

DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
Office of Commercial Space Transportation
Adoption of the Environmental Assessment
and
Finding of No Significant Impact
for
Blue Origin’s Orbital Launch Site at Cape Canaveral Air Force Station,
Florida

Summary

The U.S. Air Force (USAF) acted as the lead agency, and the Federal Aviation Administration (FAA) was a cooperating agency, in the preparation of the 2016 *Final Environmental Assessment for Blue Origin Orbital Launch Site at Cape Canaveral Air Force Station, Florida* (EA), which analyzed the potential environmental impacts of Blue Origin constructing and operating a commercial launch site at the combined areas of Launch Complexes (LCs) 11 and 36 at Cape Canaveral Air Force Station (CCAFS). Blue Origin is seeking a long-term combined lease with the USAF for use of LCs 11 and LC 36. The proposal evaluated in the EA included construction of the launch site, engine testing, launching a liquid-fueled heavy-lift class orbital vehicle (termed the Orbital Launch Vehicle [OLV]), and landing and recovering the first stage of the OLV on an at-sea platform in the Atlantic Ocean. The proposal includes up to 12 OLV launches per year beginning in 2018. The National Aeronautics and Space Administration (NASA) also participated as a cooperating agency in the preparation of the EA. The EA was prepared in accordance with the National Environmental Policy Act of 1969, as amended (NEPA; 42 United States Code [U.S.C.] § 4321 et seq.); Council on Environmental Quality (CEQ) NEPA implementing regulations (40 Code of Federal Regulations [CFR] parts 1500 to 1508); the USAF’s Environmental Impact Analysis Process (32 CFR part 989); and FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*.

Blue Origin is required to obtain a license from the FAA for commercial launch operations, to include OLV launches and landings. Based on its independent review and consideration of the EA, the FAA issues this FONSI concurring with, and formally adopting, the analysis of impacts and findings in the EA

supporting the FAA's issuance of licenses to Blue Origin for OLV launch operations, including first stage landings. If, in their license application to the FAA, Blue Origin makes changes to their operations which fall outside the scope of the 2016 EA, additional environmental review would be required prior to the FAA issuing a license associated with such an application.

After reviewing and analyzing available data and information on existing conditions and potential impacts, including the EA, the FAA has determined the issuance of licenses to Blue Origin to conduct OLV launches at CCAFS and first stage landings on an at-sea platform would not significantly affect the quality of the human environment within the meaning of NEPA. Therefore, the preparation of an Environmental Impact Statement is not required, and the FAA is independently issuing this FONSI. The FAA has made this determination in accordance with applicable environmental laws and FAA orders and regulations. The EA is incorporated by reference into this FONSI.

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Purpose and Need

The purpose of FAA's Proposed Action of issuing launch licenses to Blue Origin is to fulfill the FAA's responsibilities as authorized by Executive Order 12465, *Commercial Expendable Launch Vehicle Activities* (49 FR 7099, 3 CFR, 1984 Comp., p. 163) and the Commercial Space Launch Act (51 U.S.C. Subtitle V, ch. 509, §§ 50901-50923) for oversight of commercial space launch activities, including licensing launch activities. The need for FAA's Proposed Action results from the statutory direction from Congress under the Commercial Space Launch Act, 51 U.S.C 50901(b) to, in part, "protect the public health and safety, safety of property, and national security and foreign policy interests of the United States" while "strengthening and [expanding] the United States space transportation infrastructure, including the enhancement of United States launch sites and launch-site support facilities, and development of reentry sites, with Government, State, and private sector involvement, to support the full range of United States space-related activities."

Proposed Action

The FAA's Proposed Action is to issue licenses to Blue Origin for OLV launch operations that include launches at CCAFS and landings of the first stage in the Atlantic Ocean. In order to conduct launches, Blue Origin must construct infrastructure and facilities suitable for its operations. The major elements of the launch site include the launch pad, integration facility, engine test stand, and the systems to recover and refurbish reusable space systems such as the OLV's first stage. Refer to Figure 2-4 in the EA for the planned layout of infrastructure and facilities at LCs 11 and 36. Under the Proposed Action, launches (including first stage landings) would occur up to 12 times per year beginning in 2018.

The OLV is based on a common core booster that would use Blue Origin's BE-4 engine. The OLV would be capable of carrying payloads with one or more spacecraft, within a payload fairing setup. The OLV is currently under development and would consist of a first stage, second stage, and the payload. A third stage may be added in the future. The vehicle would be up to 350 feet tall, with a diameter of approximately 23 feet. The thrust of the vehicle would reach approximately 4.5 million pounds force (lbf). The first and second stages would be powered by liquefied natural gas and liquid oxygen (LOX). The possible third or alternative second stage would be powered by liquid hydrogen and LOX.

Construction

Much of the LC-11 and LC-36 area has previously been developed. The proposed launch site and supporting facilities would require approximately 100 acres to be disturbed in the LC-11 and LC-36 area. This acreage represents a conservative estimate of directly disturbed land. The project would reuse as much existing impervious concrete surface area as possible for planned infrastructure. Much of the existing vegetation within the 100 acre-footprint would be cleared and/or replanted with sod/grasses to be used for open areas or storm water retention ponds. Specific items that would be required for the launch site include: power supply; fiber optic cable; water/wastewater supply, storage, treatment, and fire protection systems; launch pad, flame duct, and launch pad building; roads; engine test stand and systems; three lightning protection towers; vehicle and payload integration facility (including office space); a refurbishment building; propellant storage facilities; and support buildings. Refer to Section 2.2.3 of the EA for more information on these items.

Operations

Proposed operational activities include engine testing, transportation of OLV stages and/or payloads and other pre-launch activities, launches (including at-sea landings), and first stage recovery and other post-launch activities. These activities are summarized below. Refer to Section 2.2.4 of the EA for a complete discussion.

Engine Testing

Testing of the BE-4 engine would occur at the proposed engine test stand in the LC-11 area. Each engine tested would have a separate test plan. Each test plan would require a variety of engine test run durations (measured in seconds) with a maximum total run duration of approximately 500 seconds. The total duration of all engine testing would be approximately 30 minutes per month based on approximately 9 test events per month. Maximum test thrust for the BE-4 would be approximately 550,000 lbf.

Transportation and Other Pre-Launch Activities

The operation of the proposed launch site would include transportation of vehicle stages and/or payload elements. Launch vehicle stages and payloads would arrive at the launch site by heavy truck (tractor-trailer) or specialized transporter. A transportation survey study was conducted to demonstrate adherence to Florida Department of Transportation (FDOT) standards and ensure existing roadways and proposed roadway modifications would support the transport vehicles. The study evaluated the loads on roadways using a self-propelled multi-axle trailer system or pulled by a semi-tractor as the conveyance equipment. Transporting the OLV's first stage would require two trailers: an eight-axle unit leading with a six-axle unit in the rear. Transporting the second stage and payloads would require a single eight-axle trailer, with the six-axle trailer as a backup. When employed, the third stage transport would use a single six-axle trailer, with the eight-axle trailer as a backup. According to the transportation study, axle loading is expected to be less than 20,000 pounds and is not expected to cause detrimental wear and tear on roads that meet FDOT specifications. The proposed primary route from the Exploration Park manufacturing facility to the launch site would be north on Kennedy Parkway, east on Saturn Causeway through Kennedy Space Center (KSC), south on Cape Road, east on Central Control Road, and into the LC-36 area entrance (refer to Figure 2-5 in the EA).

Once the transports arrive at LC-36 from the Exploration Park facilities, the launch vehicle components would be offloaded at the integration facility. Ordnance, such as explosive bolts, would be delivered to

the launch site and stored in a U.S. Alcohol, Tobacco, and Firearms approved storage magazine located within the integration building. Payload propellants contained within commercial payloads may include hypergolic fuels such as hydrazine, unsymmetrical dimethyl hydrazine, monomethylhydrazine, nitrogen tetroxide, hydrogen peroxide, as well as solid rocket motors and pressurized gases including helium and nitrogen. Hypergolic describes a propellant that ignites on contact with an oxidizer. All hazardous materials would be handled in accordance with Federal, USAF, State, and local laws and regulations.

Prior to launch, a sequence of events must occur before the OLV is prepared for flight. After assembly in the integration facility, the OLV would be rolled out to the launch pad. Once at the pad, it would be erected to the vertical launch position where cryogenic fueling would commence. For cargo or satellite missions, the payload accommodations would have been pre-loaded in the integration facility. Initial launch vehicle pre-flight testing could include a short on-pad static fire test and would be part of the launch pad operations.

Pre-launch activities also would include scheduling and coordination of the airspace. Coordination with USAF and government agencies to provide notification of launch and other pre-launch operations (i.e., static fire engine tests and wet dress rehearsals) and establishing secure areas in the vicinity of the launch site would occur. The 45th Space Wing Operations Group operates the Eastern Range and supports launches of space vehicles for the Department of Defense, NASA, and national and international commercial customers. The Proposed Action does not include reconfiguration of the dimensions (shape and altitude) of the airspace. Airspace use would be coordinated by the FAA. Blue Origin would coordinate with the USAF and FAA for launch and notification requirements.

Launches

OLV launches would be similar to existing launches at CCAFS. All launches would be conducted to the east over the Atlantic Ocean. Blue Origin proposes conducting up to 12 OLV launches per year beginning in 2018. Of these 12 launches, ten are expected to be conducted during daylight hours, and two may be conducted during night time hours. Depending upon the situation, this number may fluctuate, having a higher percentage of daytime launches due to unforeseen circumstances (e.g., weather). Launches would require establishing public access controls to ensure the public remains a safe distance from the launch site. As part of evaluating Blue Origin's license application, the FAA would conduct a safety review per 14 CFR part 400 and define a flight hazard area and safety clear zone, which is an area that must remain clear of members of the public during a launch to protect public safety.

First Stage Recovery and Other Post-Launch Activities

After a successful launch, the first stage would separate from the second stage at a pre-determined altitude. After separation, the first stage would return to Earth for recovery in an area in the Atlantic Ocean (see Figure 2-7 in the EA). The first stage would land on an at-sea platform, be rendered safe, and be transported by ship (coordinated by Blue Origin) into Port Canaveral. The first stage would not have parachutes and would return to the at-sea platform under the power of re-ignited main engines. Once transported to shore, cranes would place the first stage on the transporter for transfer to Blue Origin facilities at LC-36 for refurbishment in preparation for a future flight. If the expended first stage was not successfully landed on the at-sea platform, it would likely sink in the ocean and would not be recovered.

The second and/or third stages would continue on the mission to orbit with the payload. They would be left in orbit and rendered safe per FAA and USAF regulations (14 CFR §§ 431.25, 431.35), such as venting the vehicle and ensuring the batteries have discharged. Eventually, the second stage would be expected to deorbit and enter the atmosphere. Parts not consumed during re-entry would fall in the general broad ocean area of the central Indian Ocean. Should there be a third stage, it would be placed into a safe disposal orbit (i.e., an orbit that lies away from common operational orbits to reduce the probability of colliding with spacecraft).

Alternatives

Alternatives analyzed in the EA include the Proposed Action and the No Action Alternative. Under the No Action Alternative, Blue Origin would not construct and operate a launch site at the combined areas of LC-11 and LC-36 at CCAFS. Consequently, Blue Origin would not apply for a launch license from the FAA to conduct commercial space launch operations at CCAFS. LC-11 would remain undeveloped and continue to remain vacant. LC-36 would remain under a lease to Space Florida for future use as an orbital launch site. LC-36 is not currently licensed by the FAA for commercial space operations. The No Action Alternative would not meet the stated purpose and need.

Other launch sites (alternatives) were considered, although none were considered reasonable alternatives because they did not meet the project's technical requirements (refer to Section 2.4 of the EA).

Environmental Impacts

The following presents a brief summary of the potential environmental impacts considered in the EA for the Proposed Action. This FONSI incorporates the EA by reference and is based on the potential impacts discussed therein. The FAA has determined the analysis of impacts presented in the EA represents the best available information regarding the potential impacts associated with the FAA's regulatory responsibilities as described in this FONSI. Although not required by FAA Order 1050.1F, this FONSI includes the following additional impact categories because they are addressed by the lead agency (USAF) in the EA: geology and soils, health and safety, orbital debris, and transportation.

Air Quality

Air emissions would result from three main (non-stationary) sources: construction equipment, engine testing, and OLV launches. Construction activities are expected to last two years. Emissions from construction equipment would be localized and not result in exceedance of any air quality standards. Engine tests of the BE-4 engine and launches of the OLV would result in emissions below the mixing height (i.e., 3,000 feet above ground level) and thus have the potential to affect ambient air quality. Table 4-4 in the EA displays estimated emissions during a typical BE-4 engine test. Tables 4-5 and 4-6 in the EA provide estimated air emissions below 3,000 feet for each OLV launch and for 12 annual launches. As shown in the tables, carbon monoxide (CO) is the only criteria pollutant emitted during engine testing and flight of the OLV below 3,000 feet. Engine testing is expected to emit a total of 11.8 tons of CO per year. Twelve annual OLV launches are expected to emit a total of 1.74 tons of CO below the mixing layer. The total amount of CO emitted annually would not result in an exceedance of the National Ambient Air Quality Standards (NAAQS) for CO. Most CO emitted by the liquid fueled engines is oxidized to carbon dioxide (CO₂) during afterburning in the exhaust plume. Small quantities of the other pollutants, such as nitrogen oxides, would primarily occur above 3,000 feet and would disperse quickly after launch, and therefore were not quantified for the analysis and are essentially zero. Brevard County and CCAFS are in attainment with the NAAQS, and therefore the General Conformity Rule does not apply. In conclusion, the Proposed Action would not result in significant air quality impacts [EA 4.5 at 4-26].

Biological Resources (including Fish, Wildlife, and Plants)

Plants

Construction would clear approximately 20 acres of vegetation, including native and invasive species. Native vegetation that would be removed consists of grasses (low-quality wildlife habitat) and oak scrub (Florida scrub-jay habitat). Brazilian pepper and Australian pine are two invasive species that would be removed (a minor beneficial impact). Vegetative material would either be removed to a suitable off-site area, or burned on location in accordance with USAF regulations as schedule and burn conditions permit. Conversion of the vegetative community from scrub to open grass area, and loss of habitat and native vegetation, would be compensated through the restoration of overgrown scrub-jay habitat located elsewhere on CCAFS.

Launches would have minor impacts to vegetation from the heat and fire associated with engine ignition. NASA has mapped the effects on local vegetation from several heavy-lift class launch vehicle launches from CCAFS. Vegetation scorching has been limited to a small area (less than 2.5 acres) within 150 meters (492 feet) of the launch pad. In conclusion, the Proposed Action would not have a significant impact on plants [EA 4.3 at 4-7, 4-8].

Fish and Wildlife

Wildlife in the vicinity of LCs 11 and 36 could be affected by construction noise. Wildlife response to noise can be physiological or behavioral. Physiological responses can range from mild, such as an increase in heart rate, to more damaging effects on metabolism and hormone balance. Behavioral responses to man-made noise include attraction, tolerance, and aversion. Each has the potential for negative and positive effects, which vary among species and among individuals of a particular species due to temperament, sex, age, and prior experience with noise. Construction noise could have discernible, but temporary effects on wildlife occurring at or nearby the construction site. Potential effects of noise to mammalian species during construction would include disruption of normal activities. Construction-related noise and vibration would potentially cause disturbance to amphibians and reptiles. Potential impacts to migratory birds from construction include disruption in foraging, roosting, and courtship activities. If construction was scheduled to occur during the avian breeding season, it would occur in accordance with the Migratory Bird Treaty Act (MBTA) to avoid impacts to nesting migratory birds. Biological surveys would occur prior to commencement of construction activities, and

bird nests would be marked. In compliance with the MBTA, construction workers would not directly or indirectly disturb the nest or an adjacent area until a biologist determines the nest is no longer in use.

In addition to noise, removal of vegetation during construction would result in the loss of habitat for those species living in the area. Construction is not expected to result in a large number of animal mortalities, because most wildlife living in the area would have the ability to move away from the construction site or find shelter (e.g., burrows).

Like construction noise, launch noise would affect wildlife within the vicinity of the launch pad. Wildlife exposed to launch noise would likely have a startle response. Temporary noise impacts to wildlife are not expected to affect local or regional populations of wildlife, especially since this area is accustomed to launch operations. Sonic booms generated during launch would occur over the open ocean and would not adversely affect marine life.

In compliance with the Endangered Species Act (ESA), the potential effects of the Proposed Action on federally listed threatened and endangered species were assessed. The USAF prepared a Biological Assessment (BA) and submitted it to the U.S. Fish and Wildlife Service (USFWS). In the BA, the USAF determined the Proposed Action “may affect and is likely to adversely affect” the southeastern beach mouse (*Peromyscus polionotus niveiventris*), eastern indigo snake (*Drymarchon corais couperi*), Florida scrub-jay (*Aphelocoma coerulescens*), and the loggerhead (*Caretta caretta*), green (*Chelonia mydas*), leatherback (*Dermochelys coriacea*), hawksbill (*Eretmochelys imbricata*), and Kemp’s ridley (*Lepidochelys kempii*) sea turtles. The USFWS concurred with this determination. The USAF also determined the Proposed Action “may affect but is not likely to adversely affect” the wood stork (*Mycteria americana*), red knot (*Calidris canutus*), piping plover (*Charadrius melodus*), and West Indian (Florida) manatee (*Trichechus manatus latirostris*). The USFWS concurred with this determination. The USFWS issued a Biological Opinion (BO) on May 27, 2016, stating the Proposed Action is not likely to jeopardize the continued existence of any federally listed species and no critical habitat would be affected. In the BO, the USFWS listed terms and conditions for which the USAF must comply. Additionally, the USAF will implement special conservation measures consistent with State guidelines and requirements to avoid or minimize impacts to the gopher tortoise (*Gopherus polyphemus*), a candidate for Federal listing in Florida. In conclusion, the Proposed Action would not have a significant impact on fish and wildlife [EA 4.3 at 4-11].

Climate

Greenhouse gas (GHG) emissions include CO₂ emissions associated with construction of the launch site, engine testing, and OLV launches. As discussed in the EA, GHG emissions associated with construction would be negligible and not have a measurable impact on climate change. Engine testing would emit approximately 15,195 metric tons of CO₂ (MtCO₂) annually. Twelve OLV launches would emit approximately 2,244 MtCO₂ annually. Thus, the Proposed Action would increase atmospheric concentrations of CO₂. The Proposed Action would not result in any appreciable global warming that may lead to climate change. In accordance with CEQ's guidance on GHGs and climate change, climate change effects on the Proposed Action were also considered. Sea level rise was analyzed due to its predictability and impact on the region, and potential effects on the project area. Per the 45th Space Wing General Plan, which outlines effects due to a change in climate and plans for future optimization of CCAFS under altered climactic conditions, LCs 11 and 36 do not need to be relocated in response to expected sea level rise. Blue Origin's design of the launch site takes climate change and sea level rise into account. All new roads would be constructed between 6–12 inches higher than existing roads, which are some of the highest in the area. The site design complies with the CCAFS General Plan guidance. Site design also calls for building floors to be at least 8.5 feet above 100-year flood stage. Accordingly, the Proposed Action would not result in significant impacts related to climate [EA 4.6 at 4-29].

Coastal Resources

All construction and operations (including launches) would occur in the State-designated coastal zone, similar to other vehicle launches at CCAFS. All operations and new infrastructure and facilities would be similar to other operations and infrastructure and facilities at CCAFS. The Florida Department of Environmental Protection (FDEP) reviewed the EA and determined the Proposed Action would be consistent with the Florida Coastal Management Program. Therefore, the Proposed Action would not result in significant impacts to coastal resources [EA 4.1 at 4-3].

Department of Transportation Act, Section 4(f)

There are no Section 4(f) properties located within the boundaries of CCAFS. Therefore, there would be no physical use of a Section 4(f) property via permanent use of land, and there would be no temporary occupancy of a Section 4(f) property. When there is no physical use and no temporary occupancy, but

there is the possibility of constructive use, the FAA must determine if the impacts would substantially impair the 4(f) property. Section 4(f) properties located within an approximately 15-mile radius of LCs 11 and 36 include Merritt Island National Wildlife Refuge, Cape Canaveral National Seashore, Jetty Park, Kelly Park, KARS Park, Kings Park, and Manatee Cove Park. Additionally, the St. Johns National Wildlife Refuge and Tosohatchee State Game Preserve are located west of the launch site. Due to their proximity to LCs 11 and 36, these properties would experience noise from OLV launches. Noise levels at these 4(f) properties would increase temporarily during launches. The increased noise level would only last a few minutes and would occur up to 12 times a year under the Proposed Action. Due to the vehicle's trajectory, the OLV would accelerate over the Atlantic Ocean and away from Section 4(f) properties. Landing and recovery of the OLV's first stage would not affect Section 4(f) properties, because landing would occur a few hundred miles offshore.

For decades, the 4(f) properties in the vicinity of CCAFS have been experiencing increased noise levels during launches taking place at CCAFS and adjacent KSC including the Space Shuttle, Delta V, Titan IV, and the Falcon 9 that have launched from CCAFS and KSC facilities. Due to the long history of these 4(f) properties experiencing noise from launches at CCAFS and KSC, the Proposed Action would not substantially diminish the protected activities, features, or attributes of any of the Section 4(f) properties identified, and thus would not result in substantial impairment of the properties. Therefore, the Proposed Action would not be considered a constructive use of these Section 4(f) properties and would not invoke Section 4(f) of the DOT Act [EA 4.16 at 4-43, 4-44].

Farmlands

There are no farmlands or prime agricultural land located at CCAFS; thus, no farmlands would be affected [EA 3.1 at 3-19].

Geology and Soils

No unique geologic features of exceptional interest or mineral resources occur in the project area. Engine testing and OLVs launches would not affect geology and soils. Construction activities would follow methods that are standard in the industry to avoid unnecessary discharge into wetlands and surface waters, such as the use of double silt fencing, floating turbidity barriers, filter socks, and temporary diversion beams among other techniques, as necessary. Since site contamination is recorded, any soil that is disturbed would remain onsite or properly disposed of in accordance with the CCAFS's

Land Use Control Implementation Plan for LCs 11 and 36. Therefore, the Proposed Action would not result in significant impacts on geology or soils [EA 4.10 at 4-36].

Hazardous Materials, Solid Waste, and Pollution Prevention

All hazardous materials would continue to be handled and disposed of per the requirements established by the Resource Conservation and Recovery Act, the Occupational Safety and Health Act, and per the Hazardous Materials Contingency Plan developed for other launch vehicle programs. Blue Origin would develop a compatible and compliant plan of its own. Blue Origin would also develop and implement proper handling procedures for any payloads containing hypergolic fuels. Since all applicable Federal, State, and local rules and regulations would continue to be followed for the proper storage, handling, and usage of hazardous materials, the Proposed Action would not result in significant impacts related to hazardous materials [EA 4.7 at 4-30].

Solid waste would be expected to increase slightly with increased launch activities. The amount of solid waste generated would be handled under existing collection and disposal operations. Blue Origin would develop a Pollution Prevention Management Plan, in coordination with CCAFS pollution prevention plans and goals, to comply with all Federal, State, and local regulations. In conclusion, the Proposed Action would not result in significant impacts related to hazardous materials, solid waste, and pollution prevention [EA 4.7 at 4-31].

Health and Safety

CCAFS range safety regulations ensure the general public, launch area personnel, and foreign land masses are provided an acceptable level of safety, and that all aspects of any construction and launch operations adhere to public laws. Range safety organizations review, approve, monitor, and impose safety holds, when necessary, on all pre-launch and launch operations. All payload processing and launch facilities used to store, handle, or process ordnance items or propellants must have an Explosive Quantity-Distance Site Plan. All payload and launch programs that use toxic materials must have a Toxic Release Contingency Plan for facilities that use the materials. A Toxic Hazard Assessment must also be prepared for each facility that uses toxic propellants. The Toxic Hazard Assessment identifies the safety areas to be controlled during the storage, handling, and transfer of the toxic propellants. Furthermore, the FAA would conduct its own public safety review in accordance with the implementing regulations of

the Commercial Space Launch Act of 1984 (14 CFR Part 400) prior to issuing a license. Therefore, the Proposed Action would not result in significant impacts to public health and safety [EA 4.13 at 4-39].

Historical, Architectural, Archeological, and Cultural Resources

Neither LC-11 nor LC-36 is considered an historic complex. However, the Blockhouse (Building 05501) at LC-36A is listed as a historical landmark. An interview with the 45th Space Wing Cultural Resources Manager (CRM) indicated that LC-36 is within a large archaeological site at CCAFS. The CRM indicated archaeological artifacts (if any) within LC-36 were lost or destroyed during site development in the early 1960s. While the Blockhouse is an historic building and could not be demolished or modified, Blue Origin does not intend to use or modify the blockhouse. It would be protected from potential effects from nearby construction activities.

While most planned construction activities would be within the current perimeter of LC-36, there are some areas which would extend beyond the fence line. Therefore, an archaeological Phase I Survey was conducted, which was managed by the CRM. Based on the survey, the USAF determined the Proposed Action (or undertaking) would have no adverse effect to historic properties. The State Historic Preservation Officer concurred that the undertaking would have no adverse effect to the Blockhouse or any other historic property listed or eligible for listing on the National Register of Historic Places. Therefore, the Proposed Action would not result in significant impacts on historical, architectural, archeological, or cultural resources [EA 4.4 at 4-22].

Land Use

The Proposed Action would occur at LCs 11 and 36, which are both designated for space launch activities. The Proposed Action would be consistent with both the 45th Space Wing General Plan and the USAF mission at CCAFS, and with past operations at the launch complexes. Therefore, the Proposed Action would not result in significant impacts on land use [EA 4.1 at 4-2].

Natural Resources and Energy Supply

Current potable and non-potable water supply, as well electrical power, to LCs 11 and 36 would be able to support construction, daily operations, engine testing, and OLV launches. Blue Origin would reconnect LC-11 electrical power to the CCAFS grid. LC-36 is currently connected to the electrical supply system. Water and power usage during normal operation and in support of any launch event would be

similar to past operations the launch complexes. Therefore, there would be no significant impacts related to natural resources and energy supply [EA 4.12 at 4-38].

Noise and Noise-Compatible Land Use

There are no sensitive receptors (e.g., schools, hospitals) in the vicinity of LC-11 or LC-36. Low to moderate levels of noise would be generated by heavy equipment, work vehicles, and other construction equipment during land clearing and construction. Vehicles associated with the Proposed Action typically produce noise levels between 65 and 100 A-weighted decibels (dBA) at a distance of 50 feet. No noise-related impacts from construction are anticipated since all work would be planned to occur during daylight hours. Noise levels during construction would not exceed current levels in the area.

Operational noise would be generated during engine testing and OLV launches. A single launch event at LC-36 would generate levels at or above a maximum overall sound pressure level (L_{Amax}) of 115 dBA within 0.9 mile of the launch pad. During an engine test, a receptor located along the peak directivity angle may experience an L_{Amax} of 115 dBA at approximately 0.3 mile from the engine test stand. Sound levels produced by engine tests would remain constant over the duration of the event, whereas the levels produced by launch events would decrease as the rocket moves further away from the receptor. Noise levels above an L_{Amax} of 115 dBA would remain within CCAFS boundaries for both launch and engine test events. Noise levels above an L_{Amax} of 115 dBA generated during engine testing would not impact any facilities beyond Blue Origin's license parcel. The Proposed Action is not expected to generate propulsion noise that impacts structures beyond that of past or current NASA and CCAFS launch operations.

The Proposed Action's day-night average sound level (DNL) 65 and 60 dBA contours extend approximately 1.4 and 2 miles from LC-36's launch pad, respectively. This area does not encompass land outside CCAFS boundaries and thus no residences would be impacted. The DNL is dominated by cumulative noise from the engine tests. However, for single event based metrics, launch events would generate greater noise levels than single-engine tests. The longer duration and greater number of annual operations of engine tests generate more total sound exposure on a yearly basis than launch events. Engine testing and rocket launches would not result in significant noise impacts [EA 4.2 at 4-5].

Sonic booms would be generated during OLV launches and first stage at-sea landings. During flight of the OLV, the boom would be directed northeasterly out over the ocean in the direction of the launch

azimuth. The nominal launch trajectory would generate sonic booms that impact the Earth's surface over the Atlantic Ocean, making them inaudible on the mainland. Similarly, during an at-sea first stage landing, the boom would impact the open ocean. Therefore, with respect to human health and safety or structural damage, noise impacts due to sonic booms are not expected [EA 4.2 at 4-6].

Orbital Debris

Orbital debris from OLV launches may reenter the Earth's atmosphere. Blue Origin's policy is to employ design and operations practices that limit the generation of orbital debris, consistent with mission requirements and cost-effectiveness. There are two issues of note in evaluating orbital and reentry debris. The first is the physical reentry of foreign objects and the resulting noise, contact force, and settling of the debris. The second is the potential for hazardous materials that may be contained in or on the debris. Reentry of the first stage is controlled by Range Safety, and efforts would be coordinated to reduce the risk to shipping lanes and ensure vessel activity would be outside the launch and reentry zone. The launch of the OLV and associated spacecraft, and their potential addition to or affects from orbital and reentry debris, is not expected to have a significant impact on the environment [EA 4.8 at 4-32].

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

Blue Origin plans to add administrative, engineering, operations, and construction workforce over the next 10 years, primarily outside CCAFS at its Exploration Park Manufacturing Complex. Blue Origin estimates creating approximately 330 permanent jobs by 2023. A subset of these jobs, approximately 50 to 75 jobs, would be located at the proposed launch site. Additionally, Blue Origin expects to create approximately 600 indirect construction-related jobs. This would result in a direct positive impact to the local economy. The addition of these workers at CCAFS would not represent a significant increase in the population or growth rate of the region. While the Proposed Action would not significantly affect the local housing market, the addition of added economic activity would result in a small but positive impact to the local economy, especially since the Shuttle Program was terminated in 2011 and thousands of local workers lost their jobs.

The construction of facilities, engine testing, and OLV launches would occur within the boundaries of CCAFS and over the Atlantic Ocean, similar to current launch operations at CCAFS launch complexes. Since there are no children or minority or low income groups in that area, the Proposed Action would

not affect children or minority or low-income populations. In conclusion, the Proposed Action would not result in significant impacts related to socioeconomics, environmental justice, or children's environmental health and safety risks [EA 4.14 at 4-42; EA 4.15 at 4-42; EA 3.1 at 3-19].

Transportation

The Proposed Action would impact transportation. Plans to address roadways, culverts, and turn radius improvements have been developed and would be implemented prior to the transport of any vehicle to the launch facility. The length, width, height, and weight of the launch vehicle stages are larger than previous launch vehicles launched at LC-36. The added length would require a special trailer rig with specially designed and built dual lane trailers having up to eight axles. A traffic study was developed to support the project. Minor road modifications in some road intersections and turning situations would be needed, some traffic signals would need to be modified or moved, and two sets of power lines would be required to either be elevated or buried underground to eliminate obstructions. To reduce any slow-pace traffic impacts, launch vehicle transport would be scheduled during "off-hours" and would avoid peak-flow periods. Transport of the OLV to the proposed launch site, and transport of a returned first stage from the port to LC-36, would only occur up to 12 times per year. The Proposed Action would not result in significant impacts on transportation [EA 4.11 at 4-37].

Visual Effects (including Light Emissions)

The proposed launch site would include several structures, including water towers, lightning towers, and support structures, which would be permanent structures at CCAFS. The proposed launch site would add lighting (facility lighting, launch pad lighting) to CCAFS, but this lighting would not be visible off-base. The launch site's infrastructure and facilities and the OLV would not be visible by the public (except possibly from the ocean). During a launch, the OLV and associated exhaust contrail would be visible in the sky. Potential visual effects from launches would be similar to all other launches occurring at CCAFS and would dissipate quickly as the OLV flies into space and as wind and air currents diminish the exhaust contrail. Therefore, the Proposed Action would not result in significant visual effects [EA 4.1 at 4-3].

Water Resources (including Wetlands, Floodplains, Surface Waters, Groundwater, and Wild and Scenic Rivers)

The project site has been previously disturbed, so natural drainage patterns no longer exist. The planned design and construction of the engine test site and the launch site would change the existing drainage course, but adverse impacts to natural drainages are not anticipated. Impacts from erosion, and specific measures to control both wind and water erosion of soils prior to, during, and after construction, would be addressed by developing a Storm Water Pollution Prevention Plan (SWPPP). A storm water management system would be required for the impervious surface construction at the launch site. The design would be developed and an Environmental Resource Permit would be reviewed and approved by the St. Johns River Water Management District (SJRWMD) prior to beginning construction. Because the proposed disturbed area is greater than one acre, a National Pollutant Discharge Elimination System (or NPDES) Storm Water Construction Permit would be required by FDEP and the SWPPP would be implemented. In addition, all required dredge and fill permits would be approved by the U.S. Army Corps of Engineers (USACE).

Based on formal wetlands survey validated by the USACE and SJRWMD, approximately 8.29 acres of primary wetlands would be impacted. Thus, Blue Origin will be required to obtain a Clean Water Action Section 404 permit prior to starting construction. Blue Origin coordinated with the USAF, NASA, USACE, and SJRWMD to determine the most beneficial means to mitigate the wetlands impact. Blue Origin will mitigate impacts to wetlands through the creation and enhancement of approximately 53 acres of wetlands at their Manufacturing Facility parcel in Brevard County, Florida. The mitigation area is located within Exploration Park at KSC. Sufficient credits exist to support mitigation activities for the Proposed Action. Blue Origin has created a Financial Responsibility Mechanism for mitigation, monitoring, and corrective action for the project. In accordance with Executive Order 11990, *Protection of Wetlands*, the FAA finds (1) there is no practicable alternative to construction in wetlands, and (2) the Proposed Action includes all practicable measures to minimize harm to wetlands.

Due to the location of LCs 11 and 36, portions of the proposed engine test and launch site would be constructed within a large contiguous floodplain that spans the coast. Construction would result in clearing approximately 20 acres of vegetation within the floodplain, directly adjacent to existing fence lines at these launch complexes. While this is a relatively small area compared to the overall floodplain footprint at CCAFS, construction activities (i.e., clear cutting and grubbing of vegetation) would result in unavoidable encroachment (per Department of Transportation Order 5650.2) and impacts to floodplain-

based wildlife. This potential impact was considered and addressed during ESA consultation with the USFWS. In accordance with Executive Order 11988, *Floodplain Management*, the USAF found there is no practicable alternative to this action that would avoid floodplain encroachment during construction and operational activities, and the Proposed Action includes all practicable measures to minimize harm to the environment. The FAA agrees with this finding. The public was made aware of the wetland and floodplain findings through Blue Origin's release of the EA for public review as well as a public notice in the Florida Today newspaper. In conclusion, the Proposed Action would not result in significant impacts on water resources [EA 4.9 at 4-33 to 4-35].

Cumulative Impacts

This FONSI incorporates by reference the EA, which addresses the potential impacts of past, present, and reasonably foreseeable future activities at and within the vicinity of CCAFS that would affect the resources impacted by the Proposed Action. The region of influence for the cumulative impacts analysis includes CCAFS and surrounding area. This section presents a brief summary of the potential cumulative environmental impacts considered in the EA, focusing on those resources with the greatest potential for cumulative impact (air quality; biological resources; hazardous materials, solid waste, and pollution prevention; noise and noise-compatible land use; and water resources).

Air Quality

CCAFS, KSC, and Brevard County are in "attainment" with the NAAQS. Air emissions from past, present, and reasonably foreseeable projects in the region of influence are/would be localized and are mostly short-term in nature. Emissions generated from the Proposed Action, combined with other past, present, and reasonably foreseeable projects, would not result in exceedance of any air quality standards and thus would not result in significant cumulative air quality impacts [EA 5.2 at 5-11].

Biological Resources (including Fish, Wildlife, and Plants)

When evaluated with other projects occurring or proposed on CCAFS, KSC, or the Port Canaveral area, the proposed removal of approximately 15–20 acres of occupied/potential wildlife habitat would result in an overall reduction of available wildlife habitat in the area, as well as a reduction in the availability of scrub habitat for restoration. However, as noted above, Blue Origin would restore scrub habitat (approximately 30–40 acres) elsewhere. Cumulative impacts on the gopher tortoise are not anticipated. Gopher tortoises observed within any area to be impacted by ground disturbance would be excavated

and relocated to a recipient area approved and managed by the USAF. Similarly, cumulative impacts on beach mice are not anticipated. Although beach mice are known to occur in the area, limited clearing and construction would occur in the area. Adherence to the Light Management Plan and 45th Space Wing lighting policies would minimize cumulative impacts to nesting sea turtles and hatchlings. According to the USFWS BO, there are no known State, local, or private actions that are reasonably certain to occur in the action area that would result in cumulative effects to the Florida scrub-jay, southeastern beach mouse, eastern indigo snake, and sea turtles. Additionally, cumulative impacts on the American alligator, piping plover, and red knot are not expected to occur. Compliance with project-specific avoidance, minimization, and mitigation measures (including those in USFWS BO) would minimize cumulative impacts to wildlife. Therefore, implementation of the Proposed Action in conjunction with other past, present, and reasonably foreseeable future projects would not result in significant cumulative impacts to biological resources [EA 5.2 at 5-10].

Hazardous Materials, Solid Waste, and Pollution Prevention

For all projects at CCAFS, management of hazardous materials would comply with existing hazardous materials management plans, and emergency responses to spills would follow applicable response plans. Projects must also comply with solid waste management plans. Although releases of hazardous materials and wastes can occur in the environment, it is not expected there would be substantial cumulative contamination issues. Safeguards are in place to minimize the release of toxic chemicals into the environment, and rapid emergency response plans would ensure that accidental spills would be cleaned up quickly. Therefore, implementation of the Proposed Action in conjunction with other past, present, and reasonably foreseeable future projects would not result in significant cumulative impacts associated with hazardous materials, pollution prevention, and solid waste [EA 5.2 at 5-13].

Noise and Noise-Compatible Land Use

Construction associated with the Proposed Action and other projects in the region of influence would result in temporary, intermittent noise at and near the project site. Construction projects are typically short-term in duration and only result in localized noise impacts. The noise impacts from construction projects in the region of influence would not significantly affect the noise setting at CCAFS and the surrounding area.

Noise effects associated with launches at CCAFS and nearby launch facilities are relatively short (5 minutes or less). Furthermore, more than one launch at a time does not occur. Therefore,

implementation of the Proposed Action in conjunction with other past, present, and reasonably foreseeable future projects would not result in significant cumulative noise impacts [EA 5.2 at 5-9].

Water Resources (including Wetlands, Floodplains, Surface Waters, Groundwater, and Wild and Scenic Rivers)

Potential cumulative impacts on wetlands would be compensated by mitigation requirements imposed by the USACE as part of the Section 404 (Clean Water Act) permitting process. Cumulative loss of floodplain functions and values in the area may occur due to additional development (from several projects) in the floodplain. Although floodplains are generally avoided, if floodplain avoidance is not possible, project infrastructure would adhere to floodplain standards and requirements. New construction at CCAFS and KSC is expected to be limited and would occur at a relatively slow pace. Construction of new facilities in the surrounding (non-federal) area supporting Port Canaveral development may occur more rapidly. With the implementation of typical construction best management practices (e.g., retention and detention ponds), future development would have a minor cumulative effect on hydrology and water quality. Regionally, vegetated lands are increasingly being covered by impermeable surfaces (buildings, roads, parking lots), which increases runoff and limits replenishment of groundwater. Although storm water management has been implemented for construction efforts since the 1990s, these retention and detention ponds are sometimes not able to accommodate large amounts of water associated with heavy rainfall, resulting in some excess runoff flowing into canals and wetlands. The cumulative effects on surface water quality in local waterways would be minor. Surface water discharges would be managed according to requirements of the SJRWMD conditions for issuance of Environmental Resource Permits. Water quality impacts from projects in the area would be minimized by the design, operation, and maintenance of a storm water management system that would meet or exceed all requirements of the SJRWMD. In conclusion, implementation of the Proposed Action in conjunction with other past, present, and reasonably foreseeable future projects is not expected to result in significant cumulative water resource impacts [EA 5.2 at 5-12].

Agency Finding and Statement

The FAA has determined that no significant impacts would occur as a result of the Proposed Action and, therefore, that preparation of an Environmental Impact Statement is not warranted and a FONSI in accordance with 40 CFR Section 1501.4(e) is appropriate.

After careful and thorough consideration of the facts contained herein, the undersigned finds that the proposed Federal action is consistent with existing national environmental policies and objectives as set forth in Section 101 of NEPA and other applicable environmental requirements and will not significantly affect the quality of the human environment or otherwise include any condition requiring consultation pursuant to Section 102(2)(C) of NEPA.

APPROVED:  DATE: 4/13/2017

Dr. George C. Nield
Associate Administrator for
Commercial Space Transportation