would be required as described in Section 4.9.1.2, *Land Use, Proposed Action, Operation*. The GDNR Coastal Resources Division recommends avoiding or minimizing launch operations that require access limitations on weekends, holidays, and during organized fishing and hunting tournaments in the vicinity, as well as posting limited access dates and/or times at all public access points within 10 miles of proposed USCG LAAs, including the Georgia Coast Saltwater Paddle Trail and public boat ramps, 30 days in advance (O.C.G.A. 12-5-320, *Coastal Management Act*). Additionally, the GDNR Coastal Resources Division requests notification in writing of all launch operations that require public notification so that they may assist in alerting the affected public of upcoming closures. While there are no specific mitigation measures associated with land use, other mitigation measures identified under the resource sections within this chapter would apply to closures.

Cumberland Island Wilderness

Various measures have been developed for other resource areas that will serve to preserve Cumberland Island Wilderness character:

- As indicated in Section 6.2, *Biological Resources*, and Section 6.13, *Visual Effects*, a light management plan will be developed and implemented to minimize light emissions and potentially reduce adverse impacts to the natural quality and visitors' perceptions of solitude.
- As indicated in Section 6.12, *Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks*, advanced public notice would be provided to inform wilderness visitors of upcoming closures and launch activities, to minimize disruptions in visitors' wilderness experience.

6.10 Natural Resources and Energy Supply

Energy conservation measures could be incorporated into facility and infrastructure designs and operating standards for Spaceport Camden. Such measures could include the following:

- Following principles of environmental design and sustainability (including pollution prevention, waste minimization, and resource conservation) in project or program planning
- Incorporating into project design measures to provide more efficient cooling, heating, and lighting
- Utilizing energy from renewable sources to the extent possible (i.e., solar paneling)

6.11 Noise and Noise-Compatible Land Use

Conducting one launch per year or less during late-night hours (10:00 p.m. to 7:00 a.m.), as described in Section 2.1.2, *Representative Launch Vehicle and Operational Activities*, would minimize noise annoyance impacts. Monitoring noise levels using sound level meters during launch and static fire events would allow reconfirmation of predicted noise levels.

6.12 Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks

Recommended measures to minimize impacts include the following:

- Do not schedule tests or launches during special events, holidays, or other days of cultural significance.
- Do not schedule tests or launches during managed hunts on Cumberland Island.
- Provide advanced public notice, to minimize the impacts on commercial fishermen for waterway closures.
- Coordinate with the management of Cumberland Island and its campsites to minimize disruption to their operation.
- Develop, coordinate, review, and update (as necessary) emergency response plans.
- Support ongoing interagency coordination.
- Develop procedures for citizens to submit a damage claim on the Spaceport Camden website, prior to the first launch.
- Communicate potential closures through notices posted at local bait shops, boat ramps, and other locations where commercial, recreational, and subsistence fishing participants may frequent.

6.13 Visual Effects

The spaceport operator would incorporate measures to reduce visual impacts from the construction and operations of Spaceport Camden. These measures would address potential negative effects to adjacent land uses, wilderness areas, wildlife, vegetation, and historic sites from changes in visual context resulting from development of the site and the correlated effects of artificial lighting on sensitive resources and receptors. A Visual Resources Management Plan (VRMP) plan would include at least three modules: (1) the ALMP (addressing the visibility of lighting at night, sky glow, and glare to receptors in the surrounding areas, including wildlife, persons and activities, and sensitive natural areas; (2) the Site Revegetation and Landscaping Plan (addressing revegetation, landscaping, and irrigation during and post-construction; and (3) the Site and Physical Design Plan (addressing the appearance, character, and visibility of new facilities and infrastructure).

In developing the VRMP, the spaceport operator would coordinate with a team of representatives from other agencies and organizations (i.e., the Georgia SHPO, the USFWS, NPS, GDNR, IDA, local agencies with jurisdiction over resources in the area, local businesses, and local citizen representatives). This group or committee would identify key issues of concern and establish suitable methods and metrics to track changes in the local environment attributable to spaceport lighting. Member agencies would be responsible for establishing a current baseline and collecting and monitoring data to track changes and trends. The group would meet initially during the plan development stage and then periodically to discuss issues and monitoring trends. When needed, the group would discuss and implement any reasonable adjustments to the VRMP that could inhibit undesirable trends, without compromising safety and functionality of the spaceport.

The following are examples of recommended measures for the ALMP:

- Lighting management should specifically address the use of LED lighting and promote the use of LED lighting with a correlated color temperature (amber/yellow) that is no higher than 3,000 kelvin, consistent with the IDA's Fixture Seal of Approval program (IDA, 2010a; 2010b; 2015), when this does not conflict with mission-essential safety and performance.
- Use Engineering Society's design guidelines, with IDA-approved fixtures.

- During construction, minimize project-related light and glare to the maximum extent feasible, given safety considerations, and operate portable lights at the lowest allowable wattage and height (a height no greater than 20 feet).
- Screen all lights and direct downward toward work activities, away from the night sky and nearby residents, to the maximum extent possible.
- Minimize the number of nighttime lights to the greatest extent possible, while meeting safety and security requirements.
- Use nonglare finishes on light fixtures to prevent reflective daytime glare.
- Design lighting for energy efficiency with daylight sensors or timers equipped with an on/off program. For area and pathway areas, use lights with natural light qualities, with minimum intensity, feasible for security, safety, and personnel access.
- Design lighting, including light color rendering and fixture types, to be aesthetically pleasing.
- Specific to sea turtle protection, specify fixtures and practices similar to those prescribed in the Jekyll Island Authority Code of Ordinances, Chapter 10, Article IV (Beach Lighting), Sections 10-81 and 10-83, specifically relating to sea turtle-safe lighting and protocols during nesting seasons, as appropriate. Use tinted glass on all windows and glass doors of single or multi-story structures with unobstructed line-of-sight to any beach.
- Incorporate mitigations and measures agreed to during consultation with the USFWS and identified in the consultation in Appendix A and the Protected Species and Habitat Management Plan.
- Minimize potential for glare reflected off glazing on the new facilities through use of nonreflective coatings, orientation of the glazing, or sun-tracking shading devices.
- Incorporate a LEED®-type of commissioning process for the facility to verify the functionality of the structures and building systems post-construction and prior to occupancy. The commissioning process would involve regular evaluation and monitoring to maintain efficient performance, particularly for measures and fixtures that are aimed at minimizing impacts on the natural environment, wildlife, and humans. The post-construction commissioning process would engage ongoing coordination with local residents, businesses, and highway department planners to identify glare hotspots and devise appropriate site-specific visual screening or warning systems.
- Use a commissioning process to rigorously check lighting equipment, monitor performance, and make adjustments to onsite lighting in response to specific issues.
- Periodically review dark sky effects over time with the agency and local stakeholders and consider using reasonable new measures to minimize light emissions that would not impair safety of launches.

The Site Revegetation and Landscaping Plan would include details for each facility complex at Spaceport Camden and for the overall site. It would respond to the context, provide for appropriate landscaping around each facility, and address the use of buffers using trees and understory vegetation to fully screen views from offsite locations to the extent possible, particularly from the east and Cumberland Island. This plan would also address water retention and runoff through the use of landscape and engineered features. The Site Revegetation and Landscaping Plan would address establishing new vegetation on areas that are disturbed and cleared during construction (such as stockpiling areas and vehicle maneuvering

areas) and augmenting the overall appearance of the spaceport site. The plan would respond to the following guidelines:

- Complement the other modules in providing the best practices to manage water runoff, and revegetate using appropriate plant species.
- Compose 100 percent of the species in open-space areas to reflect those that are native and indigenous to the project region. The species list should include trees, shrubs, and an herbaceous understory of varying heights, as well as both evergreen and deciduous types. Use plant variety to increase the effectiveness of revegetated areas by providing multiple layers, seasonality, diverse habitat, and reduced susceptibility to disease.
- Use no invasive plant species at any location.
- Use native grass and wildflower seed for erosion control measures where it would improve aesthetics. Wildflowers provide seasonal interest to areas where trees and shrubs are removed or grading has occurred. Choose species that are native and indigenous to the area and for their appropriateness to the surrounding habitat. For example, use upland grass and wildflower species for drier, upland areas and wetter grass species for wetland areas. If not appropriate to the surrounding habitat, wildflowers should not be included in the seed mix. Under no circumstances shall invasive plant species be used in any erosion control measures.
- Plant vegetation within 2 years, following project completion.
- Design landscaping to maximize the use of planting zones that do not need irrigation, such as seeding with a native grassland and wildflower meadow mix, and incorporate aesthetic features, such as cobbling swales or shallow detention areas, that reduce or eliminate the need for an irrigation system, where appropriate.
- If an irrigation system is required, implement an irrigation and maintenance program during the plant establishment period and continue, as needed, to ensure plant survival.
- If an irrigation system is required, use a smart watering system that evaluates the existing site conditions and plant material against weather conditions, to avoid overwatering of such areas. Avoid undue water through management and rapid repairs of broken, malfunctioning parts or components, with automatic shutoff, until repairs are implemented.

The Site and Physical Design Plan would address how to visually integrate the facilities and operations into the context of surrounding land uses and historical sites. Practices and recommendations to consider include the following:

- Establish an appropriate palette of exterior materials, finishes, and colors to complement the surrounding context and work with the objectives of the ALMP and the Site Revegetation and Landscaping Plan.
- Evaluate local industrial sites near locations with historic value and incorporate appropriate features and design measures that complement the natural landscape, aesthetics, and historical context, to the extent possible, and where needed.
- Use measures to minimize visual intrusion of project facilities on the nearby surroundings. Select paint and surface color and finishes that are coherent with the general surrounding area, when visible from visually sensitive, offsite locations.
- Select coherent paint colors and finishes, panel size, fenestration patterns, building materials, and appropriate use of back lighting. Consider U.S. Department of the Interior BLM Standard

Environmental Colors Chart CC-001: April 2014 for information about selecting color and other BMPs and techniques for visual screening at the following website:

https://www.blm.gov/policy/ib-2014-051.

- Select appropriate paint type to ensure long-term durability of the painted surfaces. Maintain exterior finishes to preserve their intended design function.
- Where appropriate for the design themes, use natural material (e.g., stone or rock surfacing) and integral color, to reduce visibility and blend with the landscape.
- For tall vertical structures, use materials or colors that blend with the surroundings, to the extent possible. For example, use low-sheen and nonreflective surface materials to reduce potential for glare. Avoid the use of glossy paints or surfaces.
- To the extent possible, use existing utility corridors on the site for new utility infrastructure.
- Develop road signage with signaling on key roadways that alerts drivers during live launch windows.
- Develop designated launch-observation points in the local area for the public, and use them as an opportunity for education and outreach.
- Support efforts to aid impacted local residents or businesses by installing site-specific screening or landscaping, to shield any direct glare caused by spaceport lighting. These efforts may include reimbursing cost of materials for qualifying projects.

6.14 Water Resources

Wetlands

Section 404 of the CWA establishes a program to regulate the discharge of dredged or fill materials into waters of the United States, including wetlands. USACE issues permits for projects that will disturb waters of the United States. Permit applicants must show that steps have been taken to avoid impacts, that impacts have been minimized to the extent feasible, and provide compensation for any remaining unavoidable impacts. All three of these requirements are considered mitigation measures.

The Section 404 permit process is part of a regulated permit review process. An individual permit is required for potentially significant impacts. Individual permits are reviewed by USACE, which evaluates applications under a public interest review, as well as the environmental criteria set forth in the CWA Section 404(b)(1) Guidelines.

For most discharges that will have only minimal adverse effects, a general permit may be suitable. General permits are issued on a nationwide, regional, or State basis for particular categories of activities. The general permit process eliminates individual review and allows certain activities to proceed with little or no delay, provided that the general or specific conditions for the general permit are met. For example, minor road activities, utility line backfill, and bedding are activities that can be considered for a general permit. States also have a role in Section 404 decisions, through State program general permits and water quality certification. In Georgia, Section 401 water quality certifications occur jointly with the Section 404 permit application.

During the initial design phase of Spaceport Camden, every effort was made to avoid siting facilities in waters of the United States. This effort will continue into the final design phase of the project. It is anticipated that some impacts to waters of the United States will be unavoidable and the project will require a Section 404 permit and compensatory mitigation.

In 2008, USEPA and USACE jointly promulgated regulations revising and clarifying requirements regarding compensatory mitigation. Compensatory mitigation means the restoration (reestablishment or rehabilitation), establishment (creation), enhancement, and preservation of waters of the United States for the purposes of offsetting unavoidable adverse impacts, which remain after all appropriate and practicable avoidance and minimization has been achieved (USEPA, 2017d).

There are three mechanisms for providing compensatory mitigation (listed in order of preference as established by USEPA and USACE regulations): mitigation banks, in-lieu fee programs, and permittee-responsible mitigation (USEPA, 2017d).

Mitigation bank means a site where waters of the United States are restored, established, enhanced, and/or preserved for the purpose of providing compensatory mitigation for impacts authorized by USACE permits. In general, a mitigation bank sells compensatory mitigation credits to permittees whose obligation to provide compensatory mitigation is then transferred to the mitigation bank sponsor (USEPA, 2017d).

In-lieu fee program means a program involving the restoration, establishment, enhancement, and/or preservation of aquatic resources through funds paid to a governmental or nonprofit natural resources management entity to satisfy compensatory mitigation requirements for USACE permits. In-lieu fee programs are similar to mitigation banks, with slightly different rules governing the operation on use of mitigation banks (USEPA, 2017d).

Permittee-responsible mitigation means restoration, establishment, enhancement, and/or preservation activity undertaken by the permittee (or an authorized agent or contractor) to provide compensatory mitigation for which the permittee retains full responsibility (USEPA, 2017d). Mitigation measure requirements will be coordinated with USACE as part of the ongoing Section 404 permit process. Consistent with recommendations from NMFS to minimize potential impacts to EFH in adjacent marshlands, where there is sufficient distance to do so, vegetated upland buffers between the proposed developed areas and wetlands (generally 75 feet or more) would be incorporated into the site design plans.

Floodplains

Impacts to floodplains would be mitigated by complying with the floodplain portion of the county UDC. All final designs will be approved by a professional engineer familiar with county requirements. These measures would include, but may not be limited to, the following:

- Minimization of fill requirements in the floodplain
- Construction controls to minimize erosion and sedimentation
- Facility design in compliance with county ordinances that require adequate flow circulation and preserve free, natural drainage

Surface Waters

Compensatory mitigation requirements described for wetlands would also apply for jurisdictional surface waters that are directly impacted by construction activities. Mitigation measure requirements will be coordinated with USACE as part of the ongoing Section 404 permit process.

Grading and excavation activities associated with construction have the potential to increase runoff, erosion, and sedimentation. Any potential impacts to surface water and groundwater would be prevented or minimized by implementing permit-related erosion BMPs during and after construction. Separate Georgia NPDES Construction Stormwater General Permit and land disturbance activity permits from the County would be required. Permit conditions would specify BMPs and mitigation measures required to prevent fugitive soil, sediment, and other potential contaminants from entering water bodies and

wetlands. Such conditions could include minimization of earth-moving activities during wet weather/conditions, covering soil stockpiles, installation of silt fencing and sediment traps, and revegetation of disturbed areas with native plants as soon as possible, to contain and prevent any offsite migration of sediment or eroded soils from the project areas.

The site drainage plan for the spaceport should provide effective engineering controls and adequate naturally vegetated buffers around unused wetlands to prevent any soil, sediment, or other potential contaminants resulting from stormwater runoff from impervious surfaces (e.g., roads and roofs) from entering these sensitive natural resources. Following construction, disturbed areas not covered with impervious surfaces would be reestablished with appropriate vegetation and native seed mixtures and managed to minimize future erosion potential.

Groundwater

The County would be responsible for any contamination sites acquired as part of the Proposed Action, and the County would be responsible for soil and groundwater investigations and management of soil and source material that are above Georgia risk-reduction standards. This would involve preparing a CAP, which would serve as a contract for soil and source cleanup at these sites in accordance with State of Georgia requirements.

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7 UNAVOIDABLE ADVERSE IMPACTS, IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES, AND SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

As required by 40 CFR §1502.16 of the CEQ regulations, FAA must identify any irreversible or irretrievable commitments of resources, which would be involved in the Proposed Action or reasonable alternative(s), should they be implemented. An irreversible or irretrievable commitment of resources refers to impacts on or losses to resources that cannot be recovered or reversed. Examples include permanent conversion of wetlands and loss of cultural resources, soils, wildlife, agricultural production, or socioeconomic conditions. Irreversible is a term that describes the loss of future options. It applies primarily to the impacts of use of nonrenewable resources, such as minerals or cultural resources, or to those factors, such as soil productivity, that are renewable only over long periods of time. Irretrievable is a term that applies to the loss of production, harvest, or use of natural resources. For example, if farmland is used for a nonagricultural event, some or all of the agricultural production from an area of farmland is lost irretrievably while the area is temporarily used for another purpose. The production lost is irretrievable, but the action is not irreversible.

Implementing the Proposed Action requires a commitment of natural, physical, human, and fiscal resources. In all these categories, irreversible and irretrievable commitments of resources would occur, with these commitments similar in nature across both alternatives. While the land area under consideration is currently designated as an industrial site with MEC areas on the Union Carbide Corporation property, land required for new construction would be irreversibly committed during the functional life of the facilities. In some cases, land uses would change from unimproved/semi-improved to improved, but for the most part, designation as an industrial site would remain. Although it is possible for land to revert to its former state if the facilities were abandoned and destroyed, the likelihood of such an occurrence for established facilities would be low.

Considerable amounts of fossil fuels and construction materials such as steel, cement, aggregate, and bituminous material would be expended under the Proposed Action alternatives. However, these physical resources should generally be in sufficient supply during the proposed project; therefore their commitment would not have an adverse effect on the resources' local, regional, or national continued or future availability.

Some biological resources would be irreversibly and irretrievably lost with construction of the proposed project, and some areas of wildlife habitat would be lost. However, based on the amount of actual construction footprint compared to the amount of buffer area and remaining open areas at and surrounding the launch site, the loss would be minimal. Significant or sensitive habitat areas would be avoided to the extent practicable, and impacts to sensitive species would be mitigated as discussed in the EIS and ESA Section 7 consultation.

In terms of human resources, labor would be used in preparation, fabrication, and construction related to the project. Labor is generally not considered to be a resource in short supply, and commitment to the project would not have an adverse effect on the continued availability of these resources. Project construction would require a substantial expenditure of funds. It is anticipated that businesses, employees, and residents of the local area would benefit from improved economics resulting from implementation of the Proposed Action.

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