

DRAFT

Environmental Assessment for the
Reconstitution and Enhancement of Space Launch Complex 20
Multi-User Launch Operations at
Cape Canaveral Air Force Station
Florida

Prepared for
Space Florida

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Acronyms and Abbreviations

1		
2	°C	degree Celsius
3	°F	degree Fahrenheit
4	45 SW	45 th Space Wing
5	AASHTO	American Association of State Highway and Transportation Officials
6	ACHP	Advisory Council on Historic Preservation
7	AFI	Air Force Instruction
8	AFSPCI	Air Force Space Command Instruction
9	AFSPCMAN	Air Force Space Command Manual
10	AIRFA	American Indian Religious Freedom Act
11	ANSI	American National Standards Institute
12	ARPA	Archaeological Resources Protection Act
13	ASME	American Society of Mechanical Engineers
14	AST	Aboveground Storage Tank
15	ASW	Aquifer Storage Wells
16	ATDC	Advanced Technology Development Center
17	BA	Biological Assessment
18	BDC	Bulk Destruct Charges
19	BMP	Best Management Practices
20	BO	Biological Opinion
21	BRL	Banana River Lagoon
22	BRRC	Blue Ridge Research and Consulting, LLC
23	CAA	Clean Air Act
24	CCAFS	Cape Canaveral Air Force Station
25	CCBIC	Cape Canaveral Barrier Island Complex
26	CCS	Cape Canaveral Spaceport
27	CDNL	C-Weighted Day-Night Level
28	CES/CEIE	Civil Engineering Squadron/Installation Management and Environmental Element
29	CEQ	Council on Environmental Quality
30	CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
31	CFR	Code of Federal Regulations
32	CH ₄	Methane
33	cm	centimeter
34	CNS	Canaveral National Seashore
35	CO	Carbon Monoxide
36	CO ₂	Carbon Dioxide
37	CO ₂ e	Carbon-Dioxide Equivalent
38	COPV	composite overwrapped pressure vessel
39	CRA	Cultural Resource Assessment
40	CRM	Cultural Resource Manager
41	CSEL	C-Weighted Sound Exposure Level
42	CZMA	Coastal Zone Management Act
43	dB	Decibel

1	dba	A-weighted Decibels
2	dbc	C-weighted Decibels
3	DEM	Digital Elevation Model
4	DNL	Day-Night Average Noise Level
5	DoD	Department of Defense
6	DOT	Department of Transportation
7	EA	Environmental Assessment
8	EBS	Environmental Baseline Survey
9	EELV	Evolved Expendable Launch Vehicle
10	EFH	Essential Fish Habitat
11	EIAP	Environmental Impact Analysis Process
12	EIS	Environmental Impact Statement
13	EO	Executive Order
14	EPCRA	Environmental Planning and Community Right-to-Know Act
15	ERP	Environmental Resource Permit
16	ESA	Endangered Species Act
17	EWR	Eastern and Western Range
18	FAA	Federal Aviation Administration
19	Fac	Facility
20	FAC	Florida Administrative Code
21	FCMP	Florida Coastal Management Plan
22	FDEP	Florida Department of Environmental Protection
23	FDOT	Florida Department of Transportation
24	FEMA	Federal Emergency Management Agency
25	FIRM	Flood Insurance Rate Map
26	FNAI	The Florida National Area Inventory
27	FONSI	Finding of No Significant Impact
28	FPL	Florida Power & Light
29	ft	feet/foot
30	FWC	Florida Fish and Wildlife Commission
31	g	gram
32	gal	gallon
33	gal/d	gallon per day
34	GCTL	Groundwater Cleanup Target Level
35	GHG	Greenhouse Gases
36	H ₂ O	Water
37	ha	hectares
38	HAP	Hazardous Air Pollutant
39	HIF	Horizontal Integration Facility
40	Hz	Hertz
41	IBD	Inhabited Building Distance
42	ICRMP	Installation Cultural Resource Management Plan
43	ILD	Intraline Distance
44	IM	interim measure

1	INRMP	Integrated Natural Resources Management Plan
2	IRL	Indian River Lagoon
3	IRP	Installation Restoration Program
4	ISOPAR	isoparaffinic hydrocarbon fluid
5	kg	kilogram
6	KHB	KSC Handbook
7	km	kilometer
8	kN	kilonewton
9	KSC	Kennedy Space Center
10	KV	Kilovolt
11	kW	Kilowatt
12	L	liter
13	L/d	liters per day
14	LA _A	Level Equivalent A-Weighted
15	LA _{max}	A-weight Maximum Sound Level
16	lbf	pound-force
17	lb	pounds
18	LBS	Load Break Switch
19	LCH ₄	liquid methane
20	LMP	Light Management Plan
21	LMU	Land Management Unit
22	LOX	liquid oxygen
23	LSOL	Launch Site Operators License
24	m	meter
25	MBTA	Migratory Bird Treaty Act
26	MGD	Million Gallons per Day
27	MINWR	Merritt Island National Wildlife Refuge
28	MMPA	Marine Mammal Protection Act
29	MSFCMA	Magnuson-Stevens Fishery Conservation & Management Act
30	MSL	Mean Sea Level
31	MVA	Mega Volt/Amperes
32	MWH	Mega Watt/Hour
33	N ₂ O	Nitrous Oxide
34	NAAQS	National Ambient Air Quality Standards
35	NAGRA	Native American Graves Protection Act
36	NASA	National Aeronautics and Space Administration
37	NEPA	National Environmental Policy Act
38	NFA	No Further Action
39	NHPA	National Historic Preservation Act
40	NMFS	National Marine Fisheries Service
41	NO ₂	Nitrogen Dioxide
42	NOAA	National Oceanic and Atmospheric Administration
43	NOTAM	Notice to Airmen
44	NO _x	Oxides of Nitrogen

1	NPDES	National Pollutant Discharge Elimination System
2	NPS	National Park Service
3	NRCS	National Resources Conservation Service
4	NRHP	National Register of Historic Places
5	NOTMAR	Notice to Mariners
6	O3	Oxone
7	ODC	Ozone Depleting Chemical
8	ODS	Ozone Depleting Substance
9	OLV	Orbital Launch Vehicle
10	OSHA	Occupational Safety and Health Administration
11	Pb	Lead
12	PAFB	Patrick Air Force Base
13	PCB	Polychlorinated Biphenyls
14	PM	Particulate Matter
15	PO	Potentially Occupied
16	ppb	parts per billion
17	ppm	parts per million
18	PRL	Potential Release Location
19	psf	pounds per square foot
20	PTR	Public Transport Route
21	RCRA	Resource Conservation and Recovery Act
22	REC	Record of Environmental Consideration
23	RFI	Resource Conservation and Recovery Act Facility Investigation
24	RLV	Reusable Launch Vehicle
25	ROI	region of influence
26	RP-1	Rocket Propellant 1
27	RPA	Real Property Agreement
28	SAA	Space Act Agreement
29	SAS	Surficial Aquifer System
30	SCTL	Soil Cleanup Target Level
31	SEL	Sound Exposure Level
32	SF6	Sulfur Hexafluoride
33	SFHA	Special Flood Hazard Area
34	SHPO	State Historic Preservation Office
35	SJRWMD	St. Johns River Water Management District
36	SLC	Space Launch Complex
37	SO2	Sulfur Dioxide
38	SO _x	Sulfur Oxides
39	SPCCP	Spill Prevention, Control, and Countermeasure Plan
40	SR	State Road
41	SSC	Species of Special Concern
42	STD	Standard
43	SW	Space Wing
44	SWI	Space Wing Instruction

1	SWMU	Solid Waste Management Unit
2	SWPPP	Stormwater Erosion and Pollution Prevention Plan
3	T&E	Threatened and Endangered
4	TCP	Traditional Cultural Properties
5	TEA/TEB	triethylaluminum/triethylborane
6	TEL	transport erector launcher
7	THPO	Tribal Historic Preservation Officer
8	TM	Technical Memorandum
9	TSCA	Toxic Substances Control Act
10	US	United States Highway
11	USACE	United States Army Corps of Engineers
12	USAF	United States Air Force
13	USC	United States Code
14	USEPA	United States Environmental Protection Agency
15	USFWS	United States Fish and Wildlife Service
16	USSF	United States Space Force
17	UST	Underground Storage Tank
18	VOC	Volatile Organic Compound
19	WMD	Water Management Districts
20	WMO	World Meteorological Organization
21	WWTP	Waste Water Treatment Plant

EXECUTIVE SUMMARY

Space Florida has prepared this Environmental Assessment (EA) to evaluate the potential environmental impacts associated with the Real Property transfer, via an agreement, of approximately 220 acres (89 hectares [ha]) of land, to include Space Launch Complex 20 (SLC-20) and all facilities contained thereon, at Cape Canaveral Air Force Station (CCAFS) by the US Air Force (USAF) to Space Florida. Space Florida would develop and provide for use the 220 acres (89 ha) to meet current and future commercial, national, and state space transportation needs through the expansion and modernization of space transportation facilities within Space Florida's Cape Canaveral Spaceport (CCS) territories to include areas within CCAFS.

This EA focuses on the Real Property Agreement (RPA) to transfer the 220 acres (89 ha), to include SLC-20 and transportation routes, from USAF to Space Florida, to develop a multi-user launch capability that includes the refurbishment and enhancement of an existing launch pad, the operation of small- and medium-lift launch vehicles by commercial users such as Firefly Aerospace, Inc., under an agreement with Space Florida, and the transportation of vehicle stages from Exploration Park to SLC-20. The majority of customers for rocket launch missions from this site are expected to be from the commercial sector and government agencies such as the National Aeronautics and Space Administration (NASA) and the Department of Defense (DoD).

The Federal Aviation Administration (FAA) is a cooperating agency due to their launch licensing authority, and NASA is a cooperating agency because of their space vehicle expertise and the construction of an associated manufacturing facility at Exploration Park on NASA property and because NASA is a potential customer for SLC-20 operators. The manufacturing facility is a separate action from this EA previously addressed in a 2008 NASA Environmental Assessment (EA) and a 2019 Kennedy Space Center (KSC) Environmental Checklist/Record of Environmental Consideration (REC).

PURPOSE AND NEED

The purpose of the Proposed Action is to provide multiple launch pads for commercial users in support of Space Florida's CCS Master Plan in accordance with Florida Statutes Section 331 (Space Florida 2017). Specifically, Space Florida must meet current and future commercial, national, and state space transportation requirements through expansion and modernization of space transportation facilities within its Spaceport territories. The territories include, but are not limited to, areas within CCAFS. The Proposed Action would allow commercial launch providers such as Firefly to assemble, process, test, and launch vehicles to meet the demand for lower cost access to space. The Proposed Action would provide the continued capability of space exploration by commercial users and improve the return on taxpayer investment of CCAFS facilities through expanded use and improved utilization. The Proposed Action would also continue to provide economic and technical benefits to the government and the private sector following the retirement of the Space Shuttle Program in 2011. On November 27, 2018, the Space Florida Board of Directors approved the request to proceed with negotiations and agreements for the redevelopment of SLC-20 to meet Florida's commercial space transportation industry needs.

1 The Proposed Action is needed to test and launch vehicles efficiently in the United States for use
2 by commercial space launch enterprises. The Proposed Action will contribute to meeting the
3 goals of the CCS Master Plan consistent with the National Space Transportation Policy, NASA's
4 Space Act Agreement (SAA), and DoD policy pursuant to DoD Directive 3230.3.

5 The FAA expects to receive a license application from Space Florida to operate a commercial
6 space launch site at SLC-20. Also, the FAA expects to receive a license application from Firefly to
7 conduct launch operations at SLC-20. Therefore, the FAA's proposed actions of issuing a launch
8 site operator license to Space Florida and a launch license to Firefly for launch operations at SLC-
9 20 are considered part of the Proposed Action analyzed in this EA. The FAA's purpose of its action
10 is to fulfill the FAA's responsibilities as authorized by the Commercial Space Launch Act (51 U.S.C.
11 Subtitle V, ch. 509, §§ 50901-50923) for oversight of commercial space launch activities, including
12 licensing launch activities. The need for FAA's action results from the statutory direction from
13 Congress under the U.S. Commercial Space Launch Act, 51 U.S.C 50901(b), to, in part, "protect
14 the public health and safety, safety of property, and national security and foreign policy interests
15 of the United States" while "strengthening and [expanding] the United States space
16 transportation infrastructure, including the enhancement of United States launch sites and
17 launch-site support facilities, and development of reentry sites, with Government, State, and
18 private sector involvement, to support the full range of United States space-related activities."

19 **PROPOSED ACTION**

20 The Proposed Action is to transfer, by an RPA, approximately 220 acres (89 ha) of land, to include
21 SLC-20 and all facilities contained thereon, at CCAFS by USAF to Space Florida (Figure 1-1);
22 provide use of 33 acres (13.3 ha) of the 220 acres, to include the existing launch site infrastructure
23 to a commercial user on a dedicated basis; refurbish and enhance existing SLC-20 facilities; test
24 and operate small- and medium-lift launch vehicles; and transport vehicle stages from a
25 proposed manufacturing facility at Exploration Park, KSC to SLC-20. The proposed manufacturing
26 facility was analyzed in a previous NASA KSC Environmental Impact Statement (EIS) and
27 environmental checklist/REC. In addition to the agreement noted above, this EA will include in
28 the cumulative analysis section that Space Florida will be requesting, at some point in the future,
29 that USAF provide an access road easement to allow entry to SLC-20 from the south via SLC-19
30 (refer to cross-hatched area shown in Figure 1-2). The details of this access into SLC-20 via the
31 SLC-19 access road are not sufficiently developed at this time to be analyzed in this EA and will
32 be analyzed when additional site development is planned.

33 Space Florida proposes to establish a multi-user launch capability at SLC-20. Firefly, one of the
34 potential launch providers, proposes to launch Alpha, a small-lift class launch vehicle, and future
35 Beta, a small- to medium-lift class launch vehicle, from SLC-20. Firefly's Alpha and Beta launch
36 vehicles will be used as representative vehicles for the Proposed Action and are referred to as
37 Concept A and Concept B, respectively. Both representative launch vehicles are expendable and
38 provide satellite delivery services with the future opportunity for lunar surface delivery services.
39 The major elements of the Proposed Action are Concept A and B launch pads and horizontal
40 integration facilities.

1 **ALTERNATIVE ACTIONS CONSIDERED BUT REMOVED FROM FURTHER CONSIDERATION**

2 In accordance with the statutory constraints of Space Florida’s charter, other launch sites within
3 Florida were considered; however, none of these sites were considered reasonable as they did
4 not meet the screening criteria. Specifically, Space Florida has a statutory constraint to provide
5 service within the territory of Florida and the unique requirements to access orbital launch range
6 assets (Space Florida 2018). Therefore, space launch sites located in states other than Florida
7 were not considered. In addition, operational support facilities and personnel are required to be
8 close to the space launch site. Exploration Park, a dedicated aerospace manufacturing and
9 research office park, is outside the gates at KSC, has 48 engineers per 1,000 workers, and ranks
10 in the top 30-most engineer-populated metros in the country, providing commercial aerospace
11 users with a uniquely skilled work-force to support their missions close to their actual launch sites
12 (Space Florida 2019).

13 Other launch sites within the CCAFS territory were considered, such as SLC-15 and SLC-16;
14 however, these sites were dismissed because they do not meet the availability screening criteria
15 (planned or potential development by other users) and cannot as readily meet the schedule
16 criteria as SLC-20, as this complex has been used to support NASA programs in recent years.

17 **NO ACTION ALTERNATIVE**

18 Under the No Action Alternative, USAF would not transfer by an RPA approximately 220 acres
19 (89 ha) of land to include SLC-20 and all facilities contained thereon at CCAFS, and Space Florida
20 would not reuse SLC-20 for the testing of rocket engines and would not redevelop SLC-20 into a
21 launch facility. Space Florida would not be able to test engines for future use by the government
22 or commercial users and would not be able to launch vehicles from SLC-20 at CCAFS. Space
23 Florida and any tenants would not apply for a commercial space launch license from the FAA for
24 launch operations at SLC-20. Thus, the National Space Transportation Policy of 2005 stated goal
25 of *assuring reliable and affordable access to space through U.S. space transportation capabilities*
26 would also be limited. The No Action Alternative does not meet the Purpose and Need.

27 **SUMMARY OF POTENTIAL ENVIRONMENTAL EFFECTS**

28 This EA assesses the following 15 resource areas, which were considered to provide a context for
29 understanding the potential environmental effects of the Proposed Action and alternatives: land
30 use/visual resources (including coastal resources), noise, biological resources, cultural resources,
31 air quality, climate, hazardous materials/hazardous waste (including solid waste and pollution
32 prevention), water resources, geology and soils, transportation, utilities, health and safety,
33 socioeconomics, environmental justice, and Section 4(f) properties. Additional resources
34 required to be assessed in accordance with FAA Order 1050.1F, including natural resources and
35 energy supply, farmlands, and children’s environmental health and safety risks, are considered
36 but dismissed from detailed evaluation as impacts to these resources are not expected. The
37 environmental consequences associated with the Proposed Action and the No Action Alternative
38 were analyzed for the appropriate Region of Influence (ROI) for each resource area. The following
39 table summarizes the resources considered and the potential impacts that may result from the
40 Proposed Action on those resources. Section 4 provides additional information regarding the
41 environmental effects of the construction and operation of the Proposed Action.

TABLE E-1: Summary of Potential Environmental Effects from the Proposed Action	
Resource Category	Potential Environmental Effects
Land Use / Visual Resources	<p>Construction: Negligible adverse impacts are expected to land use (including coastal resources) and visual resources. The Proposed Action is consistent with the land use and visual character of the ROI given the other numerous launch complexes nearby. No significant impacts are expected to land use compatibility as a result of the renovation and construction of launch facilities since CCAFS and SLC-20 land use is and has historically been used for launch operations.</p> <p>Operations: Negligible adverse impacts are expected to land use (including coastal resources) and visual resources. No significant impacts are expected to land use compatibility since CCAFS and historically SLC-20 uses include launching space launch vehicles. Visual impacts would only include the normally seen and short-lived vehicle contrails that result from each launch event.</p>
Noise	<p>Construction: There would be minor adverse impacts at CCAFS from the operation of construction equipment; however, these impacts would be limited to the immediate vicinity of SLC-20. There would be no impacts to communities near CCAFS due to noise associated with construction activities.</p> <p>Operations: Noise impacts to biological resources are discussed below. Sonic booms would occur from launches at SLC-20 but only over the ocean, so no impacts on the mainland from sonic booms would occur. The Proposed Action is not expected to generate propulsion noise impacts greater than what the surrounding community has been exposed to as a result of previous launches from CCAFS and KSC. Therefore, there would be minor adverse impacts to the surrounding environment as a result of the proposed launches at SLC-20.</p>
Biological Resources	<p>Construction: Clearing of land would impact approximately 0.3 acre of low-quality potential scrub-jay habitat. The renovation of the Blockhouse and other existing structures, construction of new facilities, and site clearing would also impact southeastern beach mouse, indigo snake, and gopher tortoise habitat. Impacts would be mitigated by funding restoration/enhancement of southeastern beach mouse habitat as discussed in the attached Biological Assessment (BA) and the subsequent US Fish and Wildlife Service (USFWS) Biological Opinion (BO). As a result, minor adverse impacts would occur.</p> <p>Operations: The Proposed Action has the potential to result in adverse impacts to five species of marine turtles. However, a Light Management Plan would be developed and approved by USAF and USFWS to reduce or eliminate night-time impact to the sea turtle nesting/hatchling process. Other than the sea turtles, noise from the operation of the Proposed Action would elicit a common “startle response.” Minor adverse impacts on wildlife and vegetation (including federal and state-listed wildlife species) are expected due to the need to relocate numerous gopher tortoises and the associated impact on their habitat.</p>
Cultural Resources	<p>Construction: The 45th Space Wing (45 SW) Cultural Resources Manager evaluated the areas that would be affected by the Proposed Action, and no historical or cultural resource issues were found within the Proposed Action boundaries or surrounding areas with the exception of the Blockhouse. The Blockhouse was determined to be potentially eligible for listing but the Proposed Action to use that facility as it was originally intended and to maintain the exterior similar to its original construction was determined to be a beneficial impact.</p> <p>Operations: Negligible adverse to beneficial impacts are expected due to the lack of historical and cultural resources in the ROI.</p>

TABLE E-1: Summary of Potential Environmental Effects from the Proposed Action	
Resource Category	Potential Environmental Effects
Air Quality	<p>Construction: Construction activities associated with the Proposed Action would cause a minor increase in emissions of particulate matter (PM) due to demolition and related activities. Minor emissions related to CO, CO₂, hydrocarbons, and NO_x would occur due to equipment and vehicular emissions. As such, negligible adverse impacts would occur.</p> <p>Operations: The Proposed Action is not considered to be a major source of air pollutants and does not require a Title V permit. Brevard County is in attainment for all criteria pollutants; therefore, a General Conformity analysis is not required. As documented in numerous EAs and EISs performed for launch vehicles at CCAFS and elsewhere, emissions from nominal launches, catastrophic failures, or spills of liquid propellants would not significantly alter ambient air conditions. Air emissions for the LOX/RP-1 version of the Beta concept launch vehicle would have the maximum potential for air quality impacts; however, these impacts on air quality are expected to have minor adverse impacts on air quality.</p>
Climate	Emissions of greenhouse gases (GHGs) from the construction, operations, and launches at SLC-20 would not cause any appreciable global effects. The incremental emissions for the Proposed Action would be similar to the Falcon 1 and have negligible adverse impacts on global climate change.
Water Resources	<p>Construction: No impacts to groundwater resources or groundwater quality would occur. No US Army Corps of Engineers (USACE) or St. Johns River Water Management District (SJRWMD) wetlands occur within the Proposed Action site and no impacts to wetlands would occur. A 0.19-acre upland cut surface water would remain or be regraded and additional surface water treatment areas will be constructed. Therefore, negligible adverse impacts to surface water are expected.</p> <p>Operations: Operations would result in negligible adverse impacts to surface water, groundwater resources, groundwater quality, wetlands, or floodplains. A 45 SW approved Spill Prevention, Control, and Countermeasures Plan (SPCCP) would be implemented by the tenant, which would minimize the potential for adverse impacts to water resources.</p>
Geology and Soils	<p>Construction: Contaminated soils in excess of the industrial SCTs have been removed from the site; however, contaminated soil in excess of the residential SCTLs is still present. Soils would be disturbed for site construction activities. Normal hazardous material and/or waste management processes, including solid waste, would prevent impact to the environment. Pollution prevention BMPs would also be used to prevent potential impacts. Negligible adverse impacts would occur to geology and soils.</p> <p>Operations: Daily operations and launches would not affect existing geology and soils; therefore, no adverse impacts are expected.</p>
Transportation	<p>Construction: Vehicle and truck traffic would increase slightly during facility construction and renovations. However, it would result in negligible adverse impacts to CCAFS traffic and roadways.</p> <p>Operations: Operational traffic associated with Proposed Action would increase slightly as a result of up to 24 launch vehicle transports and employee trips. Transporting launch vehicles would slow KSC and CCAFS traffic but would occur during non-peak hours. Therefore, the Proposed Action would result in minor adverse impacts to transportation.</p>

TABLE E-1: Summary of Potential Environmental Effects from the Proposed Action	
Resource Category	Potential Environmental Effects
Hazardous Materials/ Waste	<p>Construction: SLC-20 is part of Solid Waste Management Unit (SWMU) C043, which contains known soil-contaminated areas. Soil investigations identified polychlorinated biphenyls (PCBs), metals, and dioxin/furans in site soils in excess of FDEP industrial Soil Cleanup Target Level (SCTL) and in some areas the residential SCTL. Also, a small area exists where the soil exceeded the leachability of the Groundwater Cleanup Target Level (GCTL). A study was also performed for dioxin/furan compounds that occur when PCBs are heated or burned. Several Interim Measure (IM) soil removals were performed in 1995 and 1998 to remove contaminated soil and sediment at SLC-20. Additional sampling for PCBs in soil around the site was conducted concurrently with removal of water and debris at the SLC-20 actuator pit in 2012. From 2015 to 2016, a Data Gap Investigation was performed to laterally and vertically delineate PCB contamination in soil in excess of the industrial SCTL along with sampling at one substation location to determine if PCBs had leached to groundwater. A temporary groundwater monitoring well was installed and sampled at the location and all results were less than the FDEP GCTLs for PCBs, thus No Further Action for groundwater was warranted. In addition, a study was performed for dioxin/furan compounds at the site. Dioxin/furans compounds were suspected to co-exist with PCB soil contamination at the site based on heating/burning activities during launches. A soil removal was completed in 2019 to address remaining concentrations of PCBs and dioxin/furans in excess of the FDEP industrial SCTLs. Remaining soils are now safe for re-use under industrial land-use scenarios. Remediation was performed and completed in mid-2019. By working with the USAF Installation Restoration Program (IRP) and the Florida Department of Environmental Protection (FDEP) during construction, impacts to locally contaminated soils would be limited. If contaminated soils are determined to be present at SLC-20, all construction debris, root balls, etc. determined to contain contaminated soils above regulatory thresholds will be retained onsite or properly disposed of at an off-site facility in accordance with all federal and state regulations. Normal hazardous material and/or waste management processes, including solid waste, would prevent impact to the environment. Pollution prevention Best Management Practices (BMPs) would also be used to prevent potential impacts. Therefore, negligible adverse impacts to the environment are expected to result from hazardous materials or waste management as a result of the construction of the Proposed Action.</p> <p>Operations: Operations supporting the Concept A and B launch program would continue to use products containing hazardous materials, paints, solvents, oils, lubricants, acids, and batteries, which are routinely used at CCAFS. Hazardous materials such as propellants, ordnance, chemicals, and other hazardous material payload components would be transported to the facilities in accordance with Florida Department of Transportation (FDOT) regulations and would be handled and disposed of in accordance with the Resource Conservation and Recovery Act (RCRA) and the Occupational Safety and Health Administration (OSHA). Continued implementation of existing material and waste management and handling procedures currently used during the operation of other similar launch vehicles would limit or eliminate the potential for impacts. A pollution prevention management plan would also be developed and implemented to prevent potential impacts. Therefore, negligible adverse impacts would be associated with hazardous materials and hazardous waste.</p>
Utilities	<p>Construction: No draw on local utilities would occur since potable water and electrical needs would be supplied by portable sources; wastewater disposal services would not be needed until project completion; construction-related debris would be removed and landfilled at an approved facility. Negligible adverse impacts on utilities would occur during construction.</p> <p>Operations: USAF is the electrical power, potable water, and fire water provider for SLC-20 at CCAFS. Water and electric supplies and distribution capacities are estimated to be sufficient for new Space Florida tenant(s) requirements at SLC-20. Existing septic systems would be used for wastewater disposal and would be rehabilitated if needed. Therefore, the Proposed Action would result in negligible adverse impacts to utilities.</p>

TABLE E-1: Summary of Potential Environmental Effects from the Proposed Action	
Resource Category	Potential Environmental Effects
Health and Safety	<p>Construction: Space Florida tenant(s) would follow all USAF and OSHA and applicable USAF regulations (as determined by 45 SW/SE and or 45 SW/CONS) during construction activities; therefore, negligible adverse impact to the health and safety of workers is expected. In addition, Space Florida tenant(s) would follow all USAF and OSHA regulations during construction activities; therefore, negligible adverse impact to the health and safety of workers is expected.</p> <p>Operations: The operation and launch of Concept A and B vehicles would be in compliance with all current and standard health and safety local, state, and federal procedures during operation and launch; therefore, no significant impact to the health and safety of workers is expected.</p> <p>Operational safety of the nearby airfield (Skid-Strip) should not be affected by the Proposed Action as SLC-20 is approximately 14,000 feet from the edge of the Skid-Strip. Lightning protection at the Proposed Action site will be less than the 1:20 conical surface height restrictions. However, a waiver from FAA, in coordination with USAF, will be obtained for any unexpected objects exceeding the 14 CFR Part 77 surfaces from the Skid-Strip. Accordingly, negligible adverse impacts are expected.</p> <p>Explosive Site Safety was also assessed. Like all launch and hazardous operations at CCAFS, operations must account for public safety clear distances and may require temporary road closures and evacuation of some CCAFS facilities on launch days. Space Florida tenant(s) will implement engineering design controls to minimize road closures to occur only on launch days. The launch pad site design would be developed to locate explosive hazards so as to minimize the impacts to inhabited buildings on CCAFS when the launch vehicle is fueled and ready for launch. Accordingly, negligible adverse impacts are expected.</p>
Socioeconomics	<p>Construction: Construction and rehabilitation activities conducted in support of the Proposed Action would generate employment opportunities for the local workforce. Construction and workforce increases would not significantly affect the local housing market or economy. Therefore, the Proposed Action would not result in significant impacts to socioeconomics in the region and may generate a negligible positive impact.</p> <p>Operations: The negligible workforce increase expected as a result of the operation of the Proposed Action would not significantly affect the local housing market or economy. Therefore, the Proposed Action would not result in significant impacts to socioeconomics in the region and may generate a negligible positive impact.</p>
Environmental Justice	<p>Construction: Construction would occur in the SLC-20 area. Since the Proposed Action would be constructed within existing facilities at CCAFS, negligible adverse impacts are expected.</p> <p>Operations: Since the Proposed Action would operate from the existing facilities at CCAFS, negligible adverse impacts are expected.</p>
4(f) Properties	<p>Construction: No designated 4(f) properties, including public parks, recreation areas, or wildlife refuges, exist within the boundaries of CCAFS. Therefore, no impact is expected to result from construction.</p> <p>Operations: No designated 4(f) properties, including public parks, recreation areas, or wildlife refuges, exist within the boundaries of CCAFS. Although several public parks, recreation areas, and wildlife refuges are outside CCAFS, operation and launches would not result in a use or change in use of a Section 4(f) property. Therefore, negligible adverse impacts are expected to result from operation.</p>

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1 **CUMULATIVE IMPACTS**

2 Cumulative impacts are defined by the Council on Environmental Quality (CEQ) in 40 CFR §1508.7
3 as impacts on the environment that result from the incremental impact of the action when added
4 to other past, present, and reasonably foreseeable future actions regardless of what agency
5 (Federal or non-Federal) or person undertakes such other actions. The CEQ regulations further
6 require that National Environmental Policy Act (NEPA) environmental analyses address
7 connected, cumulative, and similar actions in the same document (40 CFR 1508.25). The
8 cumulative impact analysis for this EA focuses on the incremental interaction the Proposed
9 Action may have with other past, present, and reasonably foreseeable future actions and
10 evaluates cumulative impacts potentially resulting from these interactions. Implementation of
11 the Proposed Action would not cause any significant cumulative impacts to the resource areas
12 analyzed in this EA.

1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1 INTRODUCTION

Space Florida was created pursuant to Chapter 331, Part II, Florida Statutes as an independent special district and subdivision of the State of Florida. The purpose of Space Florida is to foster the growth and development of a sustainable and world-leading aerospace industry in Florida. Space Florida leverages Florida's highly skilled workforce and existing infrastructure to attract and expand the next generation of space industry businesses. The Cape Canaveral Spaceport (CCS), in which Space Florida has an operational spaceport authority role, is the premiere transportation hub for global space commerce. Space Florida oversees management and operation of key elements of Florida's existing space transportation capability.

Space Florida has prepared this Environmental Assessment (EA) to evaluate the potential environmental impacts associated with obtaining a commercial launch site operator license from the Federal Aviation Administration (FAA) and supporting the Real Property transfer, via an agreement, of approximately 220 acres (89 hectares [ha]) of land, to include Space Launch Complex 20 (SLC-20) and all facilities contained thereon, at Cape Canaveral Air Force Station (CCAFS) by the US Air Force (USAF) to Space Florida. Space Florida would develop and provide for use the 220 acres (89 ha) to meet current and future commercial, national, and state space transportation needs through the expansion and modernization of space transportation facilities within Space Florida's CCS territories to include areas within CCAFS.

This EA focuses on the transfer, via a Real Property Agreement (RPA), of 220 acres (89 ha), to include SLC-20 and transportation routes, from USAF to Space Florida to develop a multi-user launch capability that includes the refurbishment and enhancement of an existing launch pad, the operation of small- and medium-lift launch vehicles by commercial users such as Firefly Aerospace, Inc., under an agreement with Space Florida, and the transportation of vehicle stages from Exploration Park to SLC-20. The majority of customers for rocket-launch missions from this site are expected to be from the commercial sector and government agencies such as the National Aeronautics and Space Administration (NASA) and the Department of Defense (DoD).

Space Florida cannot predict with any fidelity regarding the timing of other emerging commercial launch vehicle operators or prospective developers for the entire 220-acre (89-ha) parcel; therefore, potential future development and use of this property by other entities are assessed qualitatively in the Cumulative Impacts section of this EA. Future environmental review for use of the property by other entities will be required once more specific construction and operational details are defined.

This EA was prepared in accordance with the National Environmental Policy Act (NEPA) of 1969, as amended (Title 42 of the United States Code [USC] 4321–4347), the Council on Environmental Quality (CEQ) regulations for implementing NEPA (40 Code of Federal Regulations [CFR] Parts 1500–1508), USAF's Environmental Impact Analysis Process (32 CFR Part 989), and Federal Aviation Administration (FAA) Order 1050.1F, *Environmental Impacts: Policies and Procedures*. In accordance with agreements between USAF, NASA, and FAA, USAF is the lead agency for the preparation and coordination of the EA (40 CFR §1501.5), and NASA and FAA are acting as

1 cooperating agencies (40 CFR §1501.6). As noted below in Section 1.4.1, the FAA’s role is licensing
2 commercial space launch operations.

3 **1.2 LOCATION AND BACKGROUND**

4 CCAFS occupies approximately 15,800 acres (6,394 ha) of land on Florida’s Cape Canaveral barrier
5 island (Figure 1-1).

6 The Cape Canaveral barrier island is on the east coast of Brevard County, Florida, approximately
7 150 miles (241 kilometers [km]) south of Jacksonville, 210 miles (337 km) north of Miami, and
8 60 miles (97 km) east of Orlando. The island is 4.5 miles (7 km) wide at its widest point. CCAFS
9 has 81 miles (130 km) of paved roads connecting various launch support facilities with the
10 centralized Industrial Area. The north boundary of CCAFS adjoins the Kennedy Space Center (KSC)
11 boundary on the Merritt Island barrier island. As defined in Florida Statute 313.304, the Space
12 Florida Spaceport territory includes areas within KSC and CCAFS; this territory is referred to as
13 the CCS.

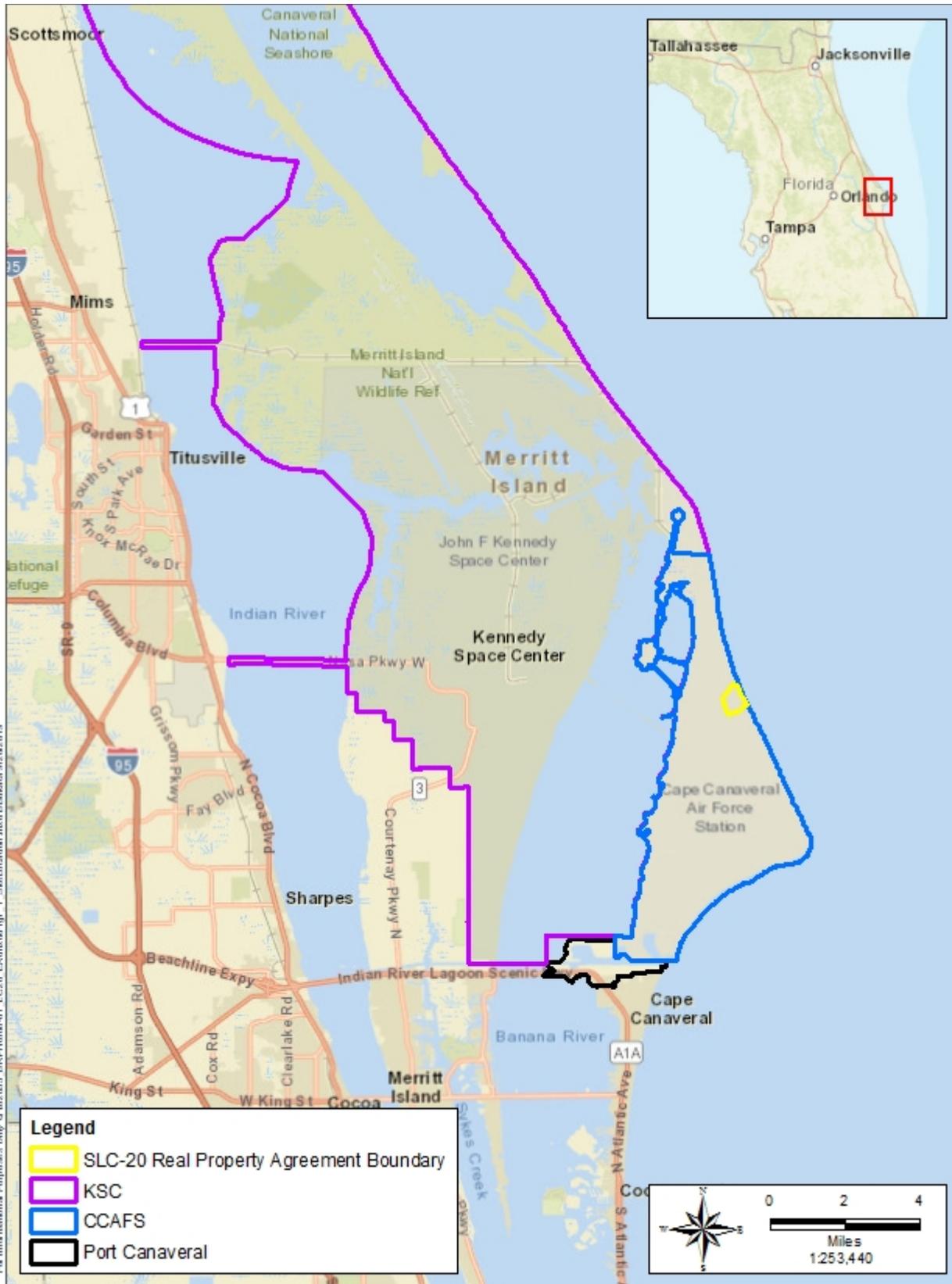
14 The Banana River separates CCAFS from KSC to the west. Port Canaveral adjoins CCAFS to the
15 south. CCAFS’s east boundary is the Atlantic Ocean. The base is accessible primarily from State
16 Road 528 to the south and from KSC to the west and north.

17 Thirty-three launch complexes have been constructed and used at CCAFS; however, there are
18 currently four active and 12 inactive launch pads at 12 launch complexes. Along with the various
19 launch and support facilities, CCAFS maintains a centralized industrial complex to support the
20 technical, mechanical, and administrative needs of each launch program. USAF’s 45th Space Wing
21 (45 SW) is currently the host wing, under the USAF’s United States Space Force (USSF), and
22 conducts east coast military, civil, and commercial launch operations.

23 The existing SLC-20 developed launch site is approximately 33 acres (13 ha), consists of
24 14 facilities, and is within the northeast portion of CCAFS, off ICBM Road, between SLC-19 and
25 SLC-34. SLC-20 is surrounded by dense live oak/saw palmetto (Figure 1-2). The facility was
26 constructed in 1958 and 1959 for the *Titan* Missile Program, modified in 1964 for the *Titan III*
27 Missile Program, and deactivated in 1966. Following deactivation, site responsibilities were
28 transferred to NASA. In addition to launch activities, the south portion of SLC-20 (area occupied
29 near Facility [Fac] 15531; (Figure 1-3) was reportedly the location of a drum-crushing operation
30 and a waste-liquid storage area for approximately 10 years from the late 1970s to the late 1980s.
31 Following abandonment of the site in the late 1980s, site responsibilities reverted back to USAF.
32 SLC-20 as a whole is not considered a historic complex, and no known archeological sites are
33 inside or outside the complex boundary (USAF 2015a). Although the entire SLC-20 complex is not
34 considered historic, the Blockhouse may be eligible for listing on the National Register of Historic
35 Places (NRHP).

36 The Proposed Action boundary consists of the 33acre (13 ha) developed launch site and the RPA
37 boundary consists of approximately 220 acres (89 ha) (see Figures 1-2 and 1-3). The areas outside
38 the Proposed Action boundary are not contemplated for development at this time and any

- 1 proposed future development outside the Proposed Action boundary will be reviewed under
- 2 NEPA.
- 3 SLC-19, immediately south of SLC-20, is a historic site. In 1999, SLC-20 was reactivated to be
- 4 operated under the direction of Space Florida for commercial launches. This reactivation included
- 5 upgrades to Launch Pad A (Fac 15540) and the construction of a new building along the perimeter
- 6 road, northeast of the Blockhouse (Fac 15500A). In 2000, three Super Loki flights were launched
- 7 from SLC-20.



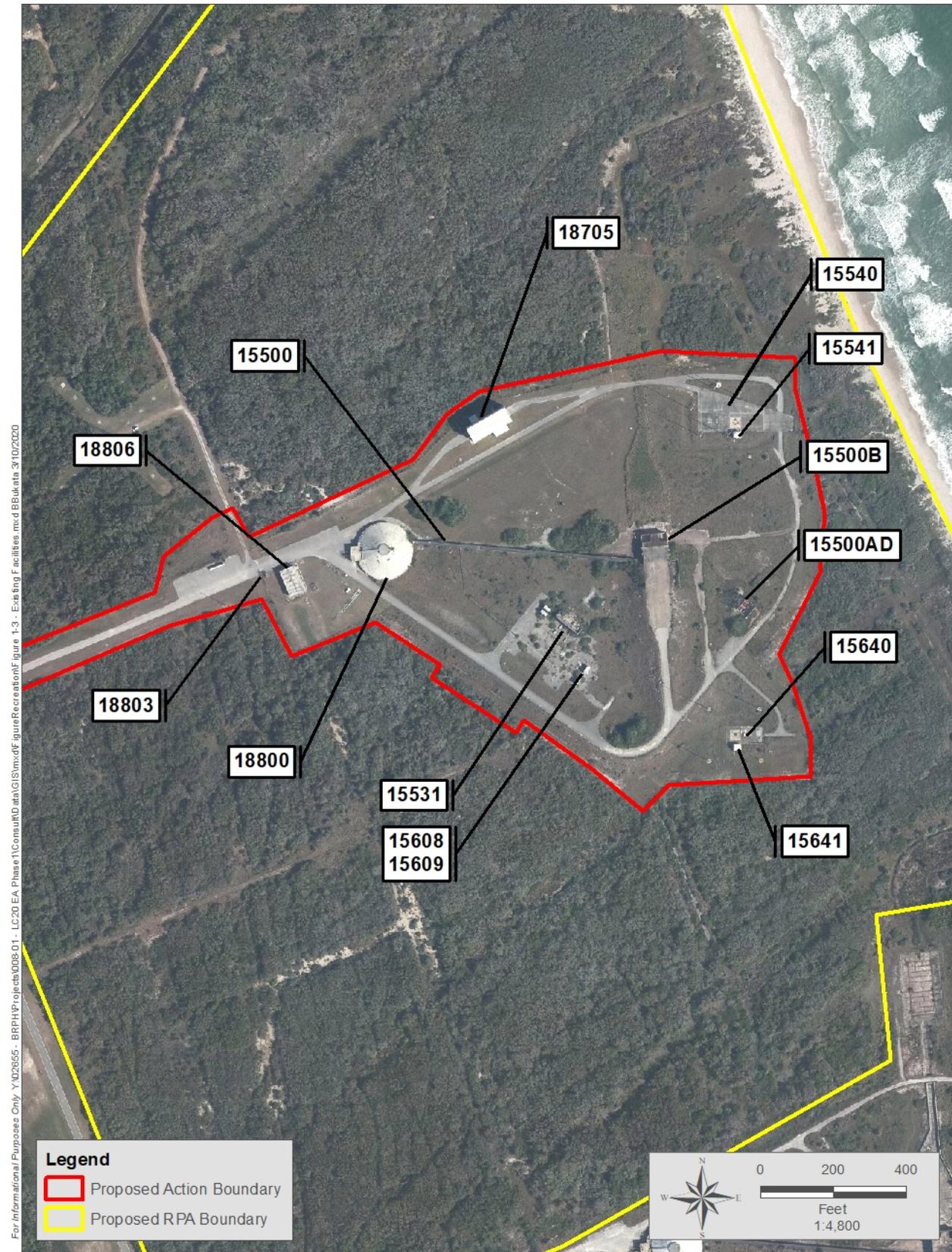
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Figure 1-1 Site Location Map



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Figure 1-2 Proposed SLC-20 Total RPA Boundary Map



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Figure 1-3 Existing SLC-20 Facilities

1 Facilities 22101 (215-foot WINDS Tower 006) and 22100 (006 Support Building) are located
2 outside the RPA Boundary but inside the Proposed Action Boundary. As part of the Proposed
3 Action, 45 SW Weather would continue to be provided access through the RPA to these two
4 facilities.

5 In 2001, NASA prepared the *Environmental Assessment for the Advanced Technology*
6 *Development Center at Cape Canaveral Spaceport, Florida* for the proposed development of an
7 Advanced Technology Development Center (ATDC) at SLC-20 to provide a test area for Spaceport
8 technologies including Cryogenic systems, launch structures, umbilicals, sensors and electronics,
9 integrated vehicles, and process engineering and range systems (NASA 2001a). NASA issued a
10 Finding of No Significant Impact (FONSI) in 2001 and construction of the ATDC Phase 1 facility
11 was completed in 2002 (NASA 2001b). ATDC used the Blockhouse for office space and data
12 acquisition. The complex reverted to USAF in the 2010-timeframe (Space Florida and 45 SW
13 2019).

14 In December 2008, NASA prepared the *Final Environmental Assessment for Exploration Park –*
15 *Phase 1 for Space Florida and Kennedy Space Center* to analyze the impacts associated with the
16 development and operation of approximately 60 acres (24 ha) of land leased from KSC and
17 referred to as Exploration Park Phase 1 (NASA 2008). NASA issued a Record of Environmental
18 Consideration (REC) for the additional construction at Exploration Park Phase 1 on August 20,
19 2019, which includes the area to be used for the launch vehicle manufacturing facility associated
20 with the SLC-20 development (Appendix A). Therefore, Exploration Park Phase 1 construction and
21 operation activities for the manufacturing facility are not included in this EA. However, the
22 transportation of manufactured stages from the Exploration Park Phase 1 manufacturing facility
23 to the SLC-20 launch site for assembly, processing, and launch is included in this EA.

24 **1.3 PURPOSE AND NEED FOR THE PROPOSED ACTION**

25 The purpose of the Proposed Action is to provide multiple launch pads for commercial users in
26 support of Space Florida's CCS Master Plan in accordance with Florida Statutes Section 331 (Space
27 Florida 2017). Specifically, Space Florida must meet current and future commercial, national, and
28 state space transportation requirements through expansion and modernization of space
29 transportation facilities within its Spaceport territories. The territories include, but are not
30 limited to, areas within CCAFS. The Proposed Action would allow commercial launch providers,
31 such as Firefly, to assemble, process, test, and launch vehicles to meet the demand for lower-
32 cost access to space. The Proposed Action would provide the continued capability of space
33 exploration by commercial users and improve the return on taxpayer investment of CCAFS
34 facilities through expanded use and improved utilization. The Proposed Action would also
35 continue to provide economic and technical benefits to the government and the private sector
36 following the retirement of the Space Shuttle Program in 2011. On November 27, 2018, the Space
37 Florida Board of Directors approved the request to proceed with negotiations and agreements
38 for the redevelopment of SLC-20 for the purposes of meeting Florida's commercial space
39 transportation industry needs.

40 The Proposed Action is needed to test and launch vehicles efficiently in the United States for use
41 by commercial space launch enterprises. The Proposed Action would contribute to meeting the
42 goals of the CCS Master Plan consistent with the National Space Transportation Policy; NASA's

1 Space Act Agreement (SAA); and DoD policy pursuant to DoD Directive 3230.3, *DoD Support for*
2 *Commercial Space Launch Activities*.

3 The FAA expects to receive a license application from Space Florida to operate a commercial
4 space launch site at SLC-20. Also, the FAA expects to receive a license application from Firefly to
5 conduct launch operations at SLC-20. Therefore, the FAA's proposed actions of issuing a launch
6 site operator license to Space Florida and a launch license to Firefly for launch operations at
7 SLC-20 are considered part of the Proposed Action analyzed in this EA. The FAA's purpose of its
8 action is to fulfill the FAA's responsibilities as authorized by the Commercial Space Launch Act
9 (51 U.S.C. Subtitle V, ch. 509, §§ 50901-50923) for oversight of commercial space launch
10 activities, including licensing launch activities. The need for FAA's action results from the
11 statutory direction from Congress under the U.S. Commercial Space Launch Act, 51 U.S.C
12 50901(b), to, in part, "protect the public health and safety, safety of property, and national
13 security and foreign policy interests of the United States" while "strengthening and [expanding]
14 the United States space transportation infrastructure, including the enhancement of United
15 States launch sites and launch-site support facilities, and development of reentry sites, with
16 Government, State, and private sector involvement, to support the full range of United States
17 space-related activities."

18 **1.4 SCOPE OF THE ENVIRONMENTAL ASSESSMENT**

19 This EA addresses the potential environmental impacts from the RPA to transfer approximately
20 220 acres (89 ha) from USAF to Space Florida, the refurbishment and enhancement of SLC-20
21 facilities, the operation of small- and medium-lift launch vehicles on 33 (13 ha) of the 220 acres
22 (89 ha), and the proposed transportation of vehicle stages from Exploration Park to SLC-20. For
23 the reasons stated in Section 1.2, the proposed construction and operation of the manufacturing
24 facility in Exploration Park Phase 1 are not included in the scope of this EA.

25 **1.4.1 Lead and Cooperating Agency Actions**

26 This EA was prepared by Space Florida as the proponent of the Proposed Action. Space Florida is
27 the dedicated state governmental authority for launch and landing operations at CCS. USAF is the
28 lead federal agency for the Proposed Action. If, after the public's review of the EA, USAF
29 determines the Proposed Action would not individually or cumulatively result in significant
30 impacts on the human or natural environments, USAF would issue a final FONSI and proceed with
31 implementing the Proposed Action.

32 The FAA is a cooperating agency because of its role in licensing commercial space launch
33 operations in the United States. The FAA intends to adopt this EA to support its environmental
34 review when evaluating the license applications. If, after reviewing a license application and this
35 EA, the FAA determines that the proposed operations fall within the scope of this EA and the
36 action would not individually or cumulatively result in significant impacts on the human
37 environment, the FAA would adopt this EA and issue its own FONSI to support the issuance of
38 the license to Space Florida and/or Firefly. The FAA will draw its own conclusions from the
39 analysis presented in this EA and assume responsibility for its environmental decision and any
40 related mitigation measures. For the FAA to completely rely on this EA to satisfy its NEPA

- 1 obligations, the EA must meet the requirements of FAA Order 1050.1F, which contains the FAA's
- 2 policies and procedures for NEPA compliance.
- 3 NASA is also a cooperating agency because of its special expertise and potential need to rely on
- 4 the analysis contained in this EA to support its environmental review process as a potential future
- 5 Firefly customer.

2.0 DESCRIPTION OF THE PROPOSED ACTION AND ALTERNATIVES

This section describes the Proposed Action (which is the Preferred Alternative), the No Action Alternative, and alternatives considered but not carried forward for further analysis.

2.1 PROPOSED ACTION

The Proposed Action is to transfer, by a Real Property Agreement (RPA, likely in the form of a long-term lease), approximately 220 acres (89 ha) of land, to include SLC-20 and all facilities contained thereon, at CCAFS by USAF to Space Florida; provide use of 33 acres (13 ha) of the 220 acres (89 ha), to include the existing launch site infrastructure to Firefly on a dedicated basis; refurbish and enhance existing SLC-20 facilities; test and operate small- and medium-lift launch vehicles by Firefly; and transport vehicle stages from Exploration Park to SLC-20. The Proposed Action is the preferred alternative.

In addition to the agreement noted above, this EA includes in the cumulative analysis section that Space Florida will be requesting, at some point in the future, that USAF provide an access road easement to allow entry to SLC-20 from the south via SLC-19 (refer to the blue area shown in Figure 1-2). The details of this access into SLC-20 via the SLC-19 access road are not sufficiently developed at this time to be analyzed in detail in this EA and will be analyzed in the future when additional site development is planned.

2.1.1 Proposed Location

The project location consists of existing SLC-20 and surrounding areas, an area totaling 220 acres (89 ha). The existing SLC-20 developed launch site is in the northeast portion of CCAFS, off ICBM Road, between SLC-19 and SLC-34 and contains numerous existing facilities (Figure 1-3). Most of the 220 acres (89 ha) is covered in relatively dense live oak/saw palmetto with scattered herbaceous wetlands. Table 2-1 describes the facilities.

Table 2-1 Existing SLC-20 Facilities

Original Site Facility Name	Current Name	Year Built	Status
Fac 15500, Control Cableway	15500, Control Cableway	1959	The structure's setting and design remains intact.
Fac 15500AD, Fuel Holding Area	15500AD, Liquid Hydrogen Holding Area	1963	All that remains today is the earthen berm, concrete walls, aboveground storage tank (AST) holding area, and truck parking area.
Fac 15500AF, Oxidizer Holding Area	15531, Retaining Wall	1962	All that remains of the original facility is the earthen berms and concrete retaining walls.
Fac 15500B, Launch Stand and Ramp	15500B, Launch Stand and Ramp	1959	Very little of the original components remain.
Fac 15540, Launch Pad A – Ballistic Missile Development Office	15540, Launch Pad A – Ballistic Missile Development Office	1989	The facility is now abandoned in-place and essentially unchanged. The launch rail has been removed and only the mounting ring remains.
Fac 15541, Equipment Building Pad A	15541, Equipment Building	1989	The facility remains abandoned in-place and essentially unchanged.
Fac 15608, Power Center	15608, Power Center	2003	

Original Site Facility Name	Current Name	Year Built	Status
Fac 15609, Control Center	15609, Control Center	2003	Both structures served as instrumentation facilities until they were abandoned in-place in 2010.
Fac 15640, Launch Pad B – Ballistic Missile Development Office	15640, Launch Pad B – Ballistic Missile Development Office	1989	The facility remains abandoned in-place and essentially unchanged. The launch rail has been removed and only the mounting ring remains.
Fac 15641, Equipment Building Pad A	15641, Equipment Building	1989	The facility remains intact.
Fac 18705, HIF	18705, HIF	1999	The building remains intact.
Fac 15500A, Blockhouse	18800, Blockhouse	1959	Although abandoned in-place in 2012, the building remains intact.
Fac 18803, Guard House	18803, Guard House	1999	This structure is in a ruinous state of condition.
Fac 15500C, Ready Building	18806, Payload Assembly Building	1959	This building is abandoned and in disrepair.

1 Source: USAF 2015b.

2 **2.1.2 Launch Vehicles**

3 Space Florida proposes to establish multi-user launch capability at SLC-20. Firefly, one of the
 4 potential launch providers, proposes to launch Alpha, a small-lift class launch vehicle, and future
 5 Beta, a small- to medium-lift class launch vehicle, from SLC-20. Firefly’s Alpha and Beta launch
 6 vehicles are used as representative vehicles for the Proposed Action and are subsequently
 7 referred to as Concept A and Concept B, respectively. Both representative launch vehicles are
 8 expendable and provide satellite delivery services with the future opportunity for lunar surface
 9 delivery services. Table 2-2 lists the general specifications for both launch vehicles. Table 2-3 lists
 10 maximum potential propellant quantities. Specific details of each launch vehicle, to include first
 11 and second stages and flight termination system, are included in subsequent sections.

12 **Table 2-2 Launch Vehicle Specifications**

Specification	Concept A	Concept B (Future)
Length	95 ft (29 m)	140 ft (43 m)
Diameter	6 ft (2 m)	10 ft (3.1 m)
Stages	2	2
Recoverable First Stage?	No	No
Parachute Required?	No	No
First Stage Propellant	LOX/RP-1	LOX/RP-1/LCH4
Total Wet Mass	120,000 lb (54,000 kg)	470,000 lb (214,000 kg)
First Stage Thrust	730 kN (163,888 lbf)	2,760 kN (620,000 lbf)

13 Notes: ft = feet; kg = kilogram; kN = kilonewtons; lbf = pound-force; lb = pounds; LCH4 = liquid methane; LOX = liquid oxygen;
 14 m = meter; RP-1 = Rocket Propellant 1

15 Source: 30 CES 2018.

16

1 **Table 2-3 Maximum Potential Propellant Quantities – Central Pad**

Launch Vehicle	Storage Type	Propellant Type	Max Quantity
Concept A	Oxidizer Storage	LOX	180,000 lb (81,647 kg)
	Fuel Storage	RP-1	83,000 lb (37,648 kg)
	Combined Vehicle	LOX/RP-1	109,000 lb (49,442 kg)
Concept B	Oxidizer Storage	LOX	570,000 lb (258,548 kg)
	Variant 1 Fuel Storage	RP- 1	170,000 lb (77,111 kg)
	Variant 1 Combined Vehicle	LOX/RP-1	435,000 lb (197,312 kg)
	Variant 2 Fuel Storage	RP-1 (Stage 1)	126,000 lb (57,153 kg)
	Variant 2 Fuel Storage	LCH4 (Stage 2)	36,000 lb (16,329 kg)
	Variant 2 Combined Vehicle	LOX/RP-1 & LOX/LCH4 (Stage 2)	419,000 lb (190,055 kg)
	Variant 3 Fuel Storage	LCH4	170,000 lb (77,111 kg)
	Variant 3 Combined Vehicle	LOX/LCH4	402,000 lb (182,344 kg)

2 **Concept A Launch Vehicle**

3 The Concept A launch vehicle is a small, unmanned, light-lift, two-stage, liquid-fueled launch
4 vehicle with a gross lift-off weight of approximately 120,000 lb (81,647 kg) that can carry payloads
5 of between 1,323 lb (600 kg) and 2,205 lb (1,000 kg), depending on the orbit. The first and second
6 stages use only liquid propellants (liquid oxygen [LOX] and RP-1; highly refined kerosene).

7 The first stage consists of a cylindrical structure containing LOX and RP-1 tanks separated by an
8 intertank. This first stage is powered by four, 182-kN (40,972-lbf) thrust LOX/RP-1 engines. Roll
9 control and thrust vector control use hydraulic actuators and use the on-board RP-1 for its fuel.
10 The propellant tanks can hold 6,715 gallons (gal) (25,419 liters [L]) of LOX and 4,346 gal (16,451 L)
11 of RP-1. The second stage consists of a cylindrical structure containing LOX and RP-1 tanks
12 separated by an intertank. The engine is a 70-kN (15,714-lbf) thrust engine with hot helium
13 attitude control and hydraulic actuators for thrust vector control. The propellant tanks hold
14 1,065 gal (4,031 L) of LOX and 670 gal (2,536 L) of RP-1.

15 Concept A may carry small payloads of up to 2,205 lb (1,000 kg) consisting mostly of non-
16 hazardous materials. Some payloads may use small amounts of hazardous propellants for on-
17 orbit maneuvering. These payload propellants may include hypergolic fuels such as hydrazine,
18 pressurized gases including helium and nitrogen, and some solid propellants. Hazardous material
19 quantities would vary. In addition, a small amount of ordnance, such as small explosive bolts and
20 on-board batteries are typical. Payload propellants will be stored before use in a certified facility
21 near the payload processing facility where the loading will occur. Residual propellants for
22 payloads will be returned to the storage facilities. Payload plans do not currently include
23 radioactive materials but, if future plans for payloads were to include radioactive materials, they
24 would be in de minimis amounts.

25 Commercial launch providers would develop a Preliminary Flight Data Package before any launch,
26 which takes into consideration a trajectory that avoids over-flights of known structures and
27 establishes a potential debris corridor for the vehicle. The reliability of the Concept A vehicle is
28 expected to be above 95 percent (30 CES 2018).

1 Two potential paths for flight termination exist. If the Concept A launch vehicle varies from its
2 planned trajectory, the launch vehicle will be equipped with a destructive flight termination
3 system. The Preliminary Flight Safety analysis will determine the flight termination system type.
4 The expected destructive termination system includes one Bulk Destruct Charges (BDC) that is
5 intended to rupture the vehicle tanks when commanded to destruct, thereby dispersing
6 propellants and breaking up the vehicle to minimize the impact to ground assets. The total weight
7 of the ordnance charges for either vehicle would be small and total approximately 0.1 lb
8 (200 grams [g]). Commercial space entities licensed to use SLC-20 will have agreements in place
9 with 45 SW, which allows ordnance to be stored at the 45 SW Ordnance Storage Area and
10 delivered on a real-time basis to the launch complex during vehicle integration to avoid the need
11 for long-term storage of this type of hazardous material on site.

12 A thrust termination system is activated by an autonomous on-board command and disables
13 power to the vehicle engines. Upon activation of the thrust termination system, the Concept A
14 launch vehicle would fall to the ocean intact and may explode upon impact, depending on the
15 circumstances and time in the flight of the termination.

16 The Proposed Action includes non-destructive software and telemetry testing of the flight
17 termination systems. No ascent abort testing of the launch vehicle or destructive testing of the
18 ordnance flight termination system or thrust termination system is proposed.

19 **Concept B Launch Vehicle**

20 Concept B shares the same basic design as the Concept A launch vehicle with higher thrust,
21 providing a higher payload capacity that can carry between 7,275 lb (3,300 kg) and 12,787 lb
22 (5,800 kg) depending on orbit. Estimated propellant quantities for the Concept B launch vehicle
23 are provided in Table 2-4, Table 2-5, and Table 2-6.

24 **Table 2-4 Maximum Potential Propellant Quantities – Concept B Variant 1**

Name	Concept B Stage 1 (RP-1)	Concept B Stage 2 (RP-1)	Payload
Fuel Volume (RP-1)	16,000 gal (60,567 L)	2,900 gal (10,978 L)	-
Fuel Mass (RP-1)	109,000 lb (49,442 kg)	20,000 lb (9,072 kg)	-
Oxidizer Volume (LOX)	26,000 gal (98,421 L)	7,100 gal (26,876 L)	-
Oxidizer Mass (LOX)	240,000 lb (108,862 kg)	67,000 lb (30,391 kg)	-
Hydrazine Volume	-	-	78 gal (295 L)
Hydrazine Mass	-	-	650 lb (295 kg)

25 **Table 2-5 Maximum Potential Propellant Quantities – Concept B Variant 2**

Name	Concept B Stage 1 (RP-1)	Concept B Stage 2 (LCH4)	Payload
Fuel Volume (RP-1/LCH4)	16,000 gal (60,567 L)	5,300 gal (20,063 L)	-
Fuel Mass (RP-1/LCH4)	105,000 lb (47,627 kg)	19,000 lb (8,618 kg)	-
Oxidizer Volume (LOX)	25,000 gal (94,635 L)	6,800 gal (25,741 L)	-
Oxidizer Mass (LOX)	231,000 lb (104,780 kg)	65,000 lb (29,483 kg)	-
Hydrazine Volume	-	-	78 gal (295 L)
Hydrazine Mass	-	-	650 lb (295 kg)

1 **Table 2-6 Maximum Potential Propellant Quantities – Concept B Variant 3**

Name	Concept B Stage 1 (LCH4)	Concept B Stage 2 (LCH4)	Payload
Fuel Volume (LCH4)	21,000 gal (79,494 L)	5,100 gal (19,306 L)	-
Fuel Mass (LCH4)	74,000 lb (33,566 kg)	18,000 lb (8,165 kg)	-
Oxidizer Volume (LOX)	27,000 gal (10,221 L)	6,500 gal (24,605 L)	-
Oxidizer Mass (LOX)	250,000 lb (113,398 kg)	62,000 lb (28,123 kg)	-
Hydrazine Volume	-	-	78 gal (295 L)
Hydrazine Mass	-	-	650 lb (295 kg)

2 **2.1.3 Launch Site Operations**

3 Payload preparation activities would be conducted in parallel with most launch vehicle
4 preparations. Payload activities include payload checkout, spacecraft propellant loading (if
5 required), and payload encapsulation in the fairings. The encapsulated payload would then be
6 transported to SLC-20. Non-hazardous and hazardous payload processing and encapsulation
7 would take place in the existing Horizontal Integration Facility (HIF) for the Concept A launch
8 vehicle. However, following construction of the new HIF, hazardous payload processing would
9 transition to the new facility.

10 All launch vehicle stages would arrive from the manufacturing facility in Exploration Park via truck
11 and would be placed in the HIF for storage. There, the stages will be checked out and prepared
12 for mating. When ready, the encapsulated payload will be in a horizontal orientation and mated
13 to the launch vehicle that is already installed on the transport erector launcher (TEL).
14 Approximately 7 days before launch, the launch vehicle will be moved to and connected to the
15 launch stand using an aircraft tug or tractor with an internal combustion engine. The launch
16 vehicle will then undergo an additional series of tests while horizontal or vertical at the pad, such
17 as wet dress rehearsal and static fire. The launch vehicle may be erected and de-erected several
18 times before launch; the TEL is designed to streamline this operation. On the day of launch, the
19 vehicle will be erected and final checks completed. For cargo or satellite missions, the payload
20 accommodations would have been pre-loaded in the HIF. Approximately 20 to 25 people would
21 be involved in launch preparation activities.

22 LOX would be trucked in and stored on SLC-20 in multiple tanks with a maximum storage of
23 60,000 gal (227,125 L). RP-1 would be trucked in and stored on SLC-20 in multiple tanks with a
24 maximum storage of 22,000 gal (83,279 L). LCH4 would be trucked in and stored on SLC-20 in
25 multiple tanks with a maximum storage of 33,000 gal (124,919 L). All tanks and containment
26 systems will be inspected before use; as required, all tanks and containment systems will be
27 tested for adherence to American Society of Mechanical Engineers (ASME) Section VIII, Boiler
28 and Pressure Vessel Code.

29 A nitrogen and proposed helium pipeline are not expected to be required to support the
30 proposed actions; however, tie-ins to these systems may be constructed in the future under a
31 separate initiative should an opportunity become available. Liquid nitrogen would be trucked in
32 and stored on SLC-20 in 15,000 gal (56,781 L) cryogenic liquid-nitrogen tanks. Gaseous nitrogen
33 would be transferred to the site and stored in ASME storage vessels on SLC-20. Helium would be
34 trucked in using standard DOT tube trailers then pumped and stored in ASME storage vessels on

1 SLC-20. Permanent over-ground lines will be installed at the launch pad area to connect the new
2 launch pad infrastructure. These piping systems will be designed, installed, and tested in
3 accordance with ASME B31.3 Piping Code requirements.

4 After final systems checkout, a mission rehearsal will typically be performed without propellants
5 on board (dry) plus a mission rehearsal with propellants loaded on the vehicle (wet) to verify full
6 launch readiness. Two dress rehearsals are typical in the launch preparation schedule to allow
7 for team training and coordination of activities between the launch vehicle crew and CCAFS. As
8 required, wet dress rehearsals, which include fully fueling the launch vehicle, may be conducted.
9 Static fire tests may be conducted at the launch site, where the vehicle is fully fueled and the
10 engine ignited and ran for up to 5 seconds as a thorough test of all systems. Static fire tests may
11 be discontinued as the program matures. In addition, two-stage acceptance testing would occur
12 at SLC-20 approximately once or twice per month. Stage 1 would occur with four Reaver engines
13 for 30 seconds, and Stage 2 would occur with one lighting engine for 60 seconds.

14 First- and second-stage propellant loading of fuel and oxidizer would be done with standard zero-
15 leak quick disconnect fittings typically used in the aircraft industry. Gaseous nitrogen would be
16 used for pneumatics and purges. Gaseous helium would be used to fill the launch vehicle
17 composite overwrapped pressure vessels (COPVs) for pneumatics and purges during flight. Up to
18 45 gal (170 L) of triethylaluminum-triethylborane (TEA/TEB), used for engine ignitions, would be
19 stored in an ASME-approved storage tank. In addition, 55-gal (208 L) of isopropyl alcohol would
20 be available onsite for cleaning operations; however, only 5 gal (19 L) are estimated to be
21 required for various cleaning operations during the launch preparation. Lastly, 55-gal (208 L) of
22 isoparaffinic hydrocarbon fluid (ISOPAR) would be available onsite for flushes of the TEA/TEB
23 ignition system.

24 On a per-mission basis, launch campaigns (preparation for and launch) are expected to last from
25 2 to 4 weeks initially. During a launch campaign, an average of 20 to 25 launch-provider
26 employees, with a peak of 35 personnel for about 1 week, would be present at SLC-20, not
27 including payload support personnel. Ground transportation support during a launch campaign
28 would be minimal, consisting of three trucks to deliver the first stage, second stage, and payload
29 and four trucks to deliver RP-1, LOX, liquid nitrogen, and helium. Between launch campaigns,
30 20 to 25 employees would be present at the site, using personal vehicles to commute on and off
31 site.

32 All launch operations would continue to comply with the necessary notification requirements,
33 including issuance of Notices to Airmen (NOTAMs) and Local Notices to Mariners (NOTMARs),
34 consistent with current procedures. A NOTAM provides notice of unanticipated or temporary
35 changes to components of, or hazards in, the National Airspace System (FAA Order JO 7930.2S,
36 Notices to Airmen). A NOTMAR provides notice of temporary changes in conditions or hazards in
37 navigable waterways. Eastern Range operations (which include the proposed launches from SLC-
38 20) currently follow the procedures stated in a Letter of Agreement (LOA) (dated May 1, 2020)
39 between the 45th SW and FAA. The LOA establishes responsibilities and describes procedures for
40 the 45th SW, Eastern Range operations, within airspace common to the Miami Center,
41 Jacksonville Center, New York Center, San Juan Center Radar Approach Control, Central Florida
42 Terminal Radar Approach Control, NASA Shuttle Landing facility, Fleet Area Control and

1 Surveillance Facility Jacksonville, Air Traffic Control System Command Center, and Central
2 Altitude Reservation Function areas of jurisdiction. The LOA defines responsibilities and
3 procedures applicable to operations, which require the use of Restricted Areas, Warning Areas,
4 Air Traffic Controlled Assigned Airspace, and/or altitude reservations within Eastern Range
5 airspace.

6 The Proposed Action does not include altering the dimensions (shape and altitude) of the
7 airspace. However, temporary closures of existing airspace and navigable waters would be
8 necessary to ensure public safety during launch operations. Advance notice via NOTAMs and
9 NOTMARS would assist general aviation pilots and mariners in scheduling around any temporary
10 disruption of flight or shipping activities in the area of operation. Launches would be of short
11 duration and scheduled in advance to minimize interruption to airspace and waterways. For
12 these reasons, significant environmental impacts of the temporary closures of airspace and
13 waterways, and the issuance of NOTAMS and NOTMARS under the Proposed Action, are not
14 anticipated.

15

16

1 A specific safety plan would be developed for the Launch Vehicle Program to ensure that launch
2 operations comply with applicable regulations, including but not limited to the following:

- 3 • AFSPC Manual (AFSPCMAN) 91-710, Range Safety Requirements, as tailored for the Firefly
4 Program
- 5 • Defense Explosives Safety Regulation (DESR) 6055.09 in accordance with AFSPCMAN 91-710
- 6 • Air Force Instruction (AFI) 31-101, Air Force Installation Security Program
- 7 • DoD 5220.22-M, National Industrial Security Program Operating Manual (for DoD missions
8 only)
- 9 • AFI 32-1023, Design and Construction Standards and Execution of Facility Construction
10 Projects
- 11 • Air Force Occupational Safety and Health Standards (for DoD missions only)
- 12 • National Fire Protection Association, National Fire Codes
- 13 • American National Standards Institute (ANSI)
- 14 • Occupational Safety and Health Administration (OSHA)

15 **2.1.4 Launch Trajectory**

16 Launch vehicle trajectories will be specific to each particular mission based on customer needs.
17 All launches are expected to be conducted to the east over the Atlantic Ocean between the
18 allowable azimuths of 44 degrees to the northeast and 110 degrees to the southeast. As part of
19 the licensing evaluation process, the FAA conducts a policy review, payload review, financial
20 determination, and safety review. Space Florida would complete a Flight Safety Analysis as part
21 of their launch site operator license application, which would include an Expected Casualty
22 calculation and Operational Restrictions, and the FAA would evaluate this analysis as part of the
23 safety review to ensure that the results meet 14 CFR 420 regulations. The launch operator will
24 also complete the Flight Safety Analysis and define specific trajectories as part of their launch
25 operator license. All approved trajectories are based on specific launch vehicle performance and
26 characteristics and would satisfy 14 CFR 420, as well as 14 CFR 415/417 regulations.

27 **2.1.5 Frequency of Launches**

28 Space Florida expects up to 24 annual Concept A/B launches. Initially, launches will primarily
29 consist of Concept A vehicles, with Concept B launches gradually increasing as the program
30 develops. Of the 24 annual launches, it is anticipated that a maximum of 18 of those launches
31 will consist of Concept B launches. For the purposes of assessing noise-related impacts in this EA,
32 the analysis conservatively models 10 Concept A launches and the maximum number of 18
33 Concept B launches. This assumption will yield the maximum noise exposure anticipated from
34 launches. It is expected that 70 percent of the launches would occur during daylight hours and
35 30 percent of the launches would occur during nighttime hours. For this EA, nighttime is defined
36 as any event occurring after 10 PM and before 7 AM.

2.1.6 Vehicle Assembly and Transportation

The Proposed Action's Launch Vehicle Program is designed for minimal vehicle assembly or processing on the launch pad, and the majority of the vehicle assembly would occur at Exploration Park. Launch vehicle stages and payloads would arrive at SLC-20 from Exploration Park via standard tractor-trailer (no longer than 80 ft [24 m]). Oversized load movements are coordinated through CCAFS Cape Support. The roads at CCAFS were designed to Florida Department of Transportation (FDOT) standards. Specifically, this standard is to support an HS-20 truck with an axle load of 32,000 lb (14,515 kg) for the rear axles. Two trips are assumed to be required for each Concept A vehicle launch and up to three trips for each Concept B vehicle launch. Launch providers will conform to HS-20 FDOT specifications. These specifications permit a maximum axle loading of 8,000 lb (3,628 kg) on the cab axle and 32,000 lb (14,515 kg) on the rear axles, for an overall maximum weight of 80,000 lb (36,287 kg). No roadway improvements to support this route would be required for the delivery of launch components to SLC-20. Table 2-7 and Figure 2-1 show this planned transportation route. The Alternative Route would only be used if the Primary Route were not available for use and the use of this route is rarely anticipated.

Table 2-7 Transportation Route from Exploration Park to SLC-20*

Segment	Start	End
1	Manufacturing Site	Space Commerce Way
2	Space Commerce Way	State Highway 405 (NASA Parkway)
3	State Highway 405 (NASA Parkway)	KSC Gate 3
4	KSC Gate 3	NASA Parkway
5	NASA Parkway	Samuel C. Phillips Parkway
6	Samuel C. Phillips Parkway	Heavy Launch Road
7	Heavy Launch Road	ICBM Road
8	ICBM Road	SLC-20

* Cape Support will be notified before transportation of articles along the route to coordinate movements of any oversized loads before delivery.

2.1.7 Support Facilities

Space Florida intends to refurbish, enhance, and use the existing SLC-20 support shop, HIF, and Blockhouse. In addition, a potential future deluge containment area is sited north of Launch Pad A (Figure 2-2). Specific to the potentially historic Blockhouse, exterior repairs would include fixing select portions of the top-layer roof and other items to maintain good working order. All exterior repairs will be coordinated with USAF and the State Historic Preservation Office (SHPO). New construction near SLC-20 would occur in three phases with the final phase illustrated in Figure 2-2 and as summarized in Table 2-8 from 2020 through 2021.



1
2

Figure 2-1 Transportation Route from Exploration Park to SLC-20



For Informational Purposes Only \\Jea.net\pan02\WORKSPACE\02655 - BRPH\Projects\008-01 - LC20 EA Phase1\Consult\Data\GIS\mxd\Figure2-2_proposed_facilities.mxd JReynolds 3/10/2020

Figure 2-2 Proposed Site Construction

1

1

Table 2-8 Support Facility Construction Requirements

Phase	New Facility	Existing Site
Phase 1	Concept A Pad	Fac 15540, Launch Pad A
	Concept A Launch Equipment	Fac 15541, Equipment Building Pad A
	Deluge Containment	New Construction Near Former Fac 15540 and Fac 15541
	Concept A Environmental Conditioning System (ECS)	New Construction
	RP-1 and Gaseous Nitrogen Storage	Fac 15500AD, Fuel Holding Area
	Ordnance Storage	New Construction Near Former Fac 15640, Launch Pad B
	LOX, Liquid Nitrogen, and Gaseous Helium	Fac 15608, Power Center; Fac 15609, Control Center; and Fac 15531, Retaining Wall (Former Oxidizer Holding Area)
	Generators	New Construction Near Fac 18800, Blockhouse
	Launch Communication Equipment and Pad Office	New Construction Near Fac 18800, Blockhouse
	Support Shop	Fac 18806, Payload Assembly Building
	Pad Security	Fac 18803, Guard House
	Non-hazardous Payload Process Facility	Fac 18705, Warehouse
	Horizontal Integration Facility	
Phase 2	Complex Support Building/Office	New Construction
	Deluge Containment	Fac 15500B, Launch Stand and Ramp
	Concept A/B Pad	
	Concept B ECS	
	Concept B Launch Equipment	
	New Horizontal Integration Facility/Hazardous Payload Processing Facility	New Construction
Water Pump House	New Construction	
Phase 3	Customer Support Building/Office	New Construction

2 The initial construction phase would only include infrastructure needed to support the Concept A
3 launch vehicle with the existing HIF and a deluge containment system. Phase 2 would add a
4 combined Concept A/B pad in the center of SLC-20 and a new HIF/hazardous payload processing
5 facility. The maximum deluge containment system size at full buildout is expected to include
6 approximately 45,000-gal (170,344 L) of deluge water containment storage. In addition, a
7 complex support building/office would be added outside the main gate. In Phase 3, Concept A
8 and B launches would occur at the center launch pad with the addition of a new customer support
9 building outside the main gate and adjacent to the operations support building.

10 Explosive safety quantity-distance criteria would be used to establish safe distances from all
11 onsite facilities and adjoining roadways. Launch providers would be compliant with
12 AFSPCMAN 91-710, which specifies that all facilities, including launch complexes, used to store,
13 handle, or process ordnance or propellants shall be properly sited and approved in accordance
14 with DoD quantity-distance criteria and explosive safety standards specified in DoD 6055.9-STD
15 and implemented in Air Force Manual 91-201.

16 With exception of the new HIF/hazardous payload processing facility, all construction would
17 occur in previously disturbed areas. In support of the proposed construction, it is expected that
18 the guard house and electrical shed would be demolished and replaced. The existing lightning

1 protection towers at Concept Pad A would remain in place, and new lightning protection towers
2 would be added during the construction of the Concept A/B pads during Phase 2 construction.

3 Onsite infrastructure improvements would also be completed to ensure adequate water,
4 wastewater, and electrical requirements are met to accommodate up to 45 people. Domestic
5 water service to accommodate this demand is estimated to be approximately 1,500 to
6 2,000 gallons per day (gal/d) (5,678 to 7,570 liters per day [L/d]), with domestic sanitary service
7 estimated to be 1,200 to 1,700 gal/d (4,542 to 6,435 L/d) during peak launch operations with the
8 full complement of 45 people present at the site. However, these demands and adequacy of
9 existing systems would be confirmed upon design development. Currently, 12-inch combined
10 water and fire protection lines serve the facility, and sewer service is provided via several onsite
11 septic systems and drain fields. Initially, minor maintenance and renovation of these septic
12 systems may be required for initial operations. However, if offsite sanitary collection services
13 become available along ICBM Road, an onsite lift station, force main, and sewer service lines may
14 be installed to connect to the offsite system. Electrical equipment such as transformers will be
15 sized and specified at the time of design. Location and size of these transformers would be
16 coordinated with 45 SW at the time of design for incorporation into the CCAFS Spill Prevention,
17 Control, and Countermeasure Plan (SPCCP). In support of emergency generators near the
18 Blockhouse, one AST to store approximately 3,200 gal (12,113 L) of diesel fuel will be required.
19 The AST will also be included in the site's SPCCP.

20 **2.2 ALTERNATIVES CONSIDERED**

21 CEQ Regulations (40 CFR §1502.14) require agencies to consider a reasonable range of
22 alternatives. Reasonable alternatives include those alternatives that meet the purpose and need
23 of the Proposed Action. Alternatives were evaluated for reasonableness using the following
24 criteria:

- 25 • Safety – Location that provides the maximum safety to the public and workers while ensuring
26 maximum operational performance.
- 27 • Multi-User Capability – Ability to handle and launch small- to medium-lift class launch vehicles
28 with multi-user expansion capability to maximize the utility of the launch complex in the
29 future. Note that only one user has expressed interest in operating from the Proposed Action
30 area at this time.
- 31 • Geographic Location – An existing launch complex in Florida that complies with Space
32 Florida's statutory mandate of providing commercial space services within the territory of
33 Florida.
- 34 • Operational Flexibility – Avoids and/or minimizes impacts to the following: launch scheduling
35 conflicts, known cultural resources where reconstruction would be prohibited, excessively
36 contaminated soils and/or groundwater whose cleanup is cost-prohibitive, known biological
37 species critical habitat, proximal distance to Exploration Park, and populated areas.
- 38 • Availability – A launch complex that is available, requires relatively limited reconstruction to
39 be put into service, and is not currently planned for use by others.

- 1 • Long-term Operational Costs – Controlling long-term operational costs associated with local
2 wages, utility rates, logistical costs, real estate occupancy costs, construction costs, taxes,
3 insurance, etc.
- 4 • Schedule – Ability to complete construction-related tasks in support of 2020 Alpha launch.
- 5 • Workforce Availability – Ability to acquire skilled workers from regional workforce supply.
- 6 • Ability to handle and launch small- to medium-lift class launch vehicles.
- 7 • Compatibility with CCS Master Plan for launches intended for small- to medium-lift capacity.

8 **2.2.1 No Action Alternative**

9 CEQ regulations (40 CFR §1502.14) require agencies to consider a “no action” alternative in the
10 NEPA analyses to compare the effects of not taking action with the effects of the action
11 alternative(s). The No Action Alternative serves as a baseline for comparing the impacts of the
12 Proposed Action. Under the No Action Alternative, approximately 220 acres (89 ha) would not be
13 transferred from USAF to Space Florida via an agreement, 33 acres (13 ha) of the 214 acres (87 ha)
14 would not be available for use from Space Florida, and commercial aerospace tenants would not
15 conduct small- and medium-lift launch vehicle operations at SLC-20. Moreover, Space Florida and
16 any tenants would not apply for a commercial launch license from the FAA for commercial space
17 launch operations at SLC-20. SLC-20 would remain unused. The No Action Alternative would not
18 meet the purpose and need as stated in Section 1.3.

19 **2.2.2 Alternatives Considered but Eliminated from Further Consideration**

20 Other launch sites within Florida, in accordance with the statutory constraints of Space Florida’s
21 charter, were considered; however, none of these sites were considered reasonable as they did
22 not meet the screening criteria. Specifically, Space Florida has a statutory constraint to provide
23 service within the territory of Florida and the unique requirements to access orbital launch range
24 assets (Space Florida 2018). Therefore, space launch sites in states other than Florida were not
25 considered. In addition, operational support facilities and personnel are required to be located
26 close to the space launch site. Exploration Park, a dedicated aerospace manufacturing, research,
27 and office park, is outside the gates at KSC, has 48 engineers per 1,000 workers, and ranks in the
28 top 30-most engineer populated metros in the country providing commercial aerospace users
29 with a uniquely skilled workforce to support their missions close to their actual launch sites
30 (Space Florida 2019).

31 Other launch sites within the CCAFS territory were considered, such as SLC-15 and SLC-16;
32 however, these sites were dismissed as they do not meet the Availability screening criteria
33 (planned or potential development by other users) and cannot as readily meet the Schedule
34 criteria as SLC-20, as this complex has been utilized to support NASA programs in recent years.

35 **2.2.3 Preferred Action Alternative**

36 The Proposed Action has been identified as the Preferred Action Alternative for the following
37 reasons:

- 38 • Meets safety criteria. Specifically, it does not overfly populated areas or operational facilities
39 at CCAFS.

-
- 1 • Has the multi-user expansion capability to support small- to medium-lift class commercial
2 aerospace launch vehicles.
 - 3 • Meets the statutory mandate that requires Space Florida to support commercial aerospace
4 development on lands within Florida.
 - 5 • Meets the operational flexibility criteria list of requirements above.
 - 6 • Uses an existing launch complex that is not committed to others and would require limited
7 reconstruction to be put into service.
 - 8 • Meets the long-term operational cost criteria due to its existing launch complex status and
9 location of available space for long-term expansion as a multi-user launch complex proximal
10 to a variety of commodity pipelines that could be available in the future if tie-ins were
11 beneficial to its operations.
 - 12 • Meets the schedule criteria to be ready for an Alpha or Alpha-size launch in 2020.
 - 13 • Meets the workforce criteria.
 - 14 • Located within 10 miles (1.6 km) of Exploration Park and close to a manufacturing location.
 - 15 • Uses an existing launch complex facility.
 - 16 • Compatible with the CCS Master Plan, which requires that Space Florida-supported launch
17 locations be within Florida.
 - 18 • Aligns with DoD Directive 3230.3.
 - 19 • Supports the screening criteria described in Section 2.2 to include avoiding known cultural
20 resources where reconstruction would be prohibited and biological species critical habitat.

3.0 AFFECTED ENVIRONMENT

In compliance with NEPA and CEQ regulations, this Section describes the existing environment at CCAFS associated with the Proposed Action and the No-Action Alternative. Each sub-section summarizes the affected environment for the resource areas analyzed in detail in this EA. Fifteen broad environmental resource areas were considered to provide context for understanding the potential effects of the Proposed Action and as a basis for assessing the significance of these potential impacts. The areas which were reviewed include land use/visual resources (which includes coastal resources), noise, biological resources, cultural resources, air quality, climate, hazardous materials/hazardous waste (which includes solid waste and pollution prevention), water resources, geology and soils, transportation, utilities, health and safety, socioeconomics, environmental justice, and Section 4(f).

Additional resources required to be assessed by FAA Order 1050.1F, including natural resources and energy supply, farmlands and children's environmental health and safety risks, were considered but are dismissed from detailed evaluation since these resources have no potential to be affected by the Proposed Action. The lands at CCAFS do not include prime farmland. Therefore, this resource area is not addressed in detail. Risks to children are not addressed for this action as no child-care facilities or other children-related activities occur on CCAFS.

For each resource area, a region of influence (ROI) was established. The ROI is the area within which the Proposed Action may cause either an adverse or beneficial impact. The land area within the Proposed Action in Figure 1-2 shows that the area of SLC-20 has been previously disturbed.

3.1 LAND USE/VISUAL RESOURCES

Compatible land uses are those that fit within the land use patterns (vehicle launches, residential, commercial, industrial, recreational, etc.), land ownership (federal, state, private), and land use management plans. Zoning, management plans, and policies regulate how land is used. Visual resources are any naturally occurring or manmade feature that contributes to the aesthetic value of an area. Areas such as coastlines and national parks are usually considered to have high visual sensitivity. The term coastal zone is defined as the coastal waters (including the lands therein and thereunder) and the adjacent shorelands (including the waters therein and thereunder) strongly influenced by each other and proximate to the shorelines of the several coastal states and includes islands, transitional and intertidal areas, salt marshes, wetlands, and beaches (16 USC Part 1453).

The ROI for land use and visual resources includes the viewshed around SLC-20, such as adjacent lands at and surrounding CCAFS that would be able to view the launch pad, buildings, and/or vehicles during launches, such as off-station lands within launch safety clear zones. The ROI for coastal resources encompasses the station boundaries and potentially affected adjacent lands, including off-station lands within launch safety clear zones or land uses that may be affected by activities on the station.

CCAFS comprises 15,800 acres (6,394 ha), which is approximately 2 percent of the total land area of Brevard County. The dominant land uses at CCAFS are launch and landing operations, range support, airfield, port operations, station support areas, and open space.

1 Launch operations land use areas that are present along the Atlantic Ocean shoreline include
2 both inactive and active launch sites and support facilities. These sites also include lightning
3 protection towers, tall integration buildings, and other launch-related structures. The CCAFS Skid
4 Strip has always supported landing operations of “horizontal” vehicles like airplanes, jets, and
5 unguided missiles. CCAFS operations also include Reusable Launch Vehicle (RLV) landings
6 supported by a 2014 EA (USAF 2014). Open space occurs throughout CCAFS, and there are no
7 public beaches.

8 The area surrounding SLC-20 is generally flat and dominated by live oak/saw palmetto hammock.
9 The Proposed Action site is on the east side of CCAFS, off ICBM Road, and the Atlantic Ocean is
10 to the east. SLC-34 is to the north and SLC-19 is to the south. The site is already extensively
11 developed and has been designated by CCAFS for use as a launch complex since the late 1950s
12 (Figure 1-3 and Figure 2-2).

13 KSC, which is north and west of CCAFS, includes predominantly industrial uses associated with
14 NASA launch programs and open space associated with the Merritt Island National Wildlife
15 Refuge (MINWR), located approximately 1.5 miles (2.4 km) from the SLC-20 site. Uses of the river
16 and ocean water areas surrounding CCAFS include commercial fishing, marine recreation, and
17 marine transportation. The Canaveral National Seashore (CNS) is north of CCAFS, approximately
18 10 miles north of the SLC-20 area and is operated by the National Park Service (NPS). No noise
19 sensitive areas (public parks, libraries, churches, etc.) exist near the site. The closest residential
20 area to the site is Cape Canaveral and is approximately 8 miles (13 km) to the south of the launch
21 site (Figure 1-1). The Cape Canaveral area also includes Jetty Park and cruise terminals. Currently,
22 no light sources are at the launch site.

23 The entire State of Florida is defined as being part of a coastal zone (National Oceanic and
24 Atmospheric Administration [NOAA] 2004). A federal agency must ensure that proposed
25 activities within the coastal zone are consistent with that state’s Coastal Zone Management Act
26 (CZMA). Federal activity in or affecting a coastal zone requires preparation of a Coastal Zone
27 Consistency Determination, in accordance with the federal CZMA of 1972. The Proposed Action
28 is subject to the requirements of the federal CZMA.

29 Responsibility for administering the Coastal Zone Management Plan has been delegated to states
30 that have developed state-specific guidelines and requirements. The NOAA Office of Ocean and
31 Coastal Resource Management administers individual state programs. Federal property is
32 exempt from the definition of states’ coastal zones, but activities occurring on federal property
33 that directly affect state coastal zones must comply with the CZMA.

34 Brevard County and the City of Cape Canaveral are the local planning authorities for incorporated
35 and unincorporated areas near CCAFS. However, neither Brevard County nor the City of Cape
36 Canaveral has land use or zoning authority over CCAFS land because it is federally owned. CCAFS
37 has developed a general plan that defines the installation’s land uses and zoning. FDEP is the
38 state’s lead coastal zone management agency, but USAF is responsible for making the final
39 coastal zone consistency determinations for its activities within the state. The EA will be
40 submitted to the Florida Clearinghouse who will then coordinate review of the proposed action
41 by FDEP and Florida Coastal Management Plan (FCMP) member agencies

3.2 NOISE

3.2.1 General Description

Any unwanted sound that interferes with normal activities or the natural environment is defined as noise. The measurement and human perception of sound are based on three principal physical characteristics: intensity, frequency, and duration. *Intensity* is a measure of a sound's acoustic energy and is related to sound pressure. The greater the sound pressure, the more energy is carried by the sound and the louder the perception of that sound. *Frequency*, which is measured in terms of cycles per second, also called hertz (Hz), determines how the pitch of the sound is perceived. Low-frequency sounds are characterized as rumbles or roars, while typical high-frequency sounds are sirens or screeches. *Duration* is the length of time a sound can be detected.

The decibel (dB), which is a logarithmic unit that accounts for the large variation in sound pressure amplitudes, is the standard unit for the measurement of sound. Sound levels that have been adjusted to correspond to the frequency response of the human ear are referred to as A-weighted (dBA) sound pressure levels. Environmental noise is often expressed in terms of dBA.

Descriptors are used to assess and correlate the various effects of noise on humans, including land use compatibility, sleep and speech interference, annoyance, hearing loss, and startle effects. These descriptors can also be used to qualitatively assess the effects of noise on wildlife.

Day-Night Average Sound Level (DNL) represents the average sound level exposure for annual average daily events. FAA Order 1050.1F requires that the assessment of noise impacts on noise-sensitive areas uses the DNL metric to determine if significant impacts would occur. Typically, noise sensitive areas include residential, educational, health, and religious structures and sites, and parks or recreational areas (including areas with wilderness characteristics), wildlife refuges, and cultural and historical sites.

Table 3-1 provides common sound level descriptors.

Table 3-1 Noise Descriptions and Definitions

Description	Definition
A-Weighted Sound Level	The momentary magnitude of sound weighted to approximate the human ear's frequency and sensitivity. A-weighted sound levels typically measure between 20 Hz and 20 kilohertz.
Level Equivalent A-Weighted Sound Level (LAeq)	An A-weighted sound level that is "equivalent" to an actual time-varying sound level.
Day-Night Average Sound Level (DNL)	An A-weighted equivalent sound level averaged over a 24-hour period with a 10-dB "penalty" added to nighttime sounds. The DNL has been adopted by federal agencies as the standard for measuring environmental noise.
C-Weighted Sound Level	Measures sound levels in dB, with no adjustment to the noise level over most of the audible frequency range except for a slight de-emphasis of the signal below 100 Hz and above 3,000 Hz. It is used as a descriptor of low-frequency noise sources, such as blast noise and sonic booms.
C-Weighted Day-Night Level (CDNL)	The C-weighted sound level averaged over a 24-hour period; with a 10-dB penalty added to nighttime sounds. CDNL is similar to DNL, except that C-weighting is used rather than A-weighting.
C-Weighted Sound Exposure Level (CSEL)	C-weighted SEL. The same as SEL except the measurement is in C-weighting rather than A-weighting.

Description	Definition
LAm _{ax}	LAm _{ax} is the A-weighted, maximum, sound level. (Maximum is not <i>peak</i> .)
Peak Overpressure	A measure of changes in air pressure and is often measured in units of pounds per square foot (psf). Peak overpressure is often used to measure the magnitude of sonic booms, particularly with respect to evaluating the potential for structural damage.
Sound Exposure Level (SEL)	A-weighted SEL. The total sound energy in a sound event if that event could be compressed into 1 second. SEL converts the total sound energy in a given noise event with a given duration into a 1-second equivalent and therefore allows direct comparison between sounds with varying magnitudes and durations.

1

2 **3.2.2 Ambient Noise Levels**

3 The ROI for noise includes the area around SLC-20, CCAFS, KSC, and the closest populated areas,
4 which are Cape Canaveral and Cocoa Beach to the south and Merritt Island to the west and
5 southwest. Noise levels around industrial facilities at CCAFS and KSC are comparable to those of
6 an urban industrial area, reaching levels of 60 to 80 dBA. The aircraft landing facilities and CCAFS
7 Skid Strip are additional on-site sources of noise.

8 Other less frequent but more intense sources of noise are launches from CCAFS and KSC. The
9 largest portion of the total acoustic energy produced by a launch vehicle is usually contained in
10 the low-frequency end of the spectrum. Launch vehicles also generate sonic booms, which are
11 shock waves that result from the displacement of air in supersonic flight.

12 Merritt Island, Cocoa Beach, and Cape Canaveral are more than 7 miles (11 km) from CCAFS and
13 KSC. The distance between CCAFS, KSC, and adjacent communities reduces the noise effects
14 experienced in residential areas. Typical sound levels in these areas are usually low with higher
15 levels occurring in industrial areas near Port Canaveral or along transportation corridors.
16 Residential areas and resorts along the beach would be expected to have low overall noise levels,
17 normally about 45 to 55 dBA. Infrequent aircraft fly-overs and rocket launches from CCAFS and
18 KSC would be expected to increase noise levels for short periods of time.

19 **3.2.3 Construction Related Noise Description and Considerations**

20 Temporary noise from the operation of construction equipment (e.g., earth-moving machinery,
21 dump trucks, and power tools) is usually limited to a distance of 1,000 feet (305 m) or less.
22 Vehicles associated with construction typically generate between 65 and 100 dBA at a distance
23 of 50 feet (15 m). In addition, noise diminishes at a rate about 6 dBA for each doubling of distance
24 from the source. CCAFS has no sensitive receptors (e.g., schools, hospitals) in its vicinity.

25 **3.2.4 Launch Operations Related Noise Description and Considerations**

26 Launch operations-related noise refers to noise generated from activities such as actual launches
27 and also temporary noise during maintenance or refurbishment activities and ongoing noise
28 generated from worker traffic to and from the selected site. The highest recorded noise levels at
29 KSC were produced by Space Shuttle launches, which could exceed 160 dBA. Actual launch
30 activities are the major source of all operational noise. Three distinct noise events are associated

1 with launch and ascent of a launch vehicle: (1) on-pad engine noise, (2) in-flight engine noise, and
2 (3) sonic booms. Operations-related noise from the actual launches are summarized below.

3 **On-Pad Noise**

4 On-pad engine noise occurs when engines are firing but the vehicle is still on the pad. The engine
5 exhaust is diverted horizontally by a flame deflector or flame duct. Noise levels in the immediate
6 vicinity of the launch vehicle and within the launch complex are high. Since the sound source is
7 at or near ground level, propagation from the launch vehicle to off-site locations is along the
8 ground with substantial attenuation over distance. Accordingly, on-pad noise levels are typically
9 much lower than in-flight noise levels.

10 **In-Flight Engine Noise**

11 In-flight noise occurs when the vehicle is in the air, clear of the launch pad, and the engine
12 exhaust plume is in line with the vehicle. In the early part of the flight, when the vehicle's motion
13 is primarily vertical, noise contours are circular, particularly for the higher levels near the center.
14 The outer noise contours tend to be somewhat distorted. They can be stretched out in the launch
15 direction or broadened across the launch direction, depending on specific details of the launch.
16 Because the contours are approximately circular, it is often adequate to summarize noise by
17 giving the sound levels at a few distances from the launch site. The in-flight sound source is also
18 well above the ground; therefore, less attenuation of the sound occurs as it propagates to large
19 distances.

20 The emitted acoustic power from a rocket engine and the frequency spectrum of the noise can
21 be calculated from the number of engines, their size and thrust, and their flow characteristics.
22 Normally, the largest portion of the total acoustic energy is contained in the low frequency end
23 of the spectrum (1 to 100 Hz).

24 **Sonic Booms**

25 Sonic booms occur when vehicles reach supersonic speeds. A sonic boom is the shock wave
26 resulting from the displacement of air in supersonic flight. Sonic booms are considered
27 low-frequency impulsive noise events with durations lasting a fraction of a second. The intensity
28 of a sonic boom is quantified with physical pressure units rather than levels. Intensities of sonic
29 booms are traditionally described by the amplitude of the front shock wave, referred to as the
30 peak overpressure, and measured in psf.

31 In many cases, an ascending launch vehicle's orientation at the Mach 1 (speed of sound) is nearly
32 vertical, and therefore the sonic boom ray cone would not impinge on the Earth's surface and
33 would not be heard. Conversely, a descending launch vehicle's orientation often would cause a
34 sonic boom to impinge on the Earth's surface and be heard.

35 **3.3 BIOLOGICAL RESOURCES**

36 This section describes the vegetation and animal species that occur or could potentially occur
37 within the ROI. For biological resources, the ROI includes the Proposed Action boundary and
38 areas within the proposed RPA boundary that could be affected by construction activities and
39 launch operations. Biological resources include native plants and animals and the habitats in

1 which they exist. Sensitive and protected biological resources include plant and animal species
2 that are threatened or endangered (T&E) and species of special concern (SSC) as listed by USFWS
3 and the Florida Fish & Wildlife Conservation Commission (FWC).

4 USAF 45 SW is committed to the long-term management of all-natural areas on its installations
5 as directed by AFI 32-7064, Integrated Natural Resources Management. Long-term management
6 objectives are identified in the 45 SW's 2018 Integrated Natural Resources Management Plan
7 (INRMP) with specific land management objectives identified in the Scrub-Jay and Sea Turtle
8 Management Plans in the appendices of the INRMP.

9 The following sections were derived from several sources, including the 45 SW 2018 INRMP and
10 a recently completed Biological Assessment (BA) for the site. The BA was completed and
11 submitted to USFWS on January 10, 2020. In response to this BA, Appendix C provides April 23,
12 2020 correspondence from the USFWS stating that they concur with the BA and the July 2020 BO
13 that was subsequently issued.

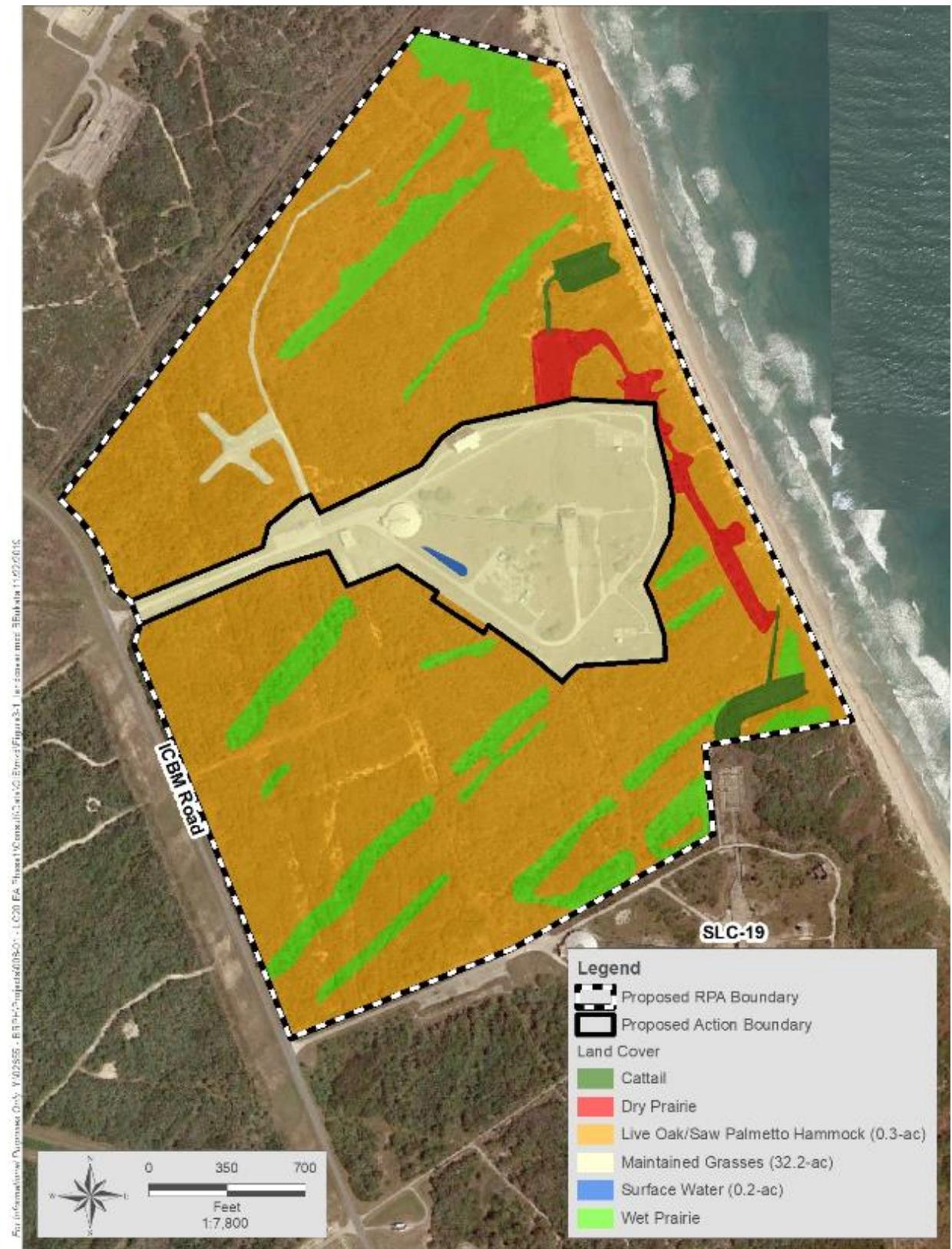
14 **3.3.1 Vegetation**

15 **Vegetation Communities**

16 Thirteen natural vegetation communities occur on CCAFS (USAF, 2018a), which are summarized
17 in Table 3-2. Many of these natural communities are high quality despite the communities being
18 fragmented by mission-related construction and clearing activities. These communities range
19 from scrub to mangrove swamps (Figure 3-1). The dominant native vegetation communities on
20 CCAFS consist of maritime hammock, coastal strand, and live oak/palmetto. Eight species of
21 state-listed plant species have been documented on CCAFS. None of the eight species have been
22 identified within the boundaries of the Proposed Action. No federally listed plant species have
23 been documented on CCAFS.

24 Vegetation within the Proposed Action area has been periodically maintained by mowing/
25 trimming and is dominated by herbaceous species with a few scattered shrubs and short trees.
26 As a result, the majority of the Proposed Action area is not comprised of native vegetation
27 communities. Figure 3-1 shows that the Proposed Action area is composed of two upland and
28 one wetland communities, and Figure 3-2 provides a topographic map of the area.

29 **Uplands** – The following two upland habitats are found within the Proposed Action boundary:
30 (1) Maintained Grasses and (2) Live Oak/Saw Palmetto Hammock. Maintained Grasses comprise
31 33 acres of existing SLC-20 and refers to vegetated areas and areas of impervious surface such as
32 roads, buildings that have been maintained inconsistently (Figure 3-1). Vegetated areas within
33 the Proposed Action area are dominated by a diversity of native and exotic species such as
34 ragweed (*Ambrosia artemisiifolia*), beggars tick (*Bidens alba*), frogfruit (*Phyla nodiflora*), muhly
35 grass (*Muhlenbergia capillaris*), Bermuda grass (*Cynodon dactylon*), bahia grass (*Paspalum*
36 *notatum*), alamo vine (*Merremia dissecta*), mother of thousands (*Kalanchoe daigremontiana*),



1
2

Figure 3-1 Existing Land Cover Map

1

Table 3-2 Summary of Natural Vegetation Communities on CCAFS

Natural Vegetation Community	Acres (Hectares)
Beach Dune (acreage not available)	Not Available
Coastal Grassland	Included in Coast Strand Acreage
Coastal Strand	1,728 (698)
Basin Marsh	75 (30)
Coastal Interdunal Swale	142 (57)
Maritime Hammock	2,291 (928)
Live Oak/Saw Palmetto Hammock	1,237 (501)
Live Oak/Saw Palmetto Shrubland	1,477 (598)
Xeric Hammock	556 (225)
Scrub	1,083 (438)
Tropical Hammock	113 (46)
Hydric Hammock	9 (4)
Mangrove or Exotics	901 (365)

Source: USAF 2018a.

2

3 sunflower (*Helianthus debilis*), lantana (*Lantana sp.*), century plant (*Agave americana*), prickly
4 pear cactus (*Opuntia humifusa*), morning glory (*Ipomea sp.*), partridge pea (*Chamaecrista*
5 *fasciculata*), and winged loosestrife (*Lythrum alatum*). Several large clumps of Brazilian pepper
6 (*Schinus terebinthifolius*) are also found in the central and south region with a few live oak
7 (*Quercus virginiana*) and hog plum (*Ximenia americana*). In addition, several large areas of
8 St. Augustine grass (*Stenotaphrum secundatum*) exist throughout the site as well as a large
9 monoculture of guinea grass (*Megathyrsus maximus*).

10 The second upland community, Live Oak/Saw Palmetto Hammock, is found in the southwest
11 region of the Proposed Action area and comprises approximately 0.3 acre (Figure 3-1). This area
12 is dominated by live oak, cabbage palm (*Sabal palmetto*), saw palmetto (*Serenoa repens*),
13 greenbriar (*Smilax sp.*), and grapevine (*Vitis rotundifolia*).

14 **Surface Water** – A small surface water community, comprising 0.19 acre, is found in one location
15 within the Proposed Action boundary (Figure 3-1 and

16 Figure 3-2). This feature is likely man-made stormwater treatment system excavated to store
17 and/or treat road or site runoff. It is dominated by St. Augustine grass, sedges (*Cyperus sp.*),
18 frogfruit, pennywort (*Hydrocotyle umbellata*), and winged loosestrife. Surface water was not
19 present, soils were extremely dry, and hydric soil indicators consisted of sandy redox. Due to the
20 lack of an organic horizon at the surface, this surface water likely does not experience prolonged
21 inundation during the wet seasons; rather, the water table is found at or below grade.

22



1
2 **Figure 3-2 DEM Map of Proposal Action Site**

3 **3.3.2 Wildlife**

4 CCAFS is on a barrier island that supports many plants, animals, and natural communities. Barrier
5 islands along the Atlantic coast are especially important to nesting sea turtles and populations of
6 small mammals and as foraging and roosting habitat for a variety of resident and migratory birds.
7 Specifically, more than 25 mammalian species, more than 50 amphibian and reptile species, and
8 more than 200 bird species are known to occur on or in the vicinity of CCAFS.

9 The coastal scrub and associated woodlands provide habitat for a wide range of wildlife including
10 raccoon, long-tailed weasel, round-tailed muskrat, southeastern beach mouse, migratory birds,
11 and mammals such as the white-tailed deer, armadillo, bobcat, and feral hog. Numerous marine
12 mammals populate the coastal and lagoon waters including the bottlenose dolphin, the spotted
13 dolphin, and the manatee, which is protected.

14 Amphibians documented on CCAFS include the spade foot and eastern narrow-mouth toads,
15 southern leopard frogs, Florida gopher frog, and green and squirrel tree frogs. Reptiles observed
16 include the American alligator, Florida box turtle, gopher tortoise, Florida softshell, green anole,
17 six-lined racerunner, broadhead skink, southern ringneck snake, everglades racer, eastern
18 coachwhip, diamondback rattlesnake, indigo snake, and pine snake.

1 The seagrass beds in the north Indian River Lagoon (IRL) system provide important nursery areas,
2 shelter, and foraging habitat for a wide variety of fish and invertebrates, manatees, and green
3 sea turtles. The inland rivers and lagoons provide habitat for marine worms, mollusks, and
4 crustaceans. The Mosquito Lagoon is an important shrimp nursery area. The beaches and off-
5 shore area are inhabited by five species of marine turtles.

6 A number of saltwater fish species can be found within Indian and Banana River Systems including
7 the bay anchovy, pipefish, goby, silver perch, lined sole, spotted sea trout, and oyster fish. The
8 small freshwater habitats found on CCAFS contain bluegill, garfish, largemouth bass, killifishes,
9 sailfin molly, and top minnow (USAF 1998).

10 **Migratory Birds**

11 Cape Canaveral is situated along a major flyway route for migratory birds and therefore home to
12 numerous birds listed on the USFWS migratory bird list, all of which are protected by the
13 Migratory Bird Treaty Act (MBTA). All but a few bird species (e.g., pigeons, European starlings)
14 found on CCAFS are on this list. Executive Order (EO) 13186, signed in 2001, requires federal
15 agencies to protect migratory birds and their habitats. This requires that if nests may be
16 impacted, the nest must be empty of eggs or young before relocation or removal.

17 CCAFS also supports a large population of ospreys and can support the bald eagle. Ospreys are
18 most often found near water, nesting near the top of large trees, bore-sight towers, utility poles,
19 antennas, and gantries. The osprey is federally protected by the MBTA, which makes it illegal to
20 destroy a nest without the proper permits. Currently, ospreys are not nesting on or in any trees
21 or structures at the Proposed Action site or in the RPA boundary area. US Congress had ensured
22 the bald eagle's protection under the MBTA and the Eagle Act. The bald eagle was delisted from
23 the endangered species list in 1995 and the threatened species list in 2007. It is still protected by
24 the State of Florida through the FWC and Florida Statute (68A-16.002, FAC). A review of
25 [http://myfwc.maps.arcgis.com/apps/webappviewer/index.html?id=253604118279431984e8bc](http://myfwc.maps.arcgis.com/apps/webappviewer/index.html?id=253604118279431984e8bc3ebf1cc8e9)
26 [3ebf1cc8e9](http://myfwc.maps.arcgis.com/apps/webappviewer/index.html?id=253604118279431984e8bc3ebf1cc8e9) in August 2019 determined that a bald eagle nest is not present within 6 miles
27 (9.7 km) of SLC-20.

28 **Threatened and Endangered Species**

29 CCAFS contains habitat utilized by a large number of federally listed and state-listed species. The
30 Florida Natural Areas Inventory (FNAI) conducted a comprehensive biological survey of CCAFS for
31 the 45 SW. This 2-year survey was completed in December 1997 to document rare, threatened,
32 and endangered flora and fauna, migratory birds, and outstanding natural communities. Survey
33 efforts at CCAFS since this time (Gulledge et al. 2009; Reyier et al. 2010; 2011; Oddy et al. 2012;
34 Fleming and Greenwade 2007; Hankla 2008) have identified additional federally and state-listed
35 sensitive species occurring at the installation. Federally or state-listed species occurring within
36 CCAFS include five fish, nine reptiles, 15 birds, three mammals, and 11 plants. No federally
37 designated critical land habitat under Section 4 of the Endangered Species Act (ESA) is mapped
38 on the installation. However, critical in-water habitat for the West Indian manatee is mapped
39 within the Banana River and within inlets/bays of CCAFS that connect to the Banana River.
40 Federally designated critical habitat for the loggerhead sea turtle and North Atlantic right whale
41 is also mapped along the Atlantic Coast. USAF negotiated with USFWS to avoid critical habitat

1 designation on land at CCAFS for the loggerhead sea turtle (79 FR 39756, 398051). This USFWS
2 exemption was granted on 10 October 2012 (USFWS 2012).

3 Table 3-3 presents listed species that are known to be present or near (within 100 ft [30.5 m])
4 the Proposed Action. USAF (2018a) provides a list of federal and state regulatory requirements,
5 which address vegetation and wildlife that may be present on CCAFS and a more detailed
6 description of protected species present at CCAFS.

7 **Table 3-3 Protected Species Fauna Found in the Vicinity of the Proposed Action**

Common Name	Scientific Name	Status	
		Federal	State
Atlantic Sturgeon*	<i>Acipenser oxyrinchus</i>	E	
Oceanic Whitetip Shark*	<i>Carcharinus lonigmanus</i>	T	
Nassau Grouper	<i>Epinephalus striatus</i>	T	
Giant Manta Ray*	<i>Manta birostris</i>	T	
Smalltooth Sawfish*	<i>Pristis pectinata</i>	E	
Amphibians			
None listed			
Reptiles			
American Alligator	<i>Alligator mississippiensis</i>	T(S/A)	
Loggerhead Sea Turtle	<i>Caretta</i>	T	
Green Sea Turtle	<i>Chelonia mydas</i>	T	
Leatherback Sea Turtle	<i>Dermochelys coriacea</i>	E	
Eastern Indigo Snake	<i>Drymarchon couperi</i>	T	
Hawksbill Sea Turtle	<i>Eretmochelys imbricata</i>	E	
Gopher Tortoise	<i>Gopherus polyphemus</i>	C	T
Kemp's Ridley Sea Turtle	<i>Lepidochelys kempii</i>	E	
Florida Pine Snake	<i>Pituophis melanoleucus mugitus</i>		T
Birds			
Florida Scrub-Jay	<i>Aphelocoma coerulescens</i>	T	
Red Knot	<i>Calidris canutus rufa</i>	T	
Crested Caracara	<i>Caracara cheriway</i>	T	
Piping Plover	<i>Charadrius melodus</i>	T	
Snowy Plover	<i>Charadrius nivosus</i>		T
Little Blue Heron	<i>Egretta caerulea</i>		T
Reddish Egret	<i>Egretta rufescens</i>		T
Tricolored Heron	<i>Egretta tricolor</i>		T
Southeastern American Kestrel	<i>Falco sparverius paulus</i>		T
American Oystercatcher	<i>Haematopus palliatus</i>		T
Wood Stork	<i>Mycteria americana</i>	T	
Roseate Spoonbill	<i>Platalea ajaja</i>		T
Black Skimmer	<i>Rynchops niger</i>		T
Roseate Tern	<i>Sterna dougallii</i>	T	
Least Tern	<i>Sternula antillarum</i>		T

Common Name	Scientific Name	Status	
		Federal	State
Mammals			
North Atlantic Right Whale*	<i>Eubalaena glacialis</i>	E	
Southeastern Beach Mouse	<i>Peromyscus polionotus niveiventris</i>	T	
West Indian Manatee	<i>Trichechus manatus</i>	T	
Plants			
Sea-Lavender	<i>Argusia gnaphalodes</i>		E
Curtiss's Milkweed	<i>Asclepias curtissii</i>		E
Sand Dune Spurge	<i>Chamaesyce cumulicola</i>		E
Satin-Leaf	<i>Chrysophyllum oliviforme</i>		T
Coastal Vervain	<i>Glandularia maritima</i>		E
Pineland Florida Lantana	<i>Lantana depressa var. floridana</i>		E
Simpson's Stopper	<i>Myrcianthes fragrans</i>		T
Shell Mound Prickly-Pear Cactus	<i>Opuntia stricta</i>		T
Beach-Star	<i>Remirea maritima</i>		E
Inkberry	<i>Scaevola plumieri</i>		T

Notes:

* Species does not occur on 45 SW properties, but occurs in water adjacent to 45 SW properties.

C = Candidate species.

E = Endangered species.

S/A = Species listed due to similarity of appearance to American crocodile.

T = Threatened species.

1 Of the species listed in Table 3-3 that could potentially be found in the vicinity of the Proposed
2 Action area, the following five listed wildlife species of concern have been identified based on
3 their documented presence or potential to utilize habitats within the Proposed Action
4 boundary or adjacent to it:

- 5 • Florida scrub-jay (*Aphelocoma coerulescens*)
- 6 • Southeastern beach mouse (*Peromyscus polionotus niveiventris*)
- 7 • Eastern indigo snake (*Drymarchon corais couperi*)
- 8 • Marine turtles
- 9 • Gopher tortoise (*Gopherus polyphemus*)

10 The following paragraphs give a broad overview for these five species of concern. Additional
11 information on these species, as well as others that can be found in the vicinity of the Proposed
12 Action area but not within the Proposed Action Boundary, is provided in the BA (Appendix D).

13 Florida Scrub-Jay

14 The Florida scrub-jay is a federally threatened bird endemic to open, oak-dominated scrub
15 habitats of Florida. Widespread destruction and degradation of scrub habitat over the last
16 century have resulted in dramatic declines in the distribution and abundance of this species.
17 Because the scrub-jay is intimately tied to open, oak-dominated scrub, conservation of the

1 species depends upon restoration of sufficient optimal habitat to support large populations.
2 Populations of this species that remain are small, demographically isolated, and likely to decline.
3 One of three core populations that contains over half of the State's remaining scrub-jays is found
4 at KSC/CCAFS (45 SW 2018).

5 Since the majority of CCAFS is or could be scrub-jay habitat, land-clearing activities have the
6 potential to adversely impact scrub-jays and their habitat. Management actions for scrub-jays on
7 CCAFS are primarily oriented toward habitat improvement. USFWS has designated CCAFS as part
8 of a core scrub-jay area, indicating that all scrub habitat on CCAFS is highly valuable to the
9 recovery of the species. Consultations between USFWS and USAF led to the development of a
10 Scrub-Jay Management Plan for CCAFS and includes a requirement to mitigate loss of scrub or
11 potential scrub at a ratio of 2:1. A Scrub Habitat Restoration Plan was developed subsequent to
12 the management plan and provides a strategy for restoring the scrub habitat needed by this
13 species. The CCAFS land area is divided into Land Management Units (LMU), which are used to
14 account for and manage many items including scrub-jay populations and burn strategies. The
15 objective of scrub habitat restoration on CCAFS is to restore the over-mature scrub to a condition
16 suitable to support the Florida scrub-jay. The main methods used for habitat restoration are
17 mechanical treatment and prescribed burning of mechanically treated sites within the LMU. No
18 land management has occurred east of ICBM Road near the Proposed Action area.

19 USAF conducts a yearly census of the Cape Canaveral population of scrub-jays in all suitable
20 accessible jay habitat. In 2018, 136 Florida scrub-jay groups were identified, which has varied
21 from 104 groups in 2000 to 157 groups in 1996 and 1997 (Figure 3-3 and Figure 3-4). Data from
22 the 2018 census did document a single group just east of ICBM Road but over 1,300 feet west of
23 the Proposed Action boundary (Figure 3-5).

24 **Southeastern Beach Mouse**

25 The southeastern beach mouse is a federally threatened subspecies that historically existed on
26 coastal dunes and coastal strand communities from Ponce Inlet (Volusia County) south to
27 Hollywood, Florida (Broward County) (Humphrey et al. 1987). Currently, the southeastern beach
28 mouse is restricted to predominantly federal lands encompassing and adjacent to CCAFS, KSC,
29 CNS, MINWR, and a few locations on Pelican Island National Wildlife Refuge and Sebastian Inlet
30 State Park (Oddy et al., 2012). Reasons for decline in southeastern beach mouse populations
31 include habitat loss due to development and erosion, habitat fragmentation, isolation,
32 competition from the house mouse, and predation from domesticated cats (Stout, 1992). This
33 species is a high priority for management on federal lands encompassing the Cape Canaveral
34 Barrier Island Complex (CCBIC), which includes KSC/MINWR, CCAFS, and CNS.

35 On CCAFS, the mice occur from the coastal dunes inland to the west side of Samuel C. Phillips
36 Parkway and are generally found where the sand is suitable for burrows, coastal scrub is present,
37 and the water table is not close to the surface. While inland populations may be more stable,
38 their abundance varies from site to site inland of the dune system. However, nearly every coastal
39 scrub site surveyed on CCAFS could support the beach mouse.

40 A long-term sampling grid (BG3) is north of the Proposed Action area but within the RPA
41 Boundary as well as a 2011 to 2012 random coastal point referred to as 18 (Figure 3-6).

1 Southeastern beach mice were captured at these locations during the 2011 to 2012 sampling
2 period (Oddy et al. 2012). Sampling conducted in 2018 did not detect the presence of this species
3 (Oddy and Stolen 2018) (Figure 3-7), and results of the sampling determined a habitat occupancy
4 rate of 0.72 percent of CCBIC coastal habitat was occupied. More importantly, several
5 southeastern beach mice were captured inside the SLC-20 Blockhouse (Facility 18800) in 2001
6 (ESC, 2002). As a result, the presence of this species has been confirmed within the Proposed
7 Action boundary as well as within the RPA boundary area.

8 **Eastern Indigo Snake**

9 The eastern indigo snake is a federally threatened species and the longest of North American
10 snakes, reaching a length of over 8 feet. It is found in a diversity of habitats and is closely
11 associated with gopher tortoise burrows, which it uses for shelter during cold weather and
12 extremely dry periods. Major threats to the indigo snake on CCAFS are habitat loss and vehicle
13 traffic. The eastern indigo snake is a top carnivore and feeds on other snakes, frogs, salamanders,
14 toads, small mammals, and birds and can have a home range of over 200 acres (USAF, 2018a).
15 The eastern indigo snake has been observed on CCAFS and likely occurs throughout the
16 installation; however, exact numbers are not known. The breeding season occurs between
17 November and April with egg-laying occurring May through June with hatchlings emerging in late
18 July through October. An installation-wide census for the eastern indigo snake has not been
19 completed.

20 This species has the potential to occur within the Proposed Action boundary based on the
21 abundance of gopher tortoise burrows. This species is also likely to occur within the RPA
22 boundary area due to the habitat type and presence of gopher tortoise burrows.

23 **Marine Turtles**

24 Four species of federally protected sea turtles have been documented as nesting on CCAFS: the
25 loggerhead (*Caretta caretta*), green (*Chelona mydas*), leatherback (*Dermochelys coriacea*), and
26 the Kemp's ridley (*Lepidochelys kempii*) sea turtle. Nests are deposited on CCAFS each year
27 between April and September. Each year, between 1,400 to 3,600 sea turtle nests are deposited
28 on the 13 miles of beach at CCAFS based on nest surveys at CCAFS from 1986 through 2018
29 (Figure 3-8) (USAF 2018b).



1
2

Figure 3-3 2018 Florida Scrub-Jay Census Map

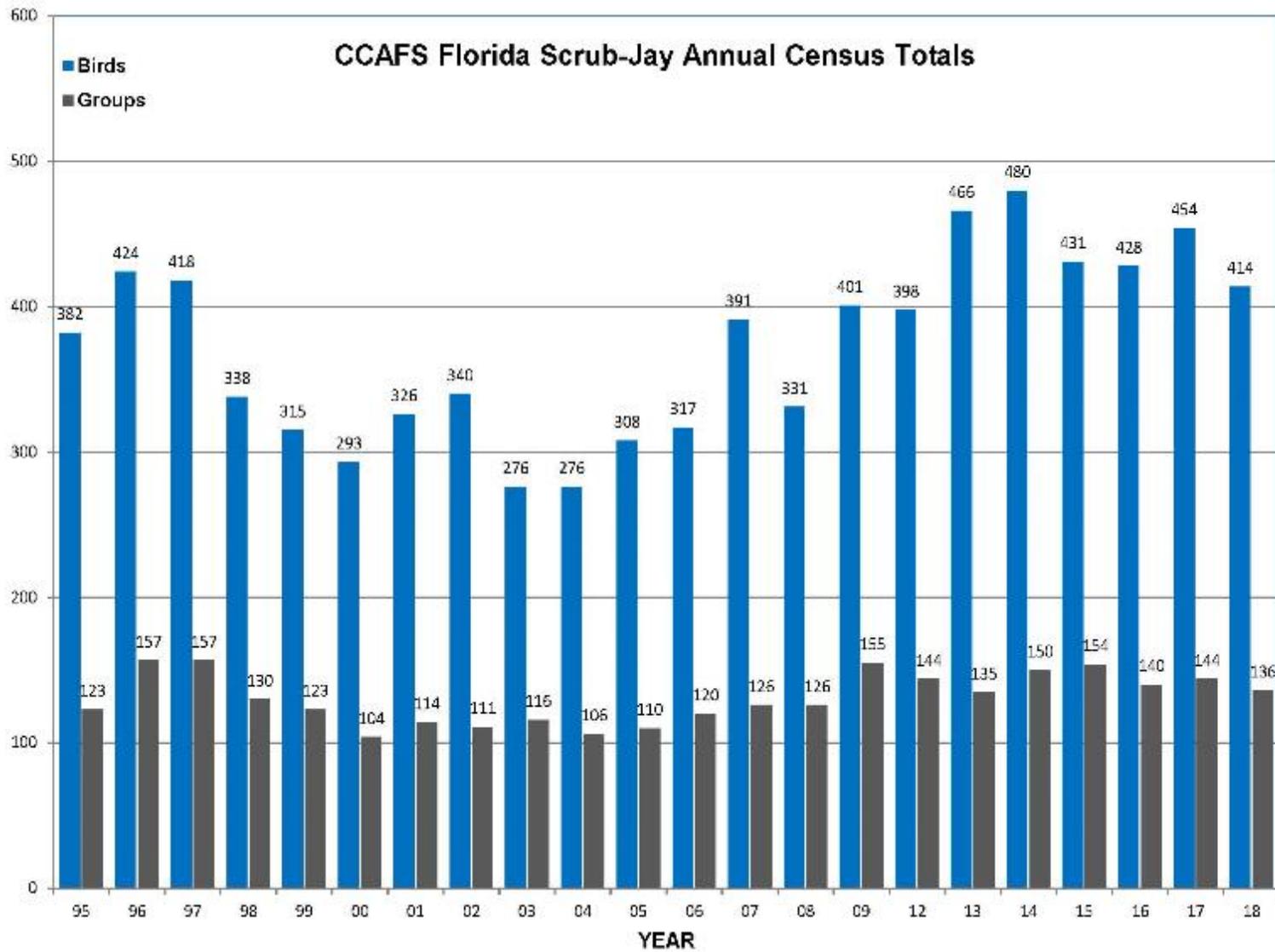


Figure 3-4 CCAFS Florida Scrub-Jay Annual Census Totals (45 Space Wing 2019)

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2



1
2

Figure 3-5 Proposed Florida Scrub-Jay Habitat Impacts and Census Data



1

2

Figure 3-6 2018 Southeastern Beach Mice Detection Location Map

3

(Green circles indicate that beach mice were detected at a site, and red circles indicate no detection at a site. Numbers indicate site locations.) (Oddy and Stolen 2018)

4



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4

Figure 3-7 Land Management Units (Blue), Long-Term Grids (Green), and Random Coastal Points (Red) on CCAFS Where Small Mammal Trapping Occurred in Fall 2011 and Spring 2012

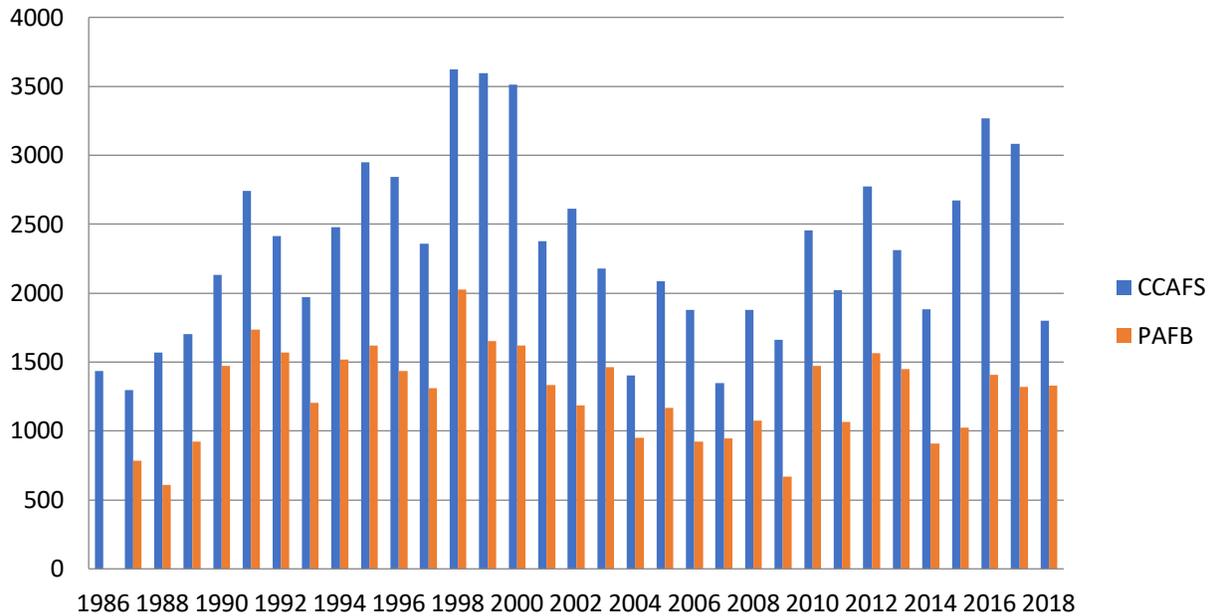


Figure 3-8 All Sea Turtle Nests Deposited at CCAFS and PAFB

Although sea turtles spend much of their lives in the ocean, females come ashore each year to nest. Preliminary research indicates that lights adjacent to sea turtle nesting beaches may hinder the beach nest site selection of nesting females. Regarding sea turtle hatchlings, extensive research has demonstrated that the principal component of the emergent sea turtle hatchlings' orientation behavior is visual (Carr and Ogren, 1960; Dickerson and Nelson, 1989; Witherington and Bjorndal, 1991). Artificial beachfront lighting has been documented to cause disorientation (loss of bearings) and misorientation (incorrect bearing) of hatchling turtles.

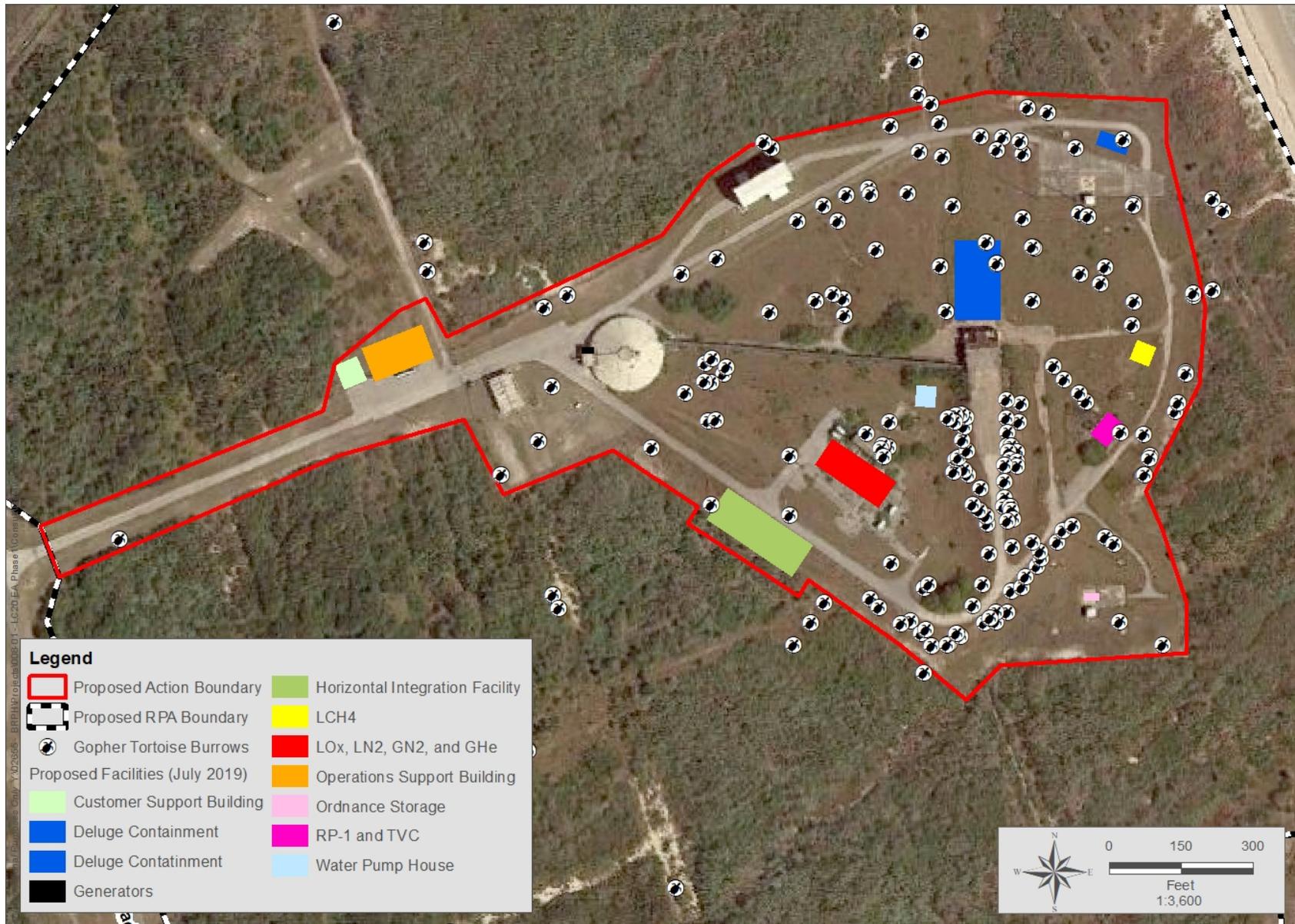
In 1988, in compliance with Section 7 of the ESA, USAF developed Light Management Plans (LMPs) for various areas and facilities on CCAFS to protect sea turtles. A BO issued by USFWS in April 1991, with several subsequent revisions, requires LMPs for any new facilities that are close to the beach, are not constructed in accordance with 45 Space Wing Instruction (SWI) 32-7001, have lighting directly visible from the beach, and/or may cause significant sky glow. The BO was modified again in 2008 and authorized a 3-percent take of nesting females and up to 3 percent of all hatchlings disoriented/misoriented from a representative sample of all surveyed marked nests. The BO also requires at least five night-light surveys at CCAFS and PAFB during the peak of nesting season (May 1 through October 31). Currently, no exterior lighting operates at SLC-20, and no disorientation has been documented on the beach in this area for several years.

Gopher Tortoise

The gopher tortoise is a State-listed threatened species by FWC and is protected by State law, Chapter 68A-27, Florida Administrative Code (FAC). The gopher tortoise is also currently classified as a *Category 2 Candidate Species* by USFWS under the ESA. The basis of the *Threatened* classification by FWC for the gopher tortoise is due to habitat loss and destruction of burrows. The gopher tortoise can live up to 80 years in the wild and occurs in upland habitats such as sandhills, pine flatwoods, scrub, scrubby flatwoods, dry prairies, xeric hammock, pine-mixed

1 hardwoods, and coastal dunes. Gopher tortoises will dig and use several burrows during the
2 warm months and burrows can range from 3 to over 50 feet (0.9 to 15 m) long. These burrows
3 provide refuge for more than 350 other commensal species such as small mammals, frogs, mice,
4 snakes, and insects.

5 In July 2019, a pedestrian gopher tortoise survey was completed for approximately 90 percent of
6 the Proposed Action area and approximately 60 percent of high probability habitat in the RPA
7 boundary. Within the Proposed Action area, a diversity of burrow sizes was observed, from
8 juveniles to large adults, with over 160 potentially occupied (PO) burrows observed within the
9 boundary and 35 observed outside the boundary (Figure 3-9).



1

Figure 3-9 Proposed Action Boundary PO Gopher Tortoise Burrow Location Map



1
2

Figure 3-10 Proposed RPA Boundary Area PO Gopher Tortoise Burrow Location Map

3.4 CULTURAL RESOURCES

Historical and cultural resources include prehistoric and historic sites, man-made structures, buildings, and remnants of legacy launch vehicles districts, artifacts, or any other physical evidence of human activity considered important to a culture or community for scientific, traditional, religious, or any other reasons. The ROI for the historical and cultural resources for the Proposed Action includes the legacy SLC-20 area and extends to the balance of the entire 220 acres (89 ha) area proposed for the real property transfer between 45 SW and Space Florida.

An extensive array of federal and state laws exist that require analyses of possible effects to cultural resources during the planning, design, and construction on federal lands and elsewhere. These laws and regulations prescribe the responsibilities and coordination between the federal agency where the Proposed Action would occur and stakeholder agencies having review and comment authority over the Proposed Action. These agencies include the State Historic Preservation Officer (SHPO), Tribal Historic Preservation Officers (THPOs), and Advisory Council on Historic Preservation (ACHP). Specific laws pertaining to the treatment of cultural resources are Sections 106 and 110 of the National Historic Preservation Act (NHPA), Archaeological Resources Protection Act (ARPA), American Indian Religious Freedom Act (AIRFA), and Native American Graves Protection Act (NAGRA). AFI 32-7065, *Cultural Resources Management*, provides guidelines for the protection and management on USAF-managed lands.

Only those cultural resources that are determined to be significant or potentially significant under the regulations cited are subject to protection from adverse impacts from a Proposed Action. To be considered significant, a cultural resource must meet one or more of the criteria established by the NPS that would make the resource eligible for inclusion in the NRHP. The phrase “eligible for inclusion” includes all properties that meet the NRHP listing criteria, which are specified in the Department of the Interior regulations cited in Title 36 CFR 60.4 and NRHP Bulletin 15. Any property considered prehistoric, historic, or considered to be traditionally significant are collectively referred to as “historic properties.”

3.4.1 Archaeological and Historic Resources

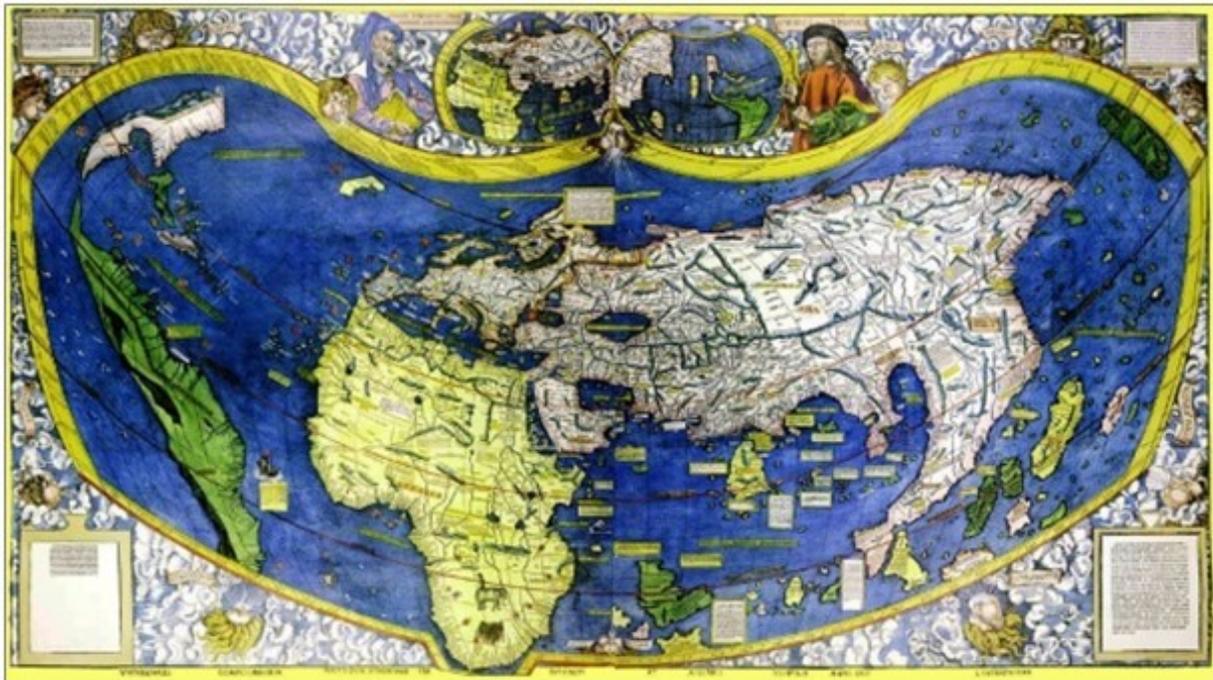
Archaeological

Research suggests that Florida experienced its first human occupation as early as 15,000 years ago. Cape Canaveral has a long record of human occupation, which is reflected by the presence of numerous prehistoric and historic sites that are part of the area’s rich archaeological heritage. Human occupation at Cape Canaveral spans from the first Native Americans approximately 5,000 years ago (Doran et al. 2014). This early settlement had its focus within the Banana River Lagoon (BRL) salt-marsh area with evidence of a wider distribution of inhabitation into the entire peninsula with utilization of marine, estuarine, and terrestrial resources. Prehistoric inhabitation in the vicinity of CCAFS include the following periods: Archaic Period, Mt. Taylor Period, Orange Period, Transitional Period, Malabar I, IIA, and IIB Periods, and Protohistoric or Seminole Period.

In Florida, the Middle Archaic (circa 5,000 BC) witnessed increased population growth and reliance on marine resources. Sites were expanded into the St. Johns River area, along the Atlantic coastal strand, and along the southwest Florida coast into south Florida (Milanich 1995). Maritime adaptations become increasingly apparent from 7,000 BC. Shellfish resources first

1 appear in the archaeological record during the Middle Archaic. Extensive shell middens along the
2 coast and canal systems connecting mangrove swamps were constructed by humans using the
3 coastal zone. Middle Archaic sites, specifically shell middens, are plentiful and are found in a
4 variety of locations in Florida (Milanich 1994). The Orange Period (2,000 to 500 BC) was noted
5 for the first appearance of ceramics and, while still hunter-gatherers, saw increased sedentism
6 with middens becoming commonplace. Malabar I saw villages with special use camps and even
7 larger populations. Malabar II (AD 900 to 1565) saw the beginning of non-local objects, European
8 artifacts, and evidence of wreck salvaging introducing the “Contact Period” (1500 to 1565).

9 Regarding the “Contact Period”, the Florida peninsula first appeared in cartography in 1502 on
10 the Cantino map and in 1507 on the Waldseemuller map (Lydecker et al. 2011).



11

12 While it is unknown when Europeans first made contact with Florida’s native tribes, Juan Ponce
13 de León made the first “authorized discovery” of Florida in 1513 (Griffin 1983; Turner 2013).
14 Before that documented voyage, it is virtually certain that Spaniards were using Florida as a
15 staging ground to capture slaves and possibly provision their ships, as had been practiced
16 extensively in the Bahamas for some time. The exact location of Juan Ponce de León’s initial
17 landfall remains unknown, but judging from the latitude recorded in his log the prior day it would
18 have been somewhere close to present-day Ponte Vedra, north of St. Augustine. He claimed the
19 “island” for Spain and named it La Florida because it was the season of Pascua Florida (“Flowery
20 Easter”) and because much of the vegetation was in bloom.

21 Like other conquistadors in the Americas, Ponce de León was likely looking primarily for gold,
22 Indians to enslave, and land to govern under the Spanish crown. Accounts of the Ponce de Leon
23 voyage describe interactions with the Ais Indians, the tribe occupying the Central East Coast of
24 Florida, including Cape Canaveral, at the time (Rouse 1951). The Ais were one of the most

1 powerful tribes in Florida at the time of the first Spanish contact. Their settlements were
2 numerous but dwellings temporary, reflective of their hunter-gatherer lifestyle.

3 Traditional resources associated with the Ais include archaeological sites, mounds, burial sites,
4 ceremonial areas, caves, and plant habitat and gathering areas including any sites that would
5 have religious or heritage significance. These traditional resources could be considered significant
6 traditional cultural properties (TCPs), are subject to the same regulations as other historic
7 properties, and are therefore afforded the same protection. No Ais Indians remain, but their
8 traditional culture is represented by the Seminole and Miccosukee Tribes of Indians in Florida.
9 During a site visit to CCAFS in 2011, the Seminole Tribe of Florida and Seminole Nation of
10 Oklahoma verbally stated that they have no TCPs on CCAFS. (45 SW Cultural Resource Manager
11 [CRM], personal communication to W. Puckett, September 2019) The 45 SW updated its
12 Installation Cultural Resource Management Plan (ICRMP) in 2015, which also stated that no TCPs
13 are present at CCAFS.

14 **Historic**

15 Cape Canaveral played a role as a prominent landmark in nearly every era of recorded history in
16 the New World but was not permanently occupied to any great extent until relatively recently.
17 As a sign of its ephemeral early occupation, a Town of Canaveral is shown in different locations
18 on maps in the last 150 years, following the focus of residential development. Historical
19 occupations include First Spanish (1513 to 1763), British (1763 to 1783), Second Spanish (1783 to
20 1821), American Territorial (1821 to 1842), Early Statehood (1842 to 1861), Civil War (1861 to
21 1865), Reconstruction and Late Nineteenth Century (1865 to 1899), and Twentieth Century
22 (1900+).

23 Cape Canaveral is now in Brevard County, which has changed boundaries several times. Brevard
24 County was formed on March 14, 1844, from a segment of Mosquito County (Orange County).
25 Brevard County, called St. Lucie County until 1854, was named for the Florida State Comptroller
26 at the time, Theodore W. Brevard. Titusville, the County seat, had early roots as the community
27 of Sand Point, which was formed to serve early settlers lured to the area by homestead land
28 grants through the Armed Occupation Act of 1842.

29 According to the 45 SW ICRMP, the federal government began buying land from the state in Cape
30 Canaveral in the late 1940s to establish a long-range proving ground. A committee was formed
31 by the DoD in 1946 with the task of finding a suitable missile test center; subsequently, the Long-
32 Range Proving Ground on Cape Canaveral was established in 1949 under the jurisdiction of USAF
33 (USAF 2015a). Important factors for the committee choosing Cape Canaveral included the
34 weather, geographical isolation, low land prices, existence of government-owned property in the
35 area, and proximity to islands in the West Indies and South Atlantic, which could be used for
36 tracking missiles. By 1948, CCAFS was firmly established as a launch site for USAF (USAF 2015a).
37 An extensive history of CCAFS space operations can be found in works by USAF and Pan American
38 World Airways, Inc. (1974) and Mark C. Cleary (1994). This land has had numerous names under
39 government ownership including Cape Canaveral (1950 to 1963), Cape Kennedy (1963 to 1974),
40 Cape Canaveral (1974 to 1994), and CCAFS (1994 to present).

3.5 AIR QUALITY

Air quality at CCAFS is regulated under Federal Clean Air Act regulations (Title 40 CFR Parts 50 through 99) and FAC Chapters 62-200 through 62-299. The US Environmental Protection Agency (USEPA), under the authority of the Clean Air Act, as amended, has established nationwide air quality standards known as the National Ambient Air Quality Standards (NAAQS). The NAAQS represent the maximum allowable atmospheric concentrations of health-based criteria and are referred to as “criteria pollutants.” These criteria pollutants include carbon monoxide (CO), lead (Pb), nitrogen dioxide (NO₂), ozone (O₃), sulfur dioxide (SO₂), particulate matter (PM) 10 micrometers or less in diameter (PM₁₀), and PM 2.5 micrometers or less in diameter (PM_{2.5}). The NAAQS are further broken down into two categories, the National Primary Standards and National Secondary Standards. The Primary NAAQS provide public health protection including the health of “sensitive” populations including the elderly, children, and persons with asthma. The Secondary NAAQS provide general public welfare protection against decreased visibility, damage to animals, crops, vegetation, and buildings. Table 3-4 lists the NAAQS.

Table 3-4 Federal National Ambient Air Quality Standards

Pollutant	Average Time	Federal Primary NAAQS	Federal Secondary NAAQS
CO	8-hour	9 ppm	N/A
	1-hour	35 ppm	N/A
Pb	Rolling 3-month Average	0.15 µg/m ³	0.15 µg/m ³
NO ₂	1-hour	100 ppb	N/A
	Annual	53 ppb	53 ppb
O ₃	8-hour	0.07 ppm	0.07 ppm
PM _{2.5}	Annual	12 µg/m ³	15 µg/m ³
	24-hour	35 µg/m ³	35 µg/m ³
PM ₁₀	24-hour	150 µg/m ³	150 µg/m ³
SO ₂	1-hour	75 ppb	N/A
	3-hour	N/A	0.5 ppm

Source: USEPA 2019.

Notes: µg/m³ = micrograms per cubic meter of air; ppb = parts per billion; ppm = parts per million

The State of Florida has a statewide network of air-quality monitoring. The focus of this network is the management of air quality throughout the state with a focus on those areas where ambient air quality standards are at risk of being violated and areas where the ambient standards are being met but are at risk due to potential growth in the populations of those areas or industrial growth. Regional air quality in Florida is assessed at county level; Brevard County is designated as “in attainment” with the NAAQS. The term “in attainment” refers to areas with concentrations of criteria pollutants that are below the levels established by the NAAQS. If the concentration of one or more criteria pollutant in an area exceeds the levels established by the NAAQS, the area may be classified as a “non-attainment” area. Since Brevard County is in attainment for all regulated criteria pollutants, no conformity determination is required for the Proposed Action.

Table 3-5 summarizes air emissions for 2012 through 2016 for CCAFS of actual tons per year of the NAAQS-regulated criteria pollutants and total hazardous air pollutants (HAPs).

1 **Table 3-5 History of Actual Annual Emissions (Tons per Year) at CCAFS**

Pollutant	Year				
	2016	2015	2014	2013	2012
CO	11.66	10.75	9.83	10.95	19.47
Pb	0.000033	-	-	-	-
NO ₂	42.21	36.28	33.56	35.79	73.58
PM _{2.5}	3.00	2.59	2.66	2.63	5.20
PM ₁₀	2.76	2.31	2.21	2.29	5.03
HAPs	0.02	0.03	0.03	0.03	0.15
VOCs	3.35	2.86	2.69	2.84	6.22

2 Source: FDEP 2019.

3 Notes: VOCs = volatile organic compounds.

4 With respect to ozone depleting chemicals (ODCs), use of ODCs at CCAFS is strictly prohibited and
5 will not be used as part of any construction or operation occurring at the proposed reconstruction
6 of SLC-20.

7 **3.6 CLIMATE**

8 **3.6.1 Regional Conditions**

9 Climate is a term which refers to the long-term regional and/or global average of temperature,
10 humidity, and rainfall patterns over long periods. In the mid-latitudes where Brevard County is
11 located, the meteorological conditions result in one of the most diverse ecosystems in North
12 America due to the rare combination of climates. Brevard County is exposed to a temperate
13 climate from the north and a warm subtropical climate to the south creating favorable conditions
14 for a wide variety of floral and faunal ecosystems. The climate in the region is characterized by
15 hot, humid, summers with temperatures in the mid-to-upper 90 degrees Fahrenheit (°F)
16 (32 degrees Celsius [°C]). Winters are mild with daytime temperatures ranging from 60 to 70°F
17 (15 to 21°C); occasionally, temperatures fall to freezing levels in January and February.

18 Hurricane season occurs from June through November with a majority of hurricanes developing
19 between August and October. The peninsula of Florida is surrounded by the Atlantic Ocean and
20 Gulf of Mexico; therefore, oceanic currents contribute to the State's weather, creating
21 atmospheric conditions suitable for spawning thunderstorms, lightning, and periodically
22 hurricanes. Humidity in the region is highly variable with relative humidity in the summer being
23 between 70 and 90 percent. During non-summer months, the relative humidity is high in the
24 morning, averaging 90 percent, but dropping to between 55 and 65 percent in the afternoons.

25 Regarding precipitation, average annual rainfall in the Brevard County area is approximately
26 52 inches per year (125 cm) with 70 percent occurring between May and October primarily due
27 to afternoon thunderstorms (NASA 2013). The maximum rainfall months are August and
28 September with an average of 7.6 inches (17.5 cm) of rain; conversely, the least amount of rain
29 falls in January with an average of 2.3 inches (5.8 cm) (Weather Atlas 2019).

30 The principal meteorological conditions that control dispersion are winds and turbulence (or
31 mixing ability) of the lower atmosphere. In the mid-latitudes where CCAFS is located, the lower
32 atmosphere (troposphere) extends 6.2 to 7.5 miles, (10 to 12 km) above the earth's surface to

1 the bottom of the stratosphere. Wind speed and direction are variable and correlated with
2 seasonal meteorological conditions. Winds during the summer are predominantly from the south
3 and southeast and become more easterly in the fall. During the winter, winds are typically from
4 the north and northwest. Uneven solar heating of land and water during the summer causes a
5 sea breeze (from ocean to land) during the day and a land breeze (from land to ocean) at night.
6 Wind speed, along with the degree of turbulence, controls the volume of air available for
7 pollutant dilution. Atmospheric stability is a measure of the mixing ability of the atmosphere and,
8 therefore, its ability to disperse pollutants. Greater turbulence and mixing are possible as the
9 atmosphere becomes less stable, and therefore pollutant dispersion increases. In general, stable
10 conditions occur most frequently during the nighttime and early morning.

11 **3.6.2 Global Climate**

12 Greenhouse gases (GHGs) are gases that trap heat in the atmosphere. The primary GHGs of
13 concern are CO₂, methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons, perfluorocarbons, and
14 sulfur hexafluoride (SF₆). These emissions occur from natural processes and human activities.
15 According to the FAA Order 1050.1F Desk Reference, climate change is a global phenomenon that
16 can have local impacts (FAA 2015). Scientific measurements show that the earth's climate is
17 warming, with concurrent impacts including warmer air temperatures, increased sea-level rise,
18 increased storm activity, and an increased intensity in precipitation events.

19 The six reporting facilities in Brevard County had a total of 3,222,445 metric tons of carbon-
20 dioxide equivalent (CO₂e) emissions in 2017 (USEPA 2020). (GHG emissions are often measured
21 in carbon-dioxide equivalent, which is calculated by multiplying emissions by the gas's global
22 warming potential.) The majority (i.e., 97 percent) of those emissions in Brevard County,
23 specifically 3,124,301 metric tons of CO₂e, were associated with the power plant and waste
24 sectors (USEPA 2020).

25 **3.7 HAZARDOUS MATERIALS AND HAZARDOUS WASTE**

26 The ROI for potential impacts from hazardous material, solid waste, and pollution prevention
27 includes the areas within and around SLC-20.

28 **3.7.1 Hazardous Material and Hazardous Waste**

29 Hazardous materials are any substance or material that has been determined to pose substantial
30 or potential threats to public health or the environment when transported in commerce
31 (49 CFR Part 172). This includes a subset of solid wastes that meet the criteria identified in
32 40 CFR Parts 260 and 261, hazardous substances and hazardous wastes. Hazardous substances
33 are any element, compound, mixture, solution, or substance defined as a hazardous substance
34 under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
35 and listed in 40 CFR Part 302. If released into the environment, hazardous substances may pose
36 substantial harm to human health or the environment. Hazardous wastes have characteristics as
37 defined by the RCRA in 40 CFR Part 261 which ... *may (a) cause, or significantly contribute to, an*
38 *increase in mortality or an increase in...illness or (b) pose a substantial present or potential hazard*
39 *to human health or the environment when improperly treated, stored, transported, or disposed*
40 *of or otherwise managed.* Hazardous waste is further defined as any solid waste that possesses

1 hazardous characteristics of toxicity, ignitability, corrosivity, or reactivity, or is specifically listed
2 as a hazardous waste in Subpart D of 40 CFR Part 261.

3 USEPA regulates hazardous chemicals, substances, and wastes under RCRA, CERCLA, and the
4 Toxic Substances Control Act (TSCA). These regulations provide requirements for the generation,
5 storage, transportation, treatment, handling, and disposal of hazardous materials and hazardous
6 waste. USEPA and various states also have regulations regarding the operation and maintenance
7 of underground storage tanks and ASTs. In addition, OSHA has definitions and workplace safety-
8 related requirements and thresholds for approximately 400 hazardous and toxic substances, and
9 DOT has definitions and requirements for the safe transportation of hazardous materials.
10 Numerous types of hazardous materials are currently used at CCAFS to support various space
11 missions and general maintenance operations.

12 Individual contractors and organizations maintain their own hazardous waste satellite
13 accumulation points and 90-day hazardous waste accumulation areas in accordance with RCRA.
14 Any amount of hazardous waste can be stored at a 90-day hazardous waste accumulation area,
15 but wastes must be disposed of off-site within 90 days. Under current RPAs, Space Florida would
16 be responsible for the collection and transportation of hazardous wastes (including propellant
17 waste) from the satellite accumulation areas to a 90-day hazardous waste accumulation area,
18 then to an off-site permitted treatment, storage, and disposal facility. As specified under lease
19 agreements and contracts, the contractors are under contract to reduce, where possible, the use
20 of Class II Ozone-Depleting Substance and Environmental Planning and Community Right-to-
21 Know Act (EPCRA) 313 chemicals.

22 Environmental Baseline Surveys (EBS) performed in 1998 and 2018 indicated that no hazardous
23 substances were used or stored on site from 1998 through 2001 and according to the 2018 EBS,
24 no hazardous waste was used or stored on site through 2018. No record of any spills exists in
25 both EBSs. The 1998 EBS reported that in the early 1990s, SLC-20 was designated as a SWMU
26 (# 043), which is discussed in further detail in Section 3.7.3. Since operations began in 1959 until
27 at least 1965, hazardous materials were used on site. Storage and release of non-hazardous
28 waste was also reported to have occurred from approximately 1978 to 1988. The UST
29 (Facility 15500A-1) installed in 1966 (680 gallons) was removed as part of the RFI/IM efforts at
30 the site. The IM included the excavation of 20 tons of associated petroleum- and metal-
31 contaminated soils in addition to the removal of the UST. A complete list of all the materials used
32 or stored on site is not available. However, the following items were documented to be
33 associated with SLC-20:

- 34 • Diesel Fuel No 2.
- 35 • Hydrazine.
- 36 • LOX.
- 37 • Nitrogen Tetroxide.
- 38 • Kerosene.
- 39 • Trichloroethylene.

- 1 • Hydraulic fluid.
- 2 • Petroleum and petroleum products.

3 Paint used on the facilities and structures at this site is assumed likely to contain lead and PCBs.
4 The presence of hazardous materials in the soil and groundwater is discussed more thoroughly
5 in Section 3.7.3.

6 Future tenants would have operations that use products that could contain hazardous materials,
7 including paints, solvents, oils, lubricants, acids, batteries, propellants, ordnance, and chemicals,
8 which are routinely used at CCAFS. Proposed operations do not deviate from current CCAFS
9 operations or introduce new or different hazardous materials or operations. Hazardous materials
10 are transported in accordance with FDOT regulations for shipping hazardous substances.
11 Ordnance is transported to and stored at Fuel Storage Area 2 until ready for use. Hazardous
12 materials, such as liquid rocket propellant, are transported and stored in specially designed
13 containers to reduce the potential of an exposure.

14 Management of hazardous materials and petroleum-related fuels is the responsibility of each
15 organization on CCAFS. RCRA requirements would be accomplished by the directives listed in the
16 respective permits issued to KSC or CCAFS (Installation Emergency Management Plan 10-2, 45 SW
17 Management Plan 19-14, and KSC Handbook [KHB] 8800.6). No sites at CCAFS are listed or under
18 consideration for listing on the National Priorities List (USEPA 2013).

19 USAF provides emergency spill response that is beyond the user's response. Space Florida's
20 tenant will prepare an Emergency Response Plan for its launch program in accordance with the
21 CCAFS Hazardous Materials Emergency Response Plan. The CCAFS Hazardous Materials
22 Emergency Response Plan ensures that adequate and appropriate guidance, policies, and
23 protocols regarding hazardous material incidents and associated emergency response are
24 available to and followed by all personnel and commercial entities.

25 In addition, Space Florida's tenant(s) would develop a site-specific SPCCP for petroleum-related
26 storage tanks and systems, including USTs or ASTs containing petroleum and diesel at SLC-20.
27 According to the 1998 EBS, no ASTs or USTs are on site. However, the 2018 EBS found that one
28 large white AST used to hold pressurized gases was on the paved access road near the guard
29 shack. ASTs were known to be used to support the Titan Launch program and were installed
30 behind protective berms. The 2018 EBS suspects that these tanks may have contained hydrazine,
31 nitrogen-tetroxide, kerosene, or hydraulic fluid. The 2018 EBS also noted that three USTs were
32 installed in 1959. A 280-gallon (1,060-L) steel tank and a 300-gallon (1,136-L) steel tank, both
33 containing Fuel Oil No. 2, were removed in 1991. One 2,000-gallon (7,571-L) steel tank also
34 containing Fuel Oil No. 2 was removed in 1998. The 1998 EBS also documented a 680-gallon
35 (2,574-L) UST used with the Blockhouse boiler that has been inactive since 1966 and was
36 scheduled for removal under the IRP. Whether this tank has been removed is unknown.

37 A generator would be needed to support the tenant's operations and keep critical equipment
38 working and is estimated to support a duration of 3 days. This would require an AST sized to hold
39 3,200 gallons (12,113 L) of diesel fuel. As this AST is greater than 500 gallons (1,893 L), FDEP tank
40 registration would be required, and the SPCCP discussed above would also include
41 countermeasure plans for this tank.

3.7.2 Solid Waste

Solid waste, including non-hazardous refuse, trash, or garbage, consists of everyday items such as product packaging, grass clippings, furniture, clothing, bottles, food scraps, newspapers, and appliances. Alkaline batteries are considered universal waste and are handled separately. General solid refuse at CCAFS is collected by a private contractor and disposed of off-site at the Brevard County Landfill, a Class I landfill at 2250 Adamson Road in the City of Cocoa, Florida. According to the Brevard County website, the existing facility is expanding to develop additional capacity that can meet the needs for future decades. 45 SW also manages a recycling program for appropriate waste material from CCAFS sites. During the 2018 EBS, piles of old piping and refrigerant compressors were found near the former ready room.

3.7.3 Installation Restoration Program

The DoD established the IRP to identify, characterize, and evaluate past disposal sites and remediate associated contamination as needed to protect human health and the environment. The IRP was initiated at CCAFS in 1984. The IRP efforts at CCAFS have been conducted in parallel with the program at PAFB and in close coordination with the USEPA, FDEP, and NASA KSC. CCAFS is not a National Priorities List site, and the IRP sites are being evaluated and remediated under RCRA authority while meeting the CERCLA regulations. FDEP has approved the 2019 soil remediation program at SLC-20.

The environmental status of each launch complex ranges from the identification of an area as an active potential release location (PRL), to an active SWMU, and then through assessment and remediation if required, to a closed or “no further action” (NFA) unit. A SWMU can be defined as any site that has had historical operations that had the potential to impact the environment. A RCRA Facility Assessment identifies releases or migration of contaminants from a SWMU. Figure 3-11 shows the locations of SWMU 043 and soil measurement of contaminants. The following provides a brief history of the remedial activities at SLC-20.

During launch activities from 1959 through 1965, several hazardous chemicals were stored and used at SLC-20, including trichloroethylene, fuels, hydrazine, LOX, nitrogen tetroxide, kerosene, hydraulic fluid, paints, lubricants, Freon, and PCBs. Based on generator knowledge, historical paint formulations used on launch structures included PCBs and lead. Routine sand-blasting activities following launches dispersed the PCBs throughout site surface soils. Additionally, paint delamination from the launch structure also contributed to PCB and lead contamination throughout the site.

Since SLC-20 became a SWMU in the early 1990s, numerous environmental assessments and remediation activities have occurred under the RCRA Facility Investigation (RFI) program. Since 2008, the IRP has conducted 5-year reviews of past investigation and data gaps. The 2013 review noted that PCBs in soils were above the industrial SCTL. These soils were generally around the former launch stand area. An ongoing dioxin/furan (compounds that occur when PCBs are heated or burned) study was also documented in the 2013 review. A Preliminary Assessment and Site Investigation were completed at SLC-20 from 1992 to 1995. Based on the results, a Resource Conservation and Recovery Act Facility Investigation (RFI) was initiated to fully evaluate the nature and extent of contamination at the site. Several IM soil removals were performed

1 concurrently with the RFI in 1995 and 1998 to remove contaminated soil and sediment at
2 SLC-20. Based on the RFI results, No Further Action was recommended for groundwater, surface
3 water, and sediment, which was approved by FDEP on September 17, 1999. Based on
4 recommendations from the Five-Year Review in 2008, additional soil sampling was performed to
5 assess for PCBs and metals associated with paint coatings on historical launch structures at the
6 site. Additional soil sampling was conducted along with removal of water and debris at the
7 SLC-20 actuator pit in 2012. From 2015 to 2016, a Data Gap Investigation was performed to
8 laterally and vertically delineate PCB contamination in soil in excess of the industrial SCTL along
9 with sampling at one former substation location to determine if PCBs had leached to
10 groundwater. A temporary groundwater monitoring well was installed and sampled at the
11 location, and all results were less than the FDEP GCTLs for PCBs, thus No Further Action for
12 groundwater was warranted. In addition, a study was performed for dioxin/furan compounds at
13 the site. Dioxin/furans compounds were suspected to co-exist with PCB soil contamination at the
14 site based on heating/burning activities during launches. A soil removal was completed in 2019
15 to address remaining concentrations of PCBs and dioxin/furans in excess of the FDEP industrial
16 SCTLs. Remaining soils are now safe for re-use under industrial land-use scenarios. An interim
17 remediation action was developed and published in 2017, which outlined removal of those soils
18 above the SCTL (Figure 3-11). Under the RFI program and managed by USAF IRP, soil remediation
19 activities were completed in mid-2019.

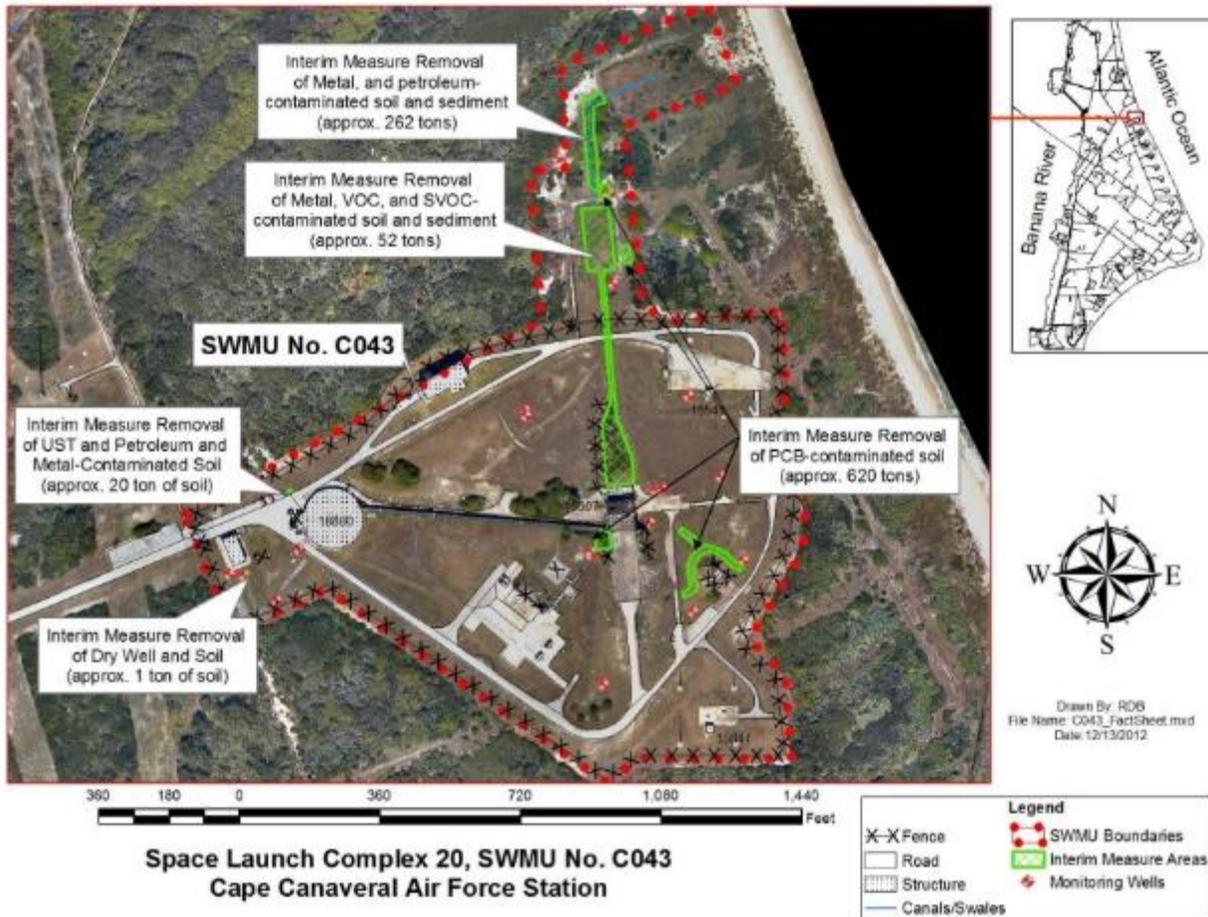


Figure 3-11 Soil Contamination Location Map for SWMU No. C043 (USAF 2013)

3.7.4 Pollution Prevention

Pollution prevention is any practice that reduces, eliminates, or prevents pollution at its source. This can be done by modifying production processes, promoting the use of non-toxic or less toxic substances, implementing conservation techniques, and re-using materials rather than putting them into the waste stream. EO 12088, Federal Compliance with Pollution Control Standards, directs federal agencies to comply with *applicable pollution control standards* in prevention, control, and abatement of environmental pollution and to consult with USEPA, state, and local agencies concerning the best techniques and methods available for prevention, control, and abatement of environmental pollution.

Environmental implications of all projects must be considered during the design phase, and designs must be developed that minimize or eliminate environmental liability. Pollution prevention environmental analysis for a project must be included and performed early in the design phase. The environmental analysis should focus on any potential pollution that may result from the proposed project and must include requirements in the design that promote pollution prevention measures whenever feasible. Designs could also include sustainability initiatives including but not limited to energy conservation, water conservation, and use of recycled or reclaimed content. Where pollution cannot be prevented, the environmental analysis would

1 include requirements that promote recycling, energy recovery, treatment, and environmentally
2 safe waste disposal practices.

3 Space Florida's tenant(s) will develop a pollution prevention plan containing methods and
4 processes that meet USAF and local requirements.

5 **3.8 WATER RESOURCES**

6 **3.8.1 Surface Waters**

7 Water resources include groundwater, surface waters, wetlands, and floodplains and their
8 physical, chemical, and biological characteristics. CCAFS is within the Florida Middle East Coast
9 Basin watershed and situated on a barrier island that separates the BRL from the Atlantic Ocean.
10 This basin contains three major water bodies: the BRL to the immediate west, Mosquito Lagoon
11 to the north, and the IRL to the west of Merritt Island. The BRL has been designated a Class III
12 surface water; a designation under the Clean Water Act that intends for a level of water quality
13 suitable for recreation and the production of fish and wildlife communities. In addition, several
14 water bodies in the Middle East Coast Basin have been designated as Outstanding Florida Waters
15 in Chapter 62-3, FAC, including most of the Mosquito Lagoon and the BRL, Indian River Aquatic
16 Preserve, Banana River State Aquatic Preserve, Pelican Island National Wildlife Refuge, and the
17 CNS. As a result of this designation, these water bodies are afforded a higher level of regulatory
18 protection. In addition, in 1990 the IRL system was designated as an Estuary of National
19 Significance under the USEPA's National Estuary Program.

20 Figure 3-1 depicts a small man-made surface water that historically served as a stormwater
21 treatment swale. No other surface waters occur within the existing SLC-20 boundary.

22 **3.8.2 Groundwater**

23 The surficial and the Floridan aquifer systems underlie CCAFS. The surficial aquifer system (SAS),
24 which is comprised generally of sand and marl, is unconfined and approximately 70 feet (21.3 m)
25 thick. The SAS is recharged by infiltration of precipitation through the thin vadose zone. Assuming
26 negligible runoff, the amount of recharge is approximately equal to the amount of precipitation
27 minus the amount returned to the atmosphere through evaporation and transpiration
28 (NASA 2013). Overall SAS groundwater flow direction at SLC-20 is predominantly to the south
29 and southwest under a relatively flat hydraulic gradient. Depth to the SAS varies but is
30 approximately 3.3 feet (1 m) (GEAR 2019).

31 The Floridan aquifer is the primary source of potable water in central Florida and contains water
32 under artesian conditions. It is confined by the clays, sands, and limestones of the overlying
33 Hawthorn Formation which is approximately 80 to 120 feet (24.4 to 36.6 m) thick. Water enters
34 the Floridan aquifer near the center of the Florida peninsula and moves laterally toward the
35 coasts. In the vicinity of CCAFS, groundwater in the Floridan aquifer flows to the northeast.

36 **3.8.3 Wetlands**

37 Wetlands are defined in AFI 32-1067, Water and Fuel Systems (February 2015), as those areas
38 *...that are inundated by surface or ground waters that support plants and animals that need*
39 *saturated or seasonally saturated soil to grow and reproduce. Wetlands include swamps,*
40 *marshes, bogs, sloughs, mud flats and natural or manmade ponds.* Wetlands are some of the

1 most biologically productive of all habitats. Wetlands are protected under Section 404, Waters
2 of the US, the Clean Water Act via the US Army Corps of Engineers (USACE), as well as by the
3 State of Florida via the state water management districts (WMDs) and FDEP. EO 11990 requires
4 avoidance, to the extent possible, of the long- and short-term adverse impacts associated with
5 the destruction or modification of wetlands and to avoid direct or indirect support of new
6 construction in wetlands wherever a practicable alternative exists.

7 No USACE or St. Johns River Water Management District (SJRWMD) jurisdictional wetlands occur
8 within the Proposed Action boundary.

9 **3.8.4 Floodplains**

10 Floodplains are lowland and relatively flat areas adjoining inland and coastal waters and other
11 flood-prone areas such as offshore islands. These flood hazard areas are identified on Federal
12 Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs) and are referred to
13 as a Special Flood Hazard Area (SFHA). SFHAs are defined as the area that will be inundated by
14 the flood event having a 1-percent chance of being equaled or exceeded in any given year. The
15 1-percent annual chance flood is also referred to as the base flood or 100-year flood. SFHAs are
16 labeled as 'Zones,' several of which are east of, but not within, the Proposed Action area:

- 17 • Zone AE – The base floodplain where base flood elevations are provided. AE Zones are now
18 used on new format FIRMs instead of A1-A30 Zones.
- 19 • Zone AO – River or stream flood hazard areas, and areas with a 1 percent or greater chance
20 of shallow flooding each year, usually in the form of sheet flow, with an average depth ranging
21 from 1 to 3 feet. These areas have a 26 percent chance of flooding over the life of a 30-year
22 mortgage. Average flood depths derived from detailed analyses are shown within these
23 zones.
- 24 • Zone VE – Coastal areas with a 1 percent or greater chance of flooding and an additional
25 hazard associated with storm waves. These areas have a 26 percent chance of flooding over
26 the life of a 30-year mortgage. Base flood elevations derived from detailed analyses are
27 shown at selected intervals within these zones.
- 28 • Zone X – Area of minimal flood hazard, usually depicted on FIRMs as above the 500-year flood
29 level.

30 DOT has implemented EO 11988 through policies and procedures documented in DOT
31 Order 5650.2, Floodplain Management and Protection. DOT Order 5650.2 defines the natural and
32 beneficial values provided by floodplains to include *natural moderation of floods, water quality
33 maintenance, groundwater recharge, fish, wildlife, plants, open space, natural beauty, scientific
34 study, outdoor recreation, agriculture, aquaculture, and forestry*. No floodplains occur within the
35 Proposed Action boundary (Figure 3-12).

36 **3.9 GEOLOGY AND SOILS**

37 CCAFS topography consists of a series of relic dune ridges formed by wind and wave action. The
38 higher naturally occurring elevations occur along the east portion of CCAFS, with a gentle slope
39 to lower elevations toward the marshlands along the BRL. Topography at CCAFS is relatively flat
40 with elevations that range from sea level to 15 feet (4.6 m) above mean sea level (MSL). The

1 geology underlying CCAFS can be generally defined by four stratigraphic units: surficial sands,
2 Caloosahatchee Marl, Hawthorn Formation, and limestone formations of the Floridan aquifer.
3 The surficial sands immediately underlying the surface are marine deposits that are typically
4 approximately 10 to 30 feet (3 to 9.1 m) below the surface. The Caloosahatchee Marl underlies
5 the surficial sands and consists of sandy shell marl that extends to 70 feet (21.3 m) below the
6 surface. The Hawthorn Formation, which consists of sandy limestone and clays, underlies the
7 Caloosahatchee Marl and is the regional confining unit for the Floridan aquifer. This formation is
8 generally 80 to 120 feet (24.4 to 36.6 m) thick, typically extending to approximately 180 feet
9 (54.9 m) below the surface. Beneath the Hawthorn Formation lie the limestone formations of the
10 Floridan aquifer, which extend several thousand feet below the surface of CCAFS (USAF 2005).

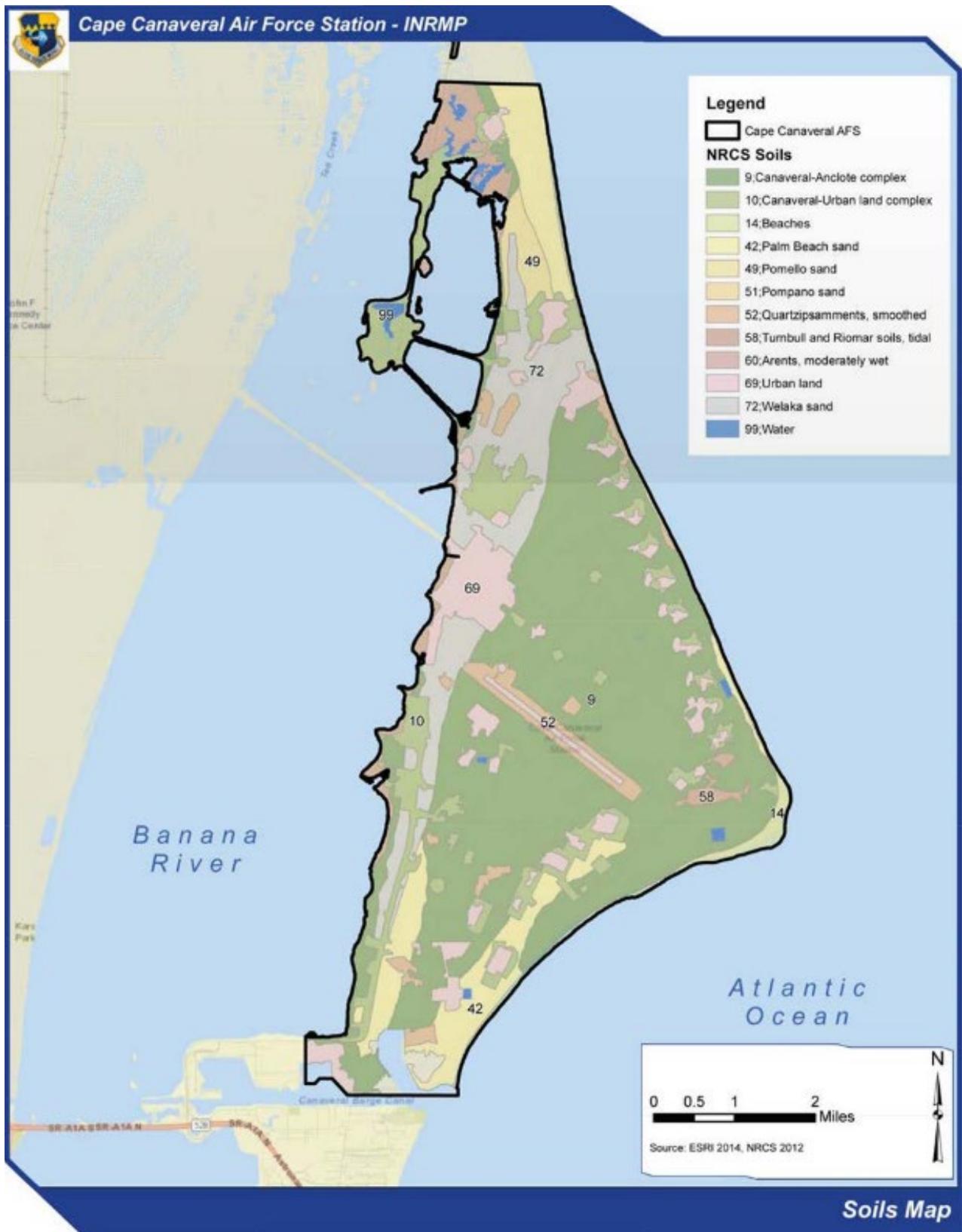
11 The National Resources Conservation Service (NRCS 2014) identifies 11 different soil types within
12 CCAFS, with the three dominant soil series being (1) Canaveral-Anclote Complex (48 percent),
13 Canaveral-Urban Complex (11 percent), Welaka Sand (10 percent), and Palm Beach Sand
14 (9 percent) (Figure 3-13). The most prevalent type of soil is Canaveral Sand. Canaveral soils are
15 on moderately low ridges and consist of a mixture of light-colored quartz sand grains and
16 multicolored shell fragments.

17 These dominant soil series are made up of nearly level and gently sloping ridges interspersed
18 with narrow wet sloughs that generally parallel the ridges and extend the entire length of the
19 County along the coast near the Atlantic Ocean. These soils are moderately well drained to
20 excessively drained, and sandy throughout and exceptionally dry, even though the water table is
21 often near the surface during rainy periods. Figure 3-14 provides an NRCS soils map of the
22 Proposed Action site.



1
2

Figure 3-12 Floodplain Map



1
2

Figure 3-13 Soils Map (USAF 2018)



1
2

Figure 3-14 Soils Map

3.10 TRANSPORTATION

3.10.1 Regional Access

CCAFS is approximately 150 miles (241 km) south of Jacksonville, 50 miles (80 km) east of Orlando, and 187 miles (301 km) north of Miami. The general region can be accessed from north and south Florida via I-95 or US Highway (US) 1, and from the west via State Route (SR) 528. Access to CCAFS can occur from the south via SR 528 (A1A) through Port Canaveral to Samuel C. Phillips Parkway, from the north along two access routes through KSC; one via SR 405 (NASA Parkway) or another via SR 402 (Max Brewer Memorial Parkway) (Figure 3-15).

3.10.2 Local Access

The majority of the employees and other related support service providers for CCAFS reside in the unincorporated areas of Brevard County and in the cities of Cape Canaveral, Cocoa, Cocoa Beach, and Rockledge, which are all within 14 miles (22.5 km) of CCAFS. The key roads providing access to CCAFS from the surrounding local communities include SR A1A, SR 520, SR 528, SR 401, SR 405, and SR 3. NASA Causeway (SR 405) connects CCAFS with KSC, the inner barrier islands, and the mainland. South access into CCAFS occurs through Gate 1, which is accessed by SR 401 via SR A1A and SR 528. West access into CCAFS is provided by NASA Parkway East and SR 405. From the north, CCAFS can be accessed through Gate 4 and Gate 6 at KSC along Cape Road. Since the Shuttle Program was terminated in 2011, the general workforce that would be using these roadways has substantially declined.

The main on-site roadway on CCAFS is Samuel C. Phillips Parkway, a two-lane road in some areas, and a four-lane divided highway in other areas that accommodates most of north-south traffic and connects with KSC to the north. SLC-20 is on ICBM Road, which also runs north and south but further east, closer to the beach. It can be accessed from Samuel C. Phillips Parkway by Central Control Road to the south and by Heavy Launch Road to the north. ICBM Road is a lightly traveled road.

Available data indicate that the roads and supporting structures (culverts, bridges, pavement) were constructed to meet FDOT standards. The condition of roadways within CCAFS were most recently assessed in 2013 in a report titled *Roads and Parking Lots Pavement Condition Index Survey Report at Cape Canaveral Air Force Station*, December 2013 (AMEC 2013). Most road pavement conditions were indexed as good or fair. However, a section of Samuel C Phillips Parkway (Section ID 01A) was assigned an index condition of poor. This section extends from approximately SLC-41 north to the turnoff to KSC Pad 39A. The transportation study indicated that while conditions of most culverts that may be transited appeared to be in good condition, some older culverts may require replacement because their conditions cannot be deterministically calculated due to age and condition. Roadways on KSC property from Commerce Way to Cape Road also appear to be in good or fair condition. However, pavement rehabilitation programs are on-going within KSC and the condition will vary over time.

The Proposed Action would transport small- and medium-lift launch vehicles from proposed manufacturing facilities at Exploration Park, KSC to SLC-20 using a standard tractor-trailer and will stay within FDOT maximum weights for an HS-20 vehicle loading (8 kips on front axle, 32 kips for rear axles), for a maximum allowable weight of 80,000 lb (36,287 kg).



1
2

Figure 3-15 Regional Road Map

Existing pavement geometries indicate that roadway widths along the access route options are at least 24 feet (7 m) wide and can accommodate the expected transport vehicles (American Association of State Highway and Transportation Officials [AASHTO] WB-96 or WB-114 vehicles, 80 feet (24 m) maximum length, 21 feet (6 m) inside turning radii, and 66 feet (20 m) outside turning radii). Key intersections also appear to be sufficient for FDOT-permitted vehicles; with NASA Parkway at Samuel C. Phillips Parkway having a minimum inside turning radius of 24 feet (7 m), Samuel C. Phillips Parkway at Heavy Launch Road having a slight horizontal alignment deflection with a 100-foot (30-m) radii, Heavy Launch Road at ICBM Road having an inside radius exceeding 60 feet (18 m), and ICBM Road at SLC-20 having an inside radius greater than 90 feet (27 m). Transport of over-sized loads are coordinated with Cape Support before delivery.

3.11 UTILITIES

Operations at SLC-20 were provided by CCAFS from the late 1950s until the site was deactivated in 1996. During demolition activities, many piping and cabling systems were abandoned-in-place; however, SLC-20 has recently been in use and continues to have additional active distribution and collection systems in operation.

3.11.1 Water Supply, Treatment, and Distribution

CCAFS water supply is provided by the City of Cocoa through the City's municipal potable water distribution system. The City pumps groundwater from the Intermediate and Floridan aquifers from well fields in east Orange County. The water is treated by the City at a potable water treatment facility at the same location. Additionally, the City has Aquifer Storage Wells (ASWs) for storage during low usage and the Taylor Creek Reservoir, a surface water storage facility. CCAFS receives potable and fire protection water from all three sources, as it is blended together after treatment (City of Cocoa, 2018).

The US Federal Government has contracted with the City to provide water to KSC, CCAFS, and PAFB. PAFB and CCAFS have a combined total of 6.5 million gallons per day (MGD) allocation and KSC has an additional 2.5 MGD. In 2018, the total daily consumption of water for CCAFS and KCS averaged was 0.7 MGD. Water is used at CCAFS for potable and non-potable purposes. Non-potable use includes hydrant flushing, fire protection, limited irrigation, and launch-related demands. CCAFS recently improved portions of its distribution facilities by separating certain water mains for fire protection only. This improved water quality in the potable distribution system by limiting water age. LC-20 is currently fed from a single 12-inch (30.5-cm) potable line. No separation between fire protection and potable water currently exists.

3.11.2 Wastewater Collection and Treatment

Wastewater at SLC-20 is currently treated in four septic tanks and drainfields. SLC-20 would continue to use this onsite wastewater treatment system in the short-term. If offsite sanitary collection services become available along ICBM Road, an onsite lift station, force main, and sewer service lines may be installed to connect to the offsite system to the CCAFS wastewater treatment plant (WWTP) in the long-term. The WWTP at CCAFS accepts domestic and industrial wastewater. The most recent permit issued for the WWTF was in April 2020 and expires

1 April 2025. The CCAFS WWTP has a permitted capacity of 0.8 MGD and in 2018 0.454 MGD or
2 57 percent of the capacity was used.

3 **3.11.3 Electrical Supply**

4 Historically, CCAFS electrical use represents only 0.4 percent of Brevard County's demand.
5 Electrical transmission lines served by Florida Power & Light (FPL) enter CCAFS at three locations:
6 from the southwest boundary, across NASA Causeway, and from Merritt Island. The three feeds
7 are capable of providing 59 Mega Volt/Amperes (MVA) to CCAFS, which is well in excess of that
8 required. Electrical usage in 2015 was 140,352 Mega Watts/Hour (MWH).

9 The local electrical distribution system is maintained by CCAFS and provides medium-voltage
10 distribution power to SLC-20. Running at 13.2 kilovolts (KV), this medium-voltage distribution
11 system is fed into the site from Load Brake Switch (LBS) BMCG2 through a duct-bank system of
12 conduit and manholes. On site, this medium-voltage power is stepped down through LBS CX20G1
13 to the various low-voltage distribution transformers, which supplies required power for the
14 existing facilities. The distribution system appears to be capable of supplying electricity to the
15 existing launch facilities. Excess capacity is available should the need arise.

16 **3.11.4 Natural Resources and Energy Supply**

17 As previously stated, launch complexes on CCAFS draw required electrical power and water from
18 the City of Cocoa. No renewable energy resources or local energy sources are available in the
19 area of SLC-20. However, a large FPL solar farm is south of Exploration Park Phase I, and a large
20 500-acre (202-ha) solar farm is in the planning stages north of the KSC Visitor Center.

21 **3.11.5 Stormwater Collection**

22 Impervious areas constructed after 1992 are subject to the FAC and the SJRWMD stormwater
23 regulations via the State-Wide Environmental Resource Permit (ERP) process that requires new
24 site developments to capture, attenuate, and treat stormwater. As facilities are improved or
25 built, stormwater systems must be built or upgraded to be consistent with the requirements of
26 SJRWMD Rule 40C-4, FAC. Space Florida's tenant would be required to submit engineering design
27 plans that present the proposed site development (e.g., civil design, grading) and the stormwater
28 management system as well as stormwater modeling calculations, all of which will be reviewed
29 and approved by SJRWMD before issuance of an ERP.

30 Current stormwater flow from impervious surfaces within SLC-20 follows pre-existing flow paths
31 to roadside swales and depressions where it infiltrates and does not appear to discharge off-site.

32 **3.12 HEALTH AND SAFETY**

33 Health and safety issues are managed at CCAFS by organizations that review the planning,
34 construction, pre-flight processing, and launch-day operations. The objective of range safety is
35 to ensure that the general public, launch-area personnel, surrounding launch complexes and
36 personnel, and areas of overflight are compliant with USAF requirements, adhere to the
37 AFSPCMAN 91-710, and all public laws. The AFSPCMAN 91-710 is the document that implements
38 the AFI, *Space Safety and Mishap Prevention Program*, and the Memorandum of Agreement
39 between USAF and the FAA on Safety for Space Transportation and Range Activities. This manual
40 specifies responsibilities and authorities, delineates policies, processes, required approvals, and

1 approval/waiver levels for all activities from or onto USSF ranges including commercial users
2 (AFSPCMAN 2016).

3 Operational health and safety concerns are primarily the areas in and around CCAFS that could
4 be affected by launch vehicle, equipment, and materials transport to and from the launch
5 complex, payload processing, vehicle safing, and launch operations. As noted above, range
6 safety organizations review, approve, monitor, and impose safety holds, when necessary, on all
7 pre-launch and launch operations in accordance with AFSPCMAN 91-710.

8 Any hazardous materials, including liquid fuels, that must be transported to the launch
9 complex, must be compliant with FDOT regulations regarding interstate shipment of those
10 materials governed by 49 CFR 100-199.

11 Explosive safety quantity-distance criteria and regulations established by DoD and USAF
12 Explosive Safety Standards are used to establish safe distances from launch complexes and
13 associated support facilities to non-related facilities and roadways. Explosive safety quantity
14 distance criteria will be used to establish safe distances from all onsite facilities and adjoining
15 roadways.

16 **3.13 SOCIOECONOMICS**

17 SLC-20 is in Brevard County. Total population, median household income, households below
18 poverty level, and unemployment rates for Brevard County were used as a basis for identifying
19 existing conditions. Data was obtained from the US Census Bureau 2013 to 2017 American
20 Community Survey 5-Year Estimates.

21 Table 3-6 compares the total population and median household income in Brevard County in
22 2010 and 2017. The data show that 10.2 percent of households were living below the poverty
23 level in 2017 and that the unemployment rate was 7.6 percent.

24 **Table 3-6 Brevard County Population Data**

	2010	2017	Percent Increase
Population	543,376	568,183	4.6
Median Household Income	\$49,523	\$51,536	4.1

25 Source: US Census Bureau, 2013 to 2017 American Community Survey 5-Year Estimate.

26 In general, the economic influence of the aerospace industry in Florida has declined somewhat
27 with the termination of the Shuttle program. However, commercial space launch companies such
28 as SpaceX, Blue Origin, and several others have had a positive impact of the economics of Brevard
29 County. According to SpaceFlorida.gov, Florida is ranked among the top five US states for
30 aerospace industry employment, with more than 130,000 employees in 2017. More than
31 17,144 aerospace-related companies are in Florida, which contribute over \$19 billion per year in
32 revenues to Florida's economy.

3.14 ENVIRONMENTAL JUSTICE

Environmental justice is defined by the 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.*” EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations*, requires all federal agencies to adopt strategies to address environmental justice concerns within the context of agency operations. Section 989.33 of AFI 32-7061, *Environmental Impact Analysis Process*, requires that a project proponent comply with EO 12898 to ensure that these types of impacts are considered in EAs and other environmental documents.

Minority populations included in the US Census Bureau 2013 to 2017 American Community Survey 5-Year Estimates are identified as White, not Hispanic, Black or African American, Hispanic, Asian, or Other (American Indian and Alaskan Native, Native Hawaiian or other Pacific Islander, some other race, or two or more races). Table 3-7 presents data based on the US Census Bureau 2017, which shows that Brevard County had a population of 568,183 persons and details the racial distribution in the County. The closest population centers to CCAFS are Titusville and Port St. John.

Table 3-7 Brevard County Racial Distribution

Race	Distribution
White, not Hispanic	82.9%
Black or African American	10.2%
Hispanic	9.7%
Asian	2.4%
Other	4.5%

Source: US Census Bureau.

3.15 SECTION 4(f) PROPERTIES

Section 4(f) of the US Department of Transportation Act of 1966 (now codified at 49 USC § 303) protects significant publicly owned parks, recreational areas, wildlife and waterfowl refuges, and public and private historic sites listed or eligible for listing on the National Register of Historic Places. Section 4(f) provides that the Secretary of Transportation may approve a transportation program or project requiring the use of publicly owned land of a public park, recreation area, or wildlife or waterfowl refuge of national, state, or local significance, or land of an historic site of national, state, or local significance, only if there is no feasible and prudent alternative to using that land and the program or project includes all possible planning to minimize harm resulting from its use. I

No designated 4(f) properties, including public parks, recreation areas, or wildlife refuges, exist within the boundaries of CCAFS. The MINWR is adjacent to KSC and CCAFS and the CNS is adjacent to KSC and north of CCAFS. The MINWR overlaps the northwest portion of KSC, and all areas not directly used for NASA operations are managed by MINWR and NPS. The nearest public park, Jetty Park, is approximately 5 miles (8 km) south of SLC-20 in the City of Cape Canaveral. Other public parks within an approximate 15-mile (24.1 km) radius of SLC-20 include Kelly Park, KARS Park, Kings Park, and Manatee Cove Park.

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4.0 ENVIRONMENTAL CONSEQUENCES

The analysis in this section focuses on the potential environmental impacts from construction and operation activities at SLC-20. Changes to the natural and human environment that could result from the Proposed Action are evaluated relative to the existing environmental conditions as described in Section 3.0. Four levels of impact may be identified:

- Negligible – The impact is barely perceptible or measurable, remains confined to a single location, and would not result in a sustained recovery time for the resource impacted.
- Minor – The impact is readily perceptible and measurable; however, the impact would be temporary and the resource should recover in a relatively short period.
- Moderate – The impact is perceptible and measurable, and may not remain localized, impacting areas adjacent to the Proposed Action area; adverse impacts to a resource may require several years to recover.
- Significant – An impact is predicted that meets the intensity/context significance criteria for the specified resource.

Under NEPA (42 USC Part 4321 et seq.), significant impacts are those that have potential to significantly affect the quality of the human environment. Human environment is a comprehensive phrase that includes the natural and physical environments and the relationship of people to those environments (40 CFR §1508.14). The CEQ regulations specify that in determining the significance of effects, consideration must be given to *context* and *intensity* (40 CFR § 1508.27).

Context means that the significance of an action must be analyzed in several contexts, such as society as a whole, to an affected region, to affected interests, or to just the locality. In other words, the context measures how far the effect would be *felt*.

The intensity of an action (i.e., the severity of the impact) regionally and locally may be determined by whether it is beneficial or adverse. Intensity refers to the **severity** of the effect within the context involved. The intensity of an action may be determined by:

- Unique characteristics in the area (i.e., wetlands, parklands, ecologically critical areas, cultural resources, and other similar factors).
- Overall beneficial project effect versus individual adverse effect(s).
- Public health and safety.
- Degree of controversy.
- Degree of unique or unknown risks.
- Precedent-setting effects for future actions.
- Cumulatively significant effects.
- Cultural or historic resources.

- 1 • Special-status species or habitats.
- 2 • Compliance with federal, state, or local environmental laws.

3 Thresholds for determining impact significance are based on the applicable compliance standard,
4 federal or state recommended guidance, or professional standards/best professional judgment.
5 In addition, the FAA uses thresholds that serve as specific indicators of significant impact for some
6 impact categories. FAA actions that would result in impacts at or above these thresholds require
7 the preparation of an EIS, unless impacts can be reduced below threshold levels. Quantitative
8 significance thresholds do not exist for all impact categories; however, consistent with the CEQ
9 regulations, the FAA has identified factors that should be considered in evaluating the context
10 and intensity of potential environmental impacts (FAA Order 1050.1F, Paragraph 4-3.3). Since the
11 FAA plans to adopt this EA to support its environmental review of license application(s), the FAA's
12 significance thresholds are considered in the assessment of potential environmental
13 consequences in this EA.

14 **4.1 LAND USE/VISUAL RESOURCES**

15 An impact may be considered significant if the project results in nonconformance with approved
16 land use plans or a conflict with existing uses or values of the project area or other properties.

17 Proposed changes to visual resources can be assessed in terms of *visual dominance* and *visual*
18 *sensitivity*. Visual dominance describes noticeable physical changes in an area. The magnitude
19 of visual dominance may vary depending on the degree of change in an area. Visual sensitivity
20 is attributed to a particular setting and the desire to maintain the current visual resources in
21 a viewshed. Areas such as coastlines and national parks are usually considered to have high visual
22 sensitivity. When evaluating visual impact, the ability of the general public to view the area
23 where the proposed action or change to the visual resource would occur must also be assessed.
24 Issuance of a federal license or permit for an activity in or affecting a coastal zone must be
25 consistent with the CZMA, which is managed by the Florida Department of Environmental
26 Protection (FDEP).

27 **4.1.1 Proposed Action**

28 **Land Use**

29 The Proposed Action would occur at SLC-20, which has been and is currently designated for space
30 launch activities. Reusing the launch complex, renovating existing facilities, constructing related
31 facilities, and conducting launch operations would be consistent with the 45 SW General Plan
32 and the USAF mission at CCAFS. Activities at SLC-20 would be in conformance with its designated
33 use for space vehicle launches. Coordination with KSC, FAA, MINWR, FDEP, and FCMP member
34 agencies would be conducted as required at the time of permitting to ensure the Proposed Action
35 is consistent with meeting the Florida CZMA plan objectives. Therefore, the Proposed Action
36 would generate **negligible adverse impacts** on land use.

37 **Visual Resources**

38 The existing and proposed SLC-20 facilities and launch vehicle would not be visible by the public
39 except possibly from the ocean. However, OLV launches and associated exhaust contrail would
40 be visible in the sky by the public. The contrail visual impact would be similar to all other vehicle

1 launches and would dissipate quickly as wind and air currents affect the trail. Local communities
2 to the south and west have been acclimated to frequent launches of similar or larger size. Launch-
3 related visual impacts would be temporary and relatively infrequent, with up to 24 launches per
4 year. Therefore, the Proposed Action would generate **negligible adverse impacts** on visual
5 resources within the flight range of the OLV vehicle. Section 4.3 discusses light impacts on nesting
6 sea turtles.

7 **4.1.2 No-Action Alternative**

8 Under the No-Action Alternative, the reuse of SLC-20 and launch of OLVs would not be
9 implemented. Therefore, **no impacts** to land use, visual resources, or coastal resources would
10 occur.

11 **4.2 NOISE**

12 Noise impact criteria are based on land use compatibility guidelines and on factors related to the
13 duration and magnitude of noise level changes. Annoyance effects are the primary consideration
14 for most noise impact assessments on humans. Noise impacts on wildlife are discussed in
15 Section 4.3, Biological Resources.

16 The Noise Control Act of 1972 (40 CFR part 209) identifies 65 DNL (dBA) or a CDNL of 61 dB
17 relative to the carrier (dBC) as an acceptable noise level for compatible land uses for sonic booms
18 or rocket noise. This level does not represent a noise standard; rather, it is a basis to set
19 appropriate standards that should also factor in local considerations and issues.

20 In accordance with FAA Order 1050.1F, significant noise impacts would occur if the Proposed
21 Action would increase noise by DNL 1.5 dB or more for a noise sensitive area that is exposed to
22 noise at or above the DNL 65 dB noise exposure level, or that will be exposed at or above the DNL
23 65 dB level due to a DNL 1.5 dB or greater increase, when compared to the No Action Alternative
24 for the same timeframe.

25 For project-related overpressures at 1 psf, the probability of a window breaking ranges from one
26 in one billion to one in one million. In general, the threshold for building damage due to sonic
27 booms is 2 psf, below which damage is unlikely.

28 **4.2.1 Proposed Action**

29 The Proposed Action includes noise generated by construction and launch operations.

30 **Clearing and Construction-Related Noise**

31 A temporary increase in ambient noise levels would occur at SLC-20 and the surrounding area
32 during the refurbishment and enhancement of existing facilities and construction of new
33 facilities. Noise impacts from the operation of construction equipment are typically limited to a
34 distance of 1,000 feet (305 m) or less. Construction vehicles that would be used in support of the
35 Proposed Action typically have noise levels between 65 dBA and 100 dBA at a distance of 50 feet
36 (15 m). No residential areas or other sensitive receptors occur at or near SLC-20; therefore,
37 refurbishment and construction noise would not impact either public or sensitive receptors
38 (USAF 2019).

1 Temporary noise sources, such as refurbishment and demolition, would be considered significant
2 if they resulted in noise levels 10 dB or more above 85 dB—a noise threshold limit value for
3 construction workers in an 8-hour day. Pursuant to 29 CFR part 1910, worker protection against
4 the effects of noise exposure would be provided. Feasible administrative and/or engineering
5 controls would be used when workers are subjected to elevated sound levels from construction
6 activities. If these controls would not reduce sound levels sufficiently, hearing protection would
7 be provided and used to reduce exposure. Noise-level impacts on workers would be regulated by
8 compliance with OSHA requirements to limit noise impacts, and OSHA standards would be
9 followed to protect worker safety related to noise levels. Monitoring of worker exposure to noise
10 would also be conducted, as required by OSHA. Accordingly, construction-related noise impacts
11 are anticipated to be **temporary and minor**.

12 **Operations and Launch Vehicle Related Noise**

13 Blue Ridge Research and Consulting, LLC (BRRRC) developed a 2019 technical report, *Noise Study*
14 *for Firefly's Cape Canaveral Orbital Launch Site Environmental Assessment*, to assess launch and
15 sonic boom noise as a result of the Proposed Action at SLC-20 (BRRRC 2019). The potential impacts
16 from propulsion noise and sonic booms were evaluated on a single-event and cumulative basis
17 in relation to hearing conservation, structural damage, and human annoyance. Appendix B
18 contains the report and the results are summarized below. BRRRC developed and used their
19 Launch Vehicle Acoustic Simulation Model (RUMBLE) noise model to predict the noise associated
20 with the proposed Firefly launch operations. Based on BRRRC's analysis, launch and sonic boom
21 noise is not expected to be significant.

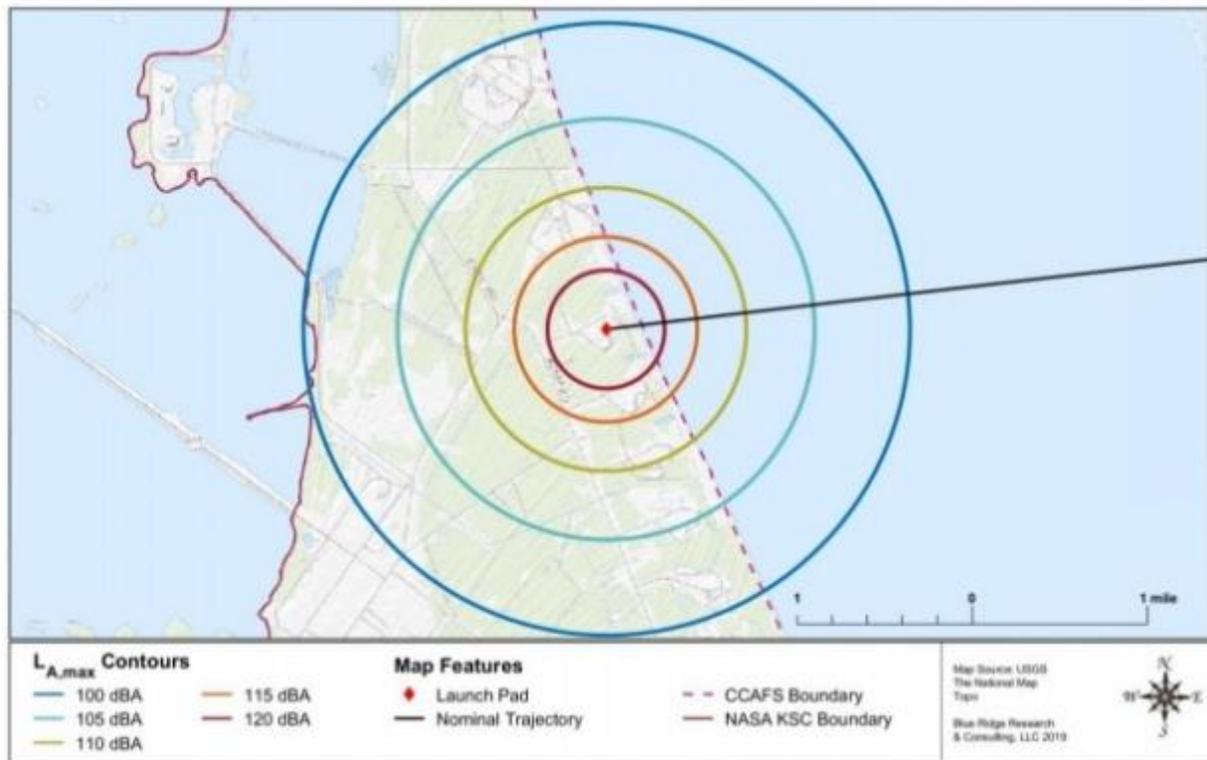
22 An upper limit noise level of L_{Amax} 115 dBA is used as a guideline to protect human hearing from
23 long-term continuous daily exposures to high noise levels. L_{Amax} is the maximum A-weighted
24 **sound** pressure level recorded over the period stated and is often used as a measure of the most
25 obtrusive facet of the **noise**, even though it may only occur for a very short time.

26 A single Firefly Alpha launch event may generate levels at or above L_{Amax} 115 dBA within
27 0.3 mile (0.5 km) of the launch site. A single Firefly Beta launch event may generate levels at or
28 above L_{Amax} 115 dBA within 0.5 mile (0.8 km) of the launch site. The 115 dBA contours
29 associated with the launch and static fire events are entirely within the boundaries of CCAFS
30 (Figure 4-1).

31 Structural damage claims were assessed by analyzing the 111 dB and 120 dB L_{Amax} contours
32 generated by Firefly Alpha and Beta launch events. The potential for structural damage claims is
33 approximately one damage claim per 100 households exposed at 120 dB, and one in
34 1,000 households at 111 dB (Guest and Slone 1972). For the Alpha launch event, the modeled
35 120 dB and 111 dB L_{Amax} contours are limited to radii of 0.6 mile (1 km) and 1.6 miles (2.6 km)
36 from the launch site, respectively. For the Beta launch event, the modeled 120 dB and 111 dB
37 L_{Amax} contours are limited to radii of 1.5 miles (2.4 km) and 4.0 miles (6.4 km) from the launch
38 site, respectively. The entire land area encompassed by the 111 dB noise contours resulting from
39 the Alpha and Beta launch or static fire events lies within the CCAFS and KSC boundaries.

40 For impulsive noise events such as sonic booms, noise impacts to human annoyance and health
41 and safety are not expected. There is potential for structural damage to glass, plaster, roofs, and

1 ceilings for well-maintained structures for overpressure levels greater than 2 psf. Sonic booms
 2 resulting from Alpha and Beta launch operations are predicted to occur over the Atlantic Ocean
 3 for all proposed launch azimuths between 44 degrees and 110 degrees. Modeled sonic boom
 4 overpressure levels between 2 and 7.4 psf are directed easterly out over the Atlantic Ocean in
 5 the direction of the launch azimuth, making them inaudible on the mainland. Accordingly, noise
 6 impacts with respect to human annoyance, health and safety, or structural damage are not
 7 expected to result from the sonic booms produced by Alpha and Beta launch operations.



8

9

Figure 4-1 Noise Contour

10 As identified in the BRRC technical report, the DNL 65 and 60 dBA contours extend approximately
 11 1.2 and 1.8 miles (1.9 and 2.9 km) from the launch site, respectively. This area does not
 12 encompass land outside the boundaries of CCAFS and KSC; therefore, no impact to residences
 13 would occur (Figure 4-2).

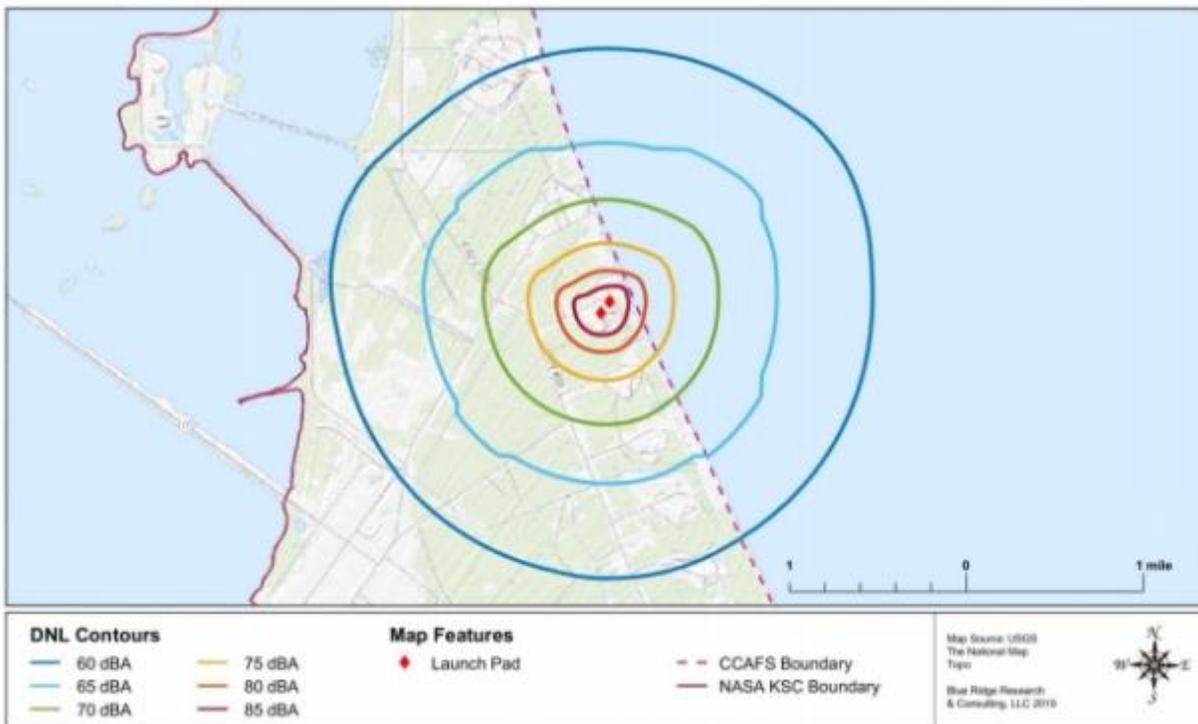
14 Airspace closures associated with launches could result in temporarily grounded aircraft at
 15 affected airports and re-routing of en-route flights on established alternate flight paths. The FAA
 16 has rarely, if ever, received reportable departure delays associated with launches at CCAFS and
 17 KSC. Aircraft could be temporarily grounded if airspace above or around the airport is closed.
 18 Ground delays are also used under some circumstances to avoid airborne reroutes. If aircraft
 19 were grounded, noise levels at the airport could temporarily increase as the planes sit idle. Also,
 20 depending on the altitude at which aircraft approach an airport, there could be temporarily
 21 increases in noise levels in communities around the airports. However, aircraft would travel on
 22 existing en-routes and flight paths that are used on a daily basis to account for weather and other
 23 temporary restrictions. Re-routing associated with launch-related closures represents a small

1 fraction of the total amount of re-routing that occurs from all other reasons in any given year.
 2 Any incremental increases in noise levels at individual airports would only last the duration of the
 3 airspace closure on a periodic basis and are not expected to meaningfully change existing day-
 4 night average sound levels at the affected airports and surrounding areas. Therefore, airspace
 5 closures due to launches are not expected to result in significant noise impacts. Advancements
 6 in airspace management are expected to further reduce the number of aircraft that would
 7 contribute to noise at the affected airports and surrounding areas.

8 Accordingly, **minor adverse impacts** from noise generated by Firefly Alpha and Beta launch
 9 operations is anticipated.

10 **4.2.2 No-Action Alternative**

11 Under the No-Action Alternative, the reuse of SLC-20 and launch of OLVs would not be
 12 implemented. Therefore, no impacts to noise would occur.



13
 14 **Figure 4-2 DNL Contours**

15 **4.3 BIOLOGICAL RESOURCES**

16 An impact to biological resources may be considered significant if USFWS or the National Marine
 17 Fisheries Service (NMFS) determines that the action would be likely to jeopardize the continued
 18 existence of a federally listed threatened or endangered species, or would result in the
 19 destruction or adverse modification of federally designated critical habitat (FAA Order 1050.1F).
 20 Also, a biological resource impact may be considered significant if the action would substantially
 21 diminish habitat for a plant or animal species, substantially diminish a regionally or locally
 22 important plant or animal species, interfere substantially with wildlife movement or reproductive
 23 behavior, and/or result in a substantial infusion of exotic plant or animal species.

1 Any action that may affect federally listed species or their critical habitats requires consultation
2 with USFWS under Section 7 of the ESA of 1973 (as amended). Also, the Marine Mammal
3 Protection Act (MMPA) of 1972 prohibits the taking of marine mammals, including harassing
4 them, and may require consultation with the NMFS. The NMFS is also responsible for evaluating
5 potential impacts to Essential Fish Habitat (EFH) and enforcing the provisions of the 1996
6 amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA)
7 (50 CFR 600.905 et seq.). A Biological Assessment is provided in Appendix D and provides
8 descriptions and analysis of listed wildlife species.

9 **4.3.1 Vegetation**

10 **Construction**

11 The Proposed Action would result in the clearing of approximately 0.3 acre (0.1 ha) of native live
12 oak/saw palmetto hammock vegetation to accommodate construction of the new HIF. Previously
13 cleared and maintained areas, which are dominated by primarily exotic herbaceous vegetation,
14 would be removed for the construction of new facilities, and remaining areas would be graded
15 with heavy equipment or mowed more frequently. Once vegetation is removed from this area
16 using heavy machinery, much of it would be graded using large, heavy-tracked bulldozers.
17 Material would be disposed of off-site or burned on location in accordance with USAF
18 regulations.

19 Converting 0.3 acre (0.1 ha) of low-quality potential Florida scrub-jay habitat to allow for the
20 construction of a new HIF would be compensated through the habitat improvements in LMU 22,
21 which would compensate for potential take of beach mice and benefit scrub-jays. Section 4.3.3
22 provides additional information.

23 **Launch Operations**

24 Proposed Action launch activities could have some small impacts near the launch pad in
25 association with the resulting fire and heat. Schmalzer et al. (1998) found vegetation scorching
26 was limited to small areas (less than 2.5 acres [1 ha]) within 492 feet (150 m) of the launch pad
27 for 14 Delta, 20 Atlas, and eight Titan launches from CCAFS.

28 The Proposed Action Concept A and B launch vehicles use liquid fuel (LOX, RP-1, and Liquid
29 Natural Gas), which produce very little acid or particulate deposition. As a result, impacts to
30 vegetation resulting from acid deposition are not expected with the Proposed Action.

31 **4.3.2 Wildlife and Migratory Birds**

32 **4.3.2.1 Construction**

33 Clearing and construction activities associated with the Proposed Action would occur over
34 approximately 2 years. Wildlife present in the area also could be affected by construction noise.
35 Wildlife response to noise can be physiological or behavioral. Physiological responses can range
36 from mild, such as an increase in heart rate, to more damaging effects on metabolism and
37 hormone balance. Behavioral responses to man-made noise include attraction, tolerance, and
38 aversion. Each has the potential for negative and positive effects, which vary among species and
39 among individuals of a particular species due to temperament, sex, age, and prior experience
40 with noise. Responses to noise are species-specific; therefore, making exact predictions about

1 hearing thresholds of a particular species based on data from another species is not possible,
2 even those with similar hearing patterns (USAF 2010). Noise generated during construction
3 activities of the Proposed Action would potentially have discernible, but temporary effects on
4 wildlife occurring nearby. Buffering of noise with attenuation rates of up to 10 A-weighted
5 decibels (dBA) per 328 feet (100 m) have been demonstrated in vegetated areas. Given that rate,
6 noise would be expected to carry 984 to 1,312 feet (300 to 400 m) away from the construction
7 sites. Most wildlife occurring closer to noise sources would be free to move away or find shelter
8 (e.g., burrows). Therefore, the impacts would be expected to be minimal (NASA 2013).

9 In addition to construction-related noise, clearing would eliminate potential habitat for wildlife.
10 The moderate level of noise generated from construction activities would be expected to act as
11 a warning mechanism for wildlife within the construction site and should help minimize impacts
12 to animals inhabiting land affected by the Proposed Action.

13 **Mammals**

14 Potential noise-related impacts to mammalian species during construction activities would
15 include disruption of normal activities due to noise and ground disturbances. These impacts
16 would be minor and short-term, and therefore would not cause significant impact to mammalian
17 populations within the vicinity of the project area.

18 **Reptiles and Amphibians**

19 Potential impacts to reptiles and amphibians resulting from construction- and human-generated
20 noise would primarily be a disruption in foraging. Reptile and amphibian hearing is poorly
21 studied. However, reptiles and amphibians are sensitive to vibrations, which provide information
22 about approaching predators and prey. As a result, vibration and noise associated with
23 construction activities would potentially cause a temporary disturbance to amphibians and
24 reptiles. These impacts would be short-term and would not cause a significant impact to reptilian
25 and amphibian populations within the vicinity of the project area (USAF 2010).

26 **Migratory Birds**

27 Potential impacts to birds resulting from construction- and human-generated noise include
28 disruption in foraging, roosting, and courtship activities. If construction was scheduled to occur
29 during the avian breeding season, construction would occur in accordance with the MBTA to
30 avoid impacts to nesting migratory birds. Despite the paucity of nest-site availability due to the
31 lack of shrubs and trees, biological surveys would occur before commencement of construction
32 activities and bird nests would be marked. In compliance with the MBTA, construction workers
33 would not directly or indirectly disturb the nest or an adjacent area until a biologist determines
34 that the nest is no longer in use. Impacts to migratory birds would be short-term and only affect
35 individuals at or near the construction site. Thus, construction would not cause a significant
36 impact to migratory bird populations. Monitoring during construction activities would identify
37 any potential disturbances of nests so that measures could be implemented to avoid adverse
38 effects, including take of migratory birds.

39 **4.3.2.2 Launch Operations**

40 **Terrestrial and Avian Species**

1 Launch operations would not be expected to significantly impact biological resources around
2 SLC-20 including terrestrial native vegetation or listed wildlife species. Noise from launches and
3 sonic booms have been studied for several avian species and beach mice; however, no adverse
4 or direct impacts were observed (KSC 2003). Even the maximum number of 24 launches per year
5 expected with the Proposed Action would result in only interrupting normal behavior
6 approximately twice per month. No animal mortality has been observed at CCAFS that could be
7 attributed to Delta, Atlas, or Titan launches (Schmalzer et al. 1998). Additionally, no negative
8 effects have been observed after the Falcon 9 launches. Extrapolating these results to future
9 Proposed Action launch vehicles is appropriate until further studies are completed at CCAFS.

10 **Marine Life**

11 Although spring and fall migration will see periodic groups of migrating North Atlantic right
12 whales that follow the U.S. coastline to as far south as Cape Canaveral, since the sonic boom
13 footprint occurs over 30 miles from CCAFS the sonic booms are not expected to negatively affect
14 the survival of any marine species (USAF 1998). Because these sonic booms are infrequent, and
15 the marine species in the ocean's surface waters are present in low densities, the effect on ocean
16 species is not expected to be significant.

17 During nominal operations, the launch vehicle would fly over the Cape Canaveral coastal waters
18 and into orbit without impacts of any kind on marine life or habitat. Reliability of the Proposed
19 Action launch vehicles is also expected to be similar to other launch vehicle development
20 programs, which range from 70-percent reliability in early development to 98-percent reliability
21 as the program matures. Hence, a launch vehicle is unlikely to impact in the ocean due to launch
22 termination. In the case that an airborne launch termination action does occur, the launch vehicle
23 may survive and impact the water essentially intact. The launch vehicle may be carrying unused
24 portions of liquid fuels. Concepts A and B launch vehicles will use a combination of LOX and RP-
25 1 propellants, which are much less toxic than hypergolic propellants used by other launch
26 vehicles. Upon contact with water, propellants would be very quickly diluted and buffered by
27 seawater. As a result, negligible potential for harm to marine life exists. Debris from launch
28 failures has a small potential to adversely affect managed fish species and their habitats in the
29 vicinity of the project area. For an impact to occur to marine life due to a mishap over the ocean,
30 which would be extremely rare, species would need to be present at or near the surface at the
31 same time as the event.

32 In an August 8, 2016 letter, NMFS issued a Letter of Concurrence for commercial and government
33 launches from KSC, CCAFS, and the SpaceX Boca Chica Launch Site, concurring with the action
34 agencies' determination that launches, including discarding stages in the ocean, would not
35 adversely affect listed species or critical habitat (see Appendix E). NMFS determined that all
36 potential project effects to listed species and critical habitat were found to be discountable or
37 insignificant.

38 **4.3.2.3 No Action Alternative**

39 Under the No Action alternative, no changes to the landscape and availability of habitat and
40 nesting areas utilized by wildlife and migratory species would occur, and noise from construction
41 or operation would also not occur. Therefore, a slight positive impact would be expected due to

1 the CCAFS Natural Resource Program being able to conduct restoration activities in the Proposed
2 Action area.

3 4.3.3 Threatened and Endangered Species

4 Table 4-1 summarizes the federal T&E wildlife species that occur or have the potential to occur
5 within the project area of the Proposed Action or may be affected by the Proposed Action. The
6 gopher tortoise is not a federally-listed species but is currently a candidate for listing and is listed
7 by the State of Florida as Threatened. Since it is a state-listed species, the 45 SW will undertake
8 special conservative actions consistent with state guidelines and requirements.

9 In accordance with ESA Section 7, USAF determined that the proposed project *may affect and is*
10 *likely to adversely affect* the southeastern beach mouse and the loggerhead, green, leatherback,
11 hawksbill, and Kemp’s ridley sea turtles. USAF also determined that the Proposed Action *may*
12 *affect but is not likely to adversely affect* the Florida scrub-jay, wood stork, red knot, piping
13 plover, eastern indigo snake, and manatee. USFWS concurred with these determinations.

14 USAF prepared a BA and submitted it to USFWS on January 10, 2020 in accordance with Section 7
15 consultation. In response to this BA, Appendix C provides the USFWS BO issued on July 17, 2020.

16 **Table 4-1 Summary of Potential Impacts to Federally Listed Wildlife Species for Proposed Action**

Common Name <i>Scientific Name</i>	Status		Occurrence	Potential Impacts
	USFWS (Federal)	FWCC (State)		
American Wood Stork <i>Mycteria americana</i>	T	T	Potential	Disruption due to noise.
Eastern Indigo Snake <i>Drymarchon corais couperi</i>	T	T	Potential	Crushing by equipment.
Florida Scrub-Jay <i>Aphelocoma coerulescens</i>	T	T	Potential	Loss of potential habitat.
Gopher Tortoise <i>Gopherus polyphemus</i>	----	T	Documented	Conflicts with site development. Crushing by equipment. Loss of habitat.
Green Sea Turtle <i>Chelonia mydas</i>	T	E	Documented	Disruption and disorientation of nesting and hatching turtles due to light.
Hawksbill Sea Turtle <i>Eretmochelys imbricata</i>	E	E	Documented	Disruption and disorientation of nesting and hatching turtles due to light.
Kemp’s Ridley Sea Turtle <i>Lepidochelys kempii</i>	E	E	Documented	Disruption and disorientation of nesting and hatching turtles due to light.
Leatherback Sea Turtle <i>Dermochelys coriacea</i>	E	E	Documented	Disruption and disorientation of nesting and hatching turtles due to light.
Loggerhead Sea Turtle <i>Caretta</i>	T	T	Documented	Disruption and disorientation of nesting and hatching turtles due to light.
North Atlantic Right Whale <i>Eubalaena glacialis</i>	E	E	Documented	Disruption of breeding habitat.
Piping Plover <i>Charadrius melodus</i>	T	T	Potential	Disruption due to noise.
Red Knot <i>Calidris canutus</i>	T	----	Potential	Disruption due to noise.

Common Name <i>Scientific Name</i>	Status		Occurrence	Potential Impacts
	USFWS (Federal)	FWCC (State)		
Southeastern Beach Mouse <i>Peromyscus polionotus niveiventris</i>	T	T	Documented	Crushing by equipment. Disruption due to noise.
American alligator* <i>Alligator mississippiensis</i>	S/A		No habitat	No affect.
West Indian Manatee <i>Trichechus manatus</i>	T	----	No habitat	No affect.

1 Note: The American alligator is protected due to its similarity of appearance to the American crocodile.

2 Specific to prescribed burning, the 45 SW has a CCAFS habitat management goal of burning
3 500 acres annually to manage habitat for threatened and endangered species. This goal has been
4 established through consultation with federal resource agencies pursuant to Section 7 of the ESA.
5 To achieve this goal, the 45 SW typically needs 6 to 8 days of prescribed burning per year. Burn
6 window opportunities for the 45 SW have been periodically reduced due to numerous factors
7 such as weather, payload transport, payload processing, payload storage at a launch pad,
8 launches, wet dress, and static test fires, among others. Historically, the 45 SW has been relatively
9 successful at meeting this objective. However, due to the current military project needs and
10 increasing number of commercial aerospace customers, prescribed burning has and will become
11 more difficult.

12 Historically, the 45 SW has maintained a launch table from which burn windows are identified.
13 The increase in aerospace activities has reduced the availability of these windows due to reasons
14 listed above as well as secondary impacts such as launch delays or improper weather conditions
15 when a prescribed burn window arises. As a result, the 45 SW plans to revise its approach with
16 current and future users and Space Florida to ensure adequate burn windows occur annually in
17 an effort to prioritize this listed species management activity rather than it being secondary to
18 launch operations. The 45 SW is currently working with senior CCAFS staff to develop operational
19 controls that will block out a set number of days annually within which launches or other activities
20 affected by prescribed burns cannot occur to allow 45 SW to meet its habitat management goals
21 agreed to with the resource agencies. Operational controls will be implemented that will provide
22 more assurance that CCAFS will meet its burning goals as part of its land management unit
23 responsibilities. In addition, Space Florida will incorporate language into their tenant lease
24 agreements that references the SW prescribed burn goal, listed species management
25 responsibilities, and resulting annual restrictions (1 to 2 weeks) during a 45 SW predefined
26 period. As part of the lease agreement with Space Florida, the tenants will have a contractual
27 obligation to comply with the specified prescribed burn days schedule by providing adequate
28 protection for their equipment (via containment or filtration systems) or moving sensitive
29 equipment to another location while the prescribed burn days are in force. Therefore,
30 implementation of this mitigation measure will reduce any impacts to prescribed burning to
31 minor.

4.3.4 Florida Scrub-Jay

The clearing and subsequent site development for the Proposed Action would result in the loss of approximately 0.3 acre of low-quality, potential scrub-jay habitat. The 2018 Florida scrub-jay census did not reveal the presence of any scrub-jay groups or individuals within the proposed construction limits. As a result, direct impacts are not expected. However, a family was observed in 2018 between ICBM Road and the Proposed Action boundary in the proposed RPA boundary area (Figure 3-5).

Potential effects to the Florida scrub-jay during construction activities would include disruption of normal activities due to noise and ground disturbances. These impacts would be short-term and would elicit a *startle response* to avoid the noise. This would help the birds to avoid the threat and therefore would not cause a negative impact to populations near the project area. Noise associated with rocket launches may startle many species within the CCAFS area. However actual noise impact to the Florida scrub-jay is expected to be minimal. In addition, USAF (1998) studied Atlas, Titan, and Delta launches and did not document any animal mortality or a significant impact to wildlife on CCAFS.

Direct Effect

The Florida scrub-jay is found within much of the CCAFS, KSC, and CCNS scrub habitat. USAF conducts a yearly census of the Cape Canaveral population of scrub-jays in all suitable accessible jay habitat. In 2018, 136 Florida scrub-jay groups were identified, which has varied from 104 groups in 2000 to 157 groups in 1996 and 1997 (Figure 3-4). As previously stated, 2018 census data indicate the presence of a single group within the RPA boundary area just east of ICBM Road but over 1,300 feet west of the Proposed Action boundary (Figure 3-5). However, no documented Florida scrub-jays occupy the Proposed Action area.

The Proposed Action would involve clearing and regrading of portions of the legacy SLC-20 site to construct new facilities. Clearing and construction would result in the direct permanent loss of approximately 0.3 acre of low-quality potential scrub-jay habitat. As a result, direct impacts to this species are expected but are not expected to be significant.

Indirect Effect

Indirect effects are caused by or result from the Proposed Action, occur subsequent to implementation of the Proposed Action, and are reasonably certain to occur. Indirect effects may occur outside the area directly affected by the action and may include other federal actions that have not undergone Section 7 consultations. The indirect effects would occur in two ways: (1) operation of SLC-20 would add activity adjacent to occupied habitat, possibly resulting in scrub-jays being struck by vehicles or (2) Proposed Action operation may restrict habitat restoration efforts and therefore slow species recovery.

The proposed operations at SLC-20 would increase traffic slightly in the vicinity of the scrub-jay habitat and create the opportunity for a take due to road-kill mortality. Repurposing SLC-20 for use has the potential to reduce controlled burn opportunities that create and improve habitat for the Florida scrub-jay within the RPA boundary and areas adjacent to it. Accordingly, restricting or slowing habitat restoration efforts in the area could result in an indirect take of this species.

1 Mitigation Measures

2 USFWS and USAF have agreed to a mitigation formula for scrub-jay habitat impacts that mitigates
3 loss of scrub or potential scrub habitat acreage by restoring degraded scrub habitat at a 2:1 ratio.
4 The objective of CCAFS scrub habitat restoration is to restore, using fire and mechanical methods,
5 the over-mature scrub to a condition suitable to support the Florida scrub-jay. Space Florida will
6 conduct beach mouse habitat restoration within a portion of the area shown on Figure 4-3. This
7 habitat enhancement will provide suitable habitat for the Florida scrub-jay to mitigate the
8 proposed 0.3 acre (0.1 ha) of habitat impacts.

9 Space Florida would work with SLC-20 tenants to advise them of 45 SW's need to conduct
10 vegetation management within the RPA boundary and areas south and north and ensure that
11 proposed processing facilities can accommodate smoke that may occur as a result of a nearby
12 prescribed fire. Space Florida would work closely with 45 SW and attend the CCAFS Controlled
13 Burn Working Group meetings to stay abreast of prescribed fire schedules. Although the
14 Proposed Action area is not suitable habitat nor currently occupied, scrub-jay surveying would
15 be conducted before clearing to ensure that no jays are nesting within 300 feet (91 m) of clearing
16 activities. All suitable scrub-jay habitat would be surveyed for nesting jays. Any nests
17 encountered would be flagged and no clearing would be allowed within 300 feet (91 m) until all
18 birds have fledged. If a dead scrub-jay is found at the project site, it will be collected and disposed
19 of in accordance with proper protocols and the USFWS Jacksonville, Florida, office will be
20 notified.

21 4.3.3.2 Southeastern Beach Mouse

22 The Proposed Action is expected to require clearing and grading portions of the existing SLC-20
23 and renovate several existing structures including the blockhouse. The southeastern beach
24 mouse is known to inhabit existing facilities such as the Blockhouse. As a result, there could be a
25 *take* associated with the Proposed Action.

26 Direct Effect

27 Construction and operations would occur at least 150 feet (46 m) west of the beach dune area,
28 which is typical beach mouse habitat. The Proposed Action would not significantly impact the
29 southeastern beach mouse population at CCAFS since no clearing or destruction of suitable
30 habitat would occur. However, there could be a take of the southeastern beach mouse due to
31 their use of the Blockhouse and disturbed habitats between this structure and the coast dunes.
32 As a result, the Proposed Action could result in a take of beach mice due to the renovation of the
33 Blockhouse.

34 Potential noise-related effects to the southeastern beach mouse during construction activities
35 would include disruption of normal activities due to noise and ground disturbances. These
36 impacts would be short-term and would elicit a *startle response* to avoid the noise. This would
37 help the mice to avoid the threat and therefore would not cause an impact to the beach mouse
38 within the vicinity of the Proposed Action. Actual noise impact to this species is expected to be
39 minimal. Additionally, USAF (1998) found that current and past Atlas, Titan, or Delta launch
40 programs have not been found to cause animal mortality or significant impacts to wildlife habitat
41 at CCAFS.

1 **Indirect Effect**

2 The proposed operations at SLC-20 would increase traffic slightly in the vicinity of the
3 southeastern beach mouse habitat and could create the opportunity for a take due to road-kill
4 mortality.

5 **Mitigation Measures**

6 As compensation for the potential take of this species as a result of the Proposed Action, Space
7 Florida will conduct beach mouse habitat restoration within a portion of the area shown on Figure
8 4-3. This habitat enhancement will help to provide high quality habitat and a corridor to
9 additional suitable interior habitat.

10 If a dead beach mouse is found at the project site, it would be collected and disposed of in
11 accordance with proper protocols and the USFWS Jacksonville, Florida, office would be notified.



1
2

Figure 4-3 Habitat Enhancement Location Map

4.3.3.3 Eastern Indigo Snake

The Proposed Action would result in the loss of approximately 0.3 acre of undisturbed potential eastern indigo snake habitat in addition to on-site disturbed habitat occupied by gopher tortoises. A take may occur as the result of habitat loss, although adjacent habitat is available. Eastern indigo snakes would also be vulnerable to mortality as a result of injuries sustained during construction activities.

Reptiles and amphibians are sensitive to vibrations, which provide information about approaching predators and prey. Vibration and noise associated with construction activities would elicit a *startle response* to avoid the noise. These impacts would be short-term and would not cause a negative impact to the eastern indigo snake within the vicinity of the project area (USAF 2010). Noise associated with rocket launches may startle many species within the CCAFS area. However, actual noise impact to this species is expected to be minimal. Additionally, USAF (1998) found that current and past Atlas, Titan, or Delta launch programs have not been found to cause animal mortality or significant impacts to wildlife at CCAFS.

Direct Effect

Clearing and construction activities have the potential to result in incidental take of some individuals of eastern indigo snake from disturbance and possible mortality during construction and operation of the Proposed Action. A take may occur as the result of this habitat loss, although adjacent habitat is available. Eastern indigo snakes would also be vulnerable to mortality as a result of injuries sustained during activities such as vegetation clearing and grading and increased vehicular traffic during operation.

The probability and level of incidental take depends on the number of eastern indigo snakes within the region, their ability to disperse, and the amount and distribution of available suitable habitat. As construction begins, this species may move away from the construction site. However, the USFWS expects that a *take* may occur. Incidental take in the form of eastern indigo snake mortality would be avoided through preconstruction surveys and relocation of any individuals present within the boundaries of the work area. Before any land disturbance activities, a 100-percent preconstruction gopher tortoise survey will be completed, and all gopher tortoises captured from burrows that will be impacted will be relocated. Any eastern indigo snakes encountered during gopher tortoise relocation efforts will be safely relocated outside the project area.

Indirect Effect

Indirect effects are expected to occur from increased traffic in and around SLC-20 due to the operation of the facility adjacent to occupied habitat, possibly resulting in indigo snakes being struck by vehicles. Since a portion of their suitable habitat would be impacted by the Proposed Action, the indigo snakes may have to go elsewhere and cause them to cross busy roads, which could result in road-kill mortality.

Mitigation Measures

Mitigation for direct impacts to the eastern indigo snake would help reduce or minimize impacts caused by the Proposed Action. This would be accomplished by presenting the 45 SW Indigo

1 Snake Protection/Education Plan to the tenant and construction contractor personnel.
2 Educational signs would be posted at the site, which will inform personnel of the snake's
3 appearance, protected status, and who to contact if any are spotted in the area. If any indigo
4 snakes are encountered during clearing activities, they would be allowed to safely leave the area
5 on their own. Furthermore, any indigo snakes encountered during gopher tortoise burrow
6 excavation will be safely moved out of the project area. An eastern indigo snake monitoring
7 report would be submitted if any indigo snakes are observed. If a dead indigo snake is found at
8 the project site, it would be disposed of in accordance with proper protocols and the USFWS
9 Jacksonville, Florida, office will be notified.

10 **4.3.3.4 Marine Turtles**

11 The proposed clearing and construction of new facilities would not directly impact the nesting
12 beach. Exterior lighting proposed for the new facilities has the potential to be visible from the
13 beach and could result in adult and/or hatchling disorientation adjacent to SLC-20. However,
14 operation would occur primarily during daylight hours and lighting impacts would be minimized,
15 limited, and regulated by a 45 SW and USFWS approved LMP.

16 Sea turtles are not expected to be affected by vibration and noise associated with construction
17 activities since the project area is west of the beach and dune area. However, noise associated
18 with rocket launches may startle many species within the CCAFS area, but this impact is expected
19 to be minimal. Expected sonic boom noise during a launch in the area is minimal, and the large
20 sonic booms up to 7.4 pounds per square foot (psf) would only occur 30 to 40 miles (48 to 64 km)
21 offshore and would also have no effect. As a result, no significant impacts on marine turtles are
22 expected.

23 **Direct Effect**

24 Clearing and construction of new facilities in association with the Proposed Action would not
25 impact the nesting beach; however, temporary lighting might be needed for construction. A
26 construction LMP would be required if any nighttime work (e.g., concrete pours) is expected
27 during sea turtle nesting season. As previously mentioned, exterior lighting proposed for the new
28 facilities has the potential to be visible from the beach. Lighting visible from the beach can cause
29 adult and hatchling sea turtles to move landward, rather than seaward, which increases the
30 chances of mortality. As a result, disorientation of adult or hatchling sea turtles could result in an
31 indirect take on the adjacent beach. USFWS concurs with the 45 SW's determination that the
32 proposed project *may affect and is likely to adversely affect* the loggerhead, green, leatherback,
33 hawksbill, and Kemp's ridley sea turtles. However, a USFWS- and 45 SW-approved LMP would be
34 prepared for the operation of SLC-20, which should minimize impact to the species of sea turtles
35 that utilize the area.

36 **Indirect Effect**

37 Indirect effects are not expected as a result of the Proposed Action.

38 **Mitigation Measures**

39 To prevent or minimize impacts to sea turtles from facility operational lighting, all exterior
40 lighting proposed for this project would be in accordance with the 45 SWI 32-7001, *Exterior*

1 *Lighting Management*, dated January 25, 2008. Additionally, an LMP would be required for the
2 new facilities before construction. Adherence to an approved LMP would reduce the potential
3 for disorientation. Strict adherence to the plan would be monitored by 45 SW to ensure
4 disorientation is minimized.

5 **4.3.3.5 Gopher Tortoise**

6 The Proposed Action would result in the loss of occupied gopher tortoise habitat and burrows
7 under existing roadways may be impacted due to the increased construction and subsequent
8 operational vehicle traffic. All tortoises that may be impacted would be excavated by FWC-
9 authorized gopher tortoise agents and relocated to an approved gopher tortoise recipient site
10 on CCAFS property in accordance with FWC protocols. Relocation activities on military bases are
11 exempt from FWC permitting and fees in accordance with the FWC Gopher Tortoise Management
12 Plan. Additionally, USAF would include any such relocations in their annual report in accordance
13 with the Gopher Tortoise Candidate Conservation Agreement. The Proposed Action could result
14 in a direct take due to mortality or injuries sustained by heavy equipment.

15 Reptiles and amphibians are sensitive to vibrations, which provide information about
16 approaching predators and prey. Vibration and noise associated with construction activities
17 would potentially cause short-term disturbance to gopher tortoises. These impacts would be
18 short-term and would not cause a significant impact to populations within the vicinity of the
19 project area (USAF 2010). Noise associated with rocket launches may startle many species within
20 the CCAFS area. However, actual noise impact to this species is expected to be minimal.
21 Additionally, regarding current and past launch programs on CCAFS, Atlas, Titan, and Delta
22 launches have been documented to not cause animal mortality or significant impact to wildlife
23 on CCAFS (USAF 1998).

24 **Direct Effect**

25 A tortoise survey documented over 160 burrows in the Proposed Action boundary with a very
26 high concentration adjacent to the access roads that serves Concepts A and B launch pads in the
27 center of the site. The Proposed Action would involve clearing vegetation within proposed
28 construction areas and likely improvements to existing roadways where numerous gopher
29 tortoise burrows are concentrated. As a result, construction and road improvement activities
30 have the potential to cause harm to gopher tortoises. This relocation would help to ensure
31 gopher tortoise survival.

32 **Indirect Effect**

33 Indirect effects could occur from increased traffic in and around SLC-20 due to the operation of
34 the facility adjacent to occupied habitat, possibly resulting in a gopher tortoise being struck by
35 vehicles.

36 **Mitigation Measures**

37 To minimize impacts to gopher tortoises, gopher tortoise burrows will not be disturbed if a
38 minimum of a 25-foot (7.6-m) buffer can remain as well as maintaining connectivity of this

1 buffer to foraging areas in accordance with FFWCC guidelines. No more than 90 days before and
2 no fewer than 72 hours before any clearing or construction, a 100-percent preconstruction
3 survey in accordance with FFWCC guidelines will be conducted to locate and flag/stake all
4 burrows. Tortoises that would be affected by construction or operation related activities would
5 be captured via bucket trappings or burrow excavations in accordance with FWC guidelines and
6 will be relocated to a nearby CCAFS-approved recipient site. CCAFS would include the results of
7 the relocation efforts in their annual monitoring report to FWC as required by their Gopher
8 Tortoise Candidate Conservation Agreement. A map showing the locations of the burrow and
9 their occupancy status if a tortoise was captured will be provided to the construction contractor
10 by the commercial space entity under lease agreement with Space Florida for SLC-20. Educational
11 posters will be provided to construction personnel and future tenet personnel so that they are
12 observant for any tortoises that may enter the construction site or during site operations. Any
13 live or dead tortoises observed will be reported to the 45th Space Wing immediately.

14 **4.3.3.6 Piping Plover**

15 The Proposed Action boundary is 150 feet (45 m) or more west of the Atlantic coast beach areas,
16 which is piping plover habitat. Noise associated with rocket launches may startle many species
17 within the CCAFS area. However, actual noise impact to this species is expected to be minimal.
18 Additionally, USAF (1998) documented that the Atlas, Titan, and Delta launches did not cause
19 animal mortality or significant impact to wildlife on CCAFS. Expected sonic boom noise in the area
20 is minimal, and large sonic booms up to 7.4 psf would only occur beyond 30 to 40 miles (48 to 64
21 km) offshore and would also have no effect to wildlife.

22 **Direct Effect**

23 Direct effects are expected to occur in the form of operational and launch-related noise
24 associated with the Proposed Action. These effects may elicit a *startle* response. However, these
25 effects would likely have a short duration and are not expected to cause lasting negative
26 consequences.

27 **Indirect Effect**

28 No indirect effects are expected.

29 **Mitigation Measures**

30 The Proposed Action would not impact piping plover habitat. Noise effects would be minimal and
31 only cause a *startle* effect. Due to these factors, mitigation would not be required.

32 **4.3.3.7 American Wood Stork**

33 The Proposed Action area does not contain wetland or surface waters that would be used by the
34 American wood stork. Noise associated with rocket launches may startle this species if they were
35 to be found within the CCAFS area. However, actual noise impact to this species is expected to
36 be minimal. As previously stated, studies on current and past launch programs on CCAFS have
37 been documented to not cause animal mortality or significant impact to wildlife on CCAFS (USAF
38 1998). Sonic boom noise may only occur well offshore, and its impact on this species is expected
39 to be minimal.

1 **Direct Effect**

2 Direct effects relating to the American wood stork are expected to be in the form of noise. Noise
3 from site operation and launches are expected to elicit a *startle* response. However, these effects
4 are predicted to be short in duration and are not expected to cause lasting negative
5 consequences.

6 **Indirect Effect**

7 Indirect effects may occur from increased operational traffic coming to and from the SLC-20,
8 possibly resulting in wood storks being struck by vehicles.

9 **Mitigation Measures**

10 No mitigation measures should be necessary since no effect to wood stork foraging or nesting
11 habitat is predicted as a result of the Proposed Action.

12 **4.3.3.8 Red Knot**

13 The Proposed Action would not come within 150 feet or less of the Atlantic coast beach areas,
14 which is red knot habitat. Noise associated with rocket launches may startle many species within
15 the CCAFS area. Actual noise impact to this species is expected to be minimal. Additionally,
16 regarding current and past launch programs on CCAFS, the Atlas, Titan, and Delta launches have
17 been documented to not cause any animal mortality or significant impact to wildlife on CCAFS
18 (USAF 1998). Expected sonic boom noise in the area is minimal, and large sonic boom up to
19 7.4 psf may only occur beyond 30 to 40 miles (48 to 64 km) offshore and would also have no
20 effect on wildlife.

21 **Direct Effect**

22 Direct effects are expected in the form of operational and launch noise associated with the
23 Proposed Action. These effects may elicit a *startle* response. However, these effects will likely
24 have a short duration and are not expected to cause lasting negative consequences.

25 **Indirect Effect**

26 No indirect effects are expected.

27 **Mitigation Measures**

28 No red knot habitat is expected to be impacted as a result of the Proposed Action. Noise effects
29 would be minimal and only cause a *startle* effect. Due to these factors, mitigation is not proposed.

30 **4.3.3.9 West Indian Manatee**

31 The Proposed Action is not likely to have an adverse effect on manatees in the area. Manatees
32 are not expected to be affected by vibration and noise associated with construction and launch
33 activities since they are not in the area continuously and the project area would be west of and
34 beyond the beach and dune area.

35 **Direct Effect**

36 Direct effects are not expected from the Proposed Action.

1 Indirect Effect

2 Indirect effects are not expected from the Proposed Action.

3 Mitigation Measures

4 No mitigation measures should be necessary as no effect is predicted due to the Proposed Action.

5 4.3.3.10 American Alligator

6 The Proposed Action is not likely to negatively impact the American Alligator as no suitable on-
7 site habitat exists. The alligator is not expected to be affected by the vibration and noise
8 associated with construction activities. Noise from construction and post-construction
9 operations may startle individuals that may occur outside the Proposed Action boundary;
10 however, these effects are predicted to be minimal and would not induce long-term
11 consequences. Additionally, regarding current and past launch programs on CCAFS, the Atlas,
12 Titan, and Delta launches have been documented to not cause any animal mortality or significant
13 impact to wildlife on CCAFS (USAF 1998). Expected sonic-boom noise in the area is minimal, and
14 large sonic booms up to 7.4 psf may only occur beyond 30 to 40 miles (48 to 64 km) offshore and
15 would also have no effect.

16 Direct Effect

17 Direct effects are not expected from the Proposed Action as no habitat to support this species
18 occurs within the Proposed Action footprint.

19 Indirect Effect

20 Indirect effects are not expected from the Proposed Action.

21 Mitigation Measures

22 No mitigation measures should be necessary as no effect on this species or its habitat is predicted
23 due to the Proposed Action.

24 4.3.3.11 North Atlantic Right Whale

25 The Proposed Action is not expected to have an impact on right whales in the area, and this
26 species was not specifically mentioned in the BA or in the BO. Whales are not expected to be
27 affected by vibration and noise associated with construction activities since they are not in the
28 area continuously and the project area would be west of and beyond the beach and dune area.
29 However, noise associated with rocket launches may startle individuals in the near-shore area
30 during migration season. However, current and past launch programs on CCAFS have been
31 documented to not cause any animal mortality or significant impact to wildlife on CCAFS (USAF
32 1998). Expected sonic boom noise in the area is minimal and large sonic boom up to 7.4 psf may
33 only occur beyond 30 to 40 miles (48 to 64 km) offshore, which is beyond the typical migration
34 routes of the whale and would therefore have no effect. Launch operations are one of the aspects
35 discussed in ESA Section 7 Consultation between the FAA, NASA, and the National Marine
36 Fisheries Service (NMFS) in 2016 and NMFS concurred with NASA's and the FAA's determinations

1 that launch operations are “not likely to adversely affect listed species and critical habitat under
2 NMFS’s purview.” (Appendix E).

3 **Direct Effect**

4 Direct effects are not expected from the Proposed Action.

5 **Indirect Effect**

6 Indirect effects are not expected from the Proposed Action.

7 **Mitigation Measures**

8 No mitigation measures are proposed as no effect is expected as a result of the Proposed Action.

9 In summary, **minor adverse impacts** to vegetation, wildlife, and listed wildlife species are
10 expected as a result of the Proposed Action.

11 **4.3.3.12 No Action Alternative**

12 Under the No Action Alternative, no changes to the landscape, land, and/or vegetation would
13 occur. Therefore, a **slight positive impact** would be expected due to the CCAFS Natural Resource
14 Program being able to conduct restoration activities within the Proposed Action area. These
15 positive impacts would be expected for the Florida scrub-jay, southeastern beach mouse, eastern
16 indigo snake, gopher tortoises, Florida pine snake, Florida mouse, gopher frog, American
17 alligator, wood stork, piping plover, and red knot. No impact would be expected for any marine
18 turtles or for the North Atlantic right whale.

19 **4.4 CULTURAL RESOURCES**

20 **4.4.1 Proposed Action**

21 A Determination of Eligibility for SLC-20 was prepared by the 45 SW CRM in 2015 and submitted
22 to the Florida SHPO for review. In response, the SHPO sent a letter on April 8, 2015, to the CRM
23 stating the majority of the facilities, including the Control Cableway (BR3151), LH2 Holding Area
24 (BR3152), Retaining Wall (BR3153), Launch Stand and Ramp (BR3154), Payload Assembly Building
25 (BR3156), Facility 15540 – Launch Pad A-BMDO, Facility 15541 – Equipment Building,
26 Facility 156 – Power Center, Facility 15609 – Control Center, Facility 15640 – Launch Pad B –
27 BDMO, Facility 15611 – Equipment Building, Facility 18705 – Warehouse, and Facility 18803 –
28 Guard House, did not meet the criteria for listing on the NRHP. Specific to the Blockhouse
29 (8BR315), the SHPO’s letter stated,

30 *It is the opinion of this office that the Launch Complex 20 Blockhouse (BR3155)*
31 *appears to meet the criteria for listing under Criterion A for Military and C for*
32 *Architecture and Engineering. Although identical historic properties have been*
33 *documented and/or mitigated, blockhouses are very rare and distinctive buildings*
34 *that are increasingly being demolished.*

35 Further, *the reuse of LC-20 or the construction of a new launch complex adjacent to LC-20 may*
36 *constitute an adverse effect on the Blockhouse.* Appendix F provides a copy of that letter.
37 However, regarding the interior of the Blockhouse, substantial alterations to accommodate

1 missions have occurred, and the interior is not important in defining the overall historic character
2 of the building.

3 Under the Proposed Action, the Blockhouse would be used for the same purpose it was
4 historically intended, which is to provide a safe launch facility at the complex for onsite
5 operational managers and technicians. The external structure of the Blockhouse has remained
6 generally intact over the years and major exterior renovations to the structure are not expected
7 under the Proposed Action. Any roof repairs would use materials of similar appearance to the
8 original roof. Removal of vegetative growth in seams on the roof would be required. Any painting
9 of the exterior walls to refresh the building would be performed in a manner that results in the
10 color and texture that is consistent with the appearance of the original structure. Any patching
11 or repair of minor cracks in the exterior walls would also be performed in a way that the
12 appearance of the structure remains true to the original exterior appearance. Due to the fact that
13 the interior of the Blockhouse has been altered substantially for multiple missions since original
14 construction and is not important in defining the overall historic character of the building, no
15 interior features would need to be preserved during renovation of this historic building.

16 In June 2019, the 45 SW CRM performed a Phase 1 cultural resource assessment (CRA) for the
17 entire area included in the Proposed Action. A Technical Memorandum (TM) was prepared that
18 summarized the findings regarding SLC-20 regarding its cultural resource value and
19 determination of whether any of the facilities or cultural resources may be considered eligible
20 for listing in the NRHP. On September 12, 2019, the SHPO concurred with the findings of the CRM
21 that the Proposed Action reuse of the SLC-20 Complex would not result in an adverse effect to
22 its facilities and cultural resource. Further, the intended use of the Blockhouse under the
23 Proposed Action is consistent with the historical nature of that facility and the proposed
24 measures to maintain the historical integrity of the external appearance of the Blockhouse is a
25 beneficial and acceptable mitigating measure for this structure. No other cultural resources,
26 either historical or archaeological, were found during the 2019 CRA. Appendix F contains a copy
27 of the SHPO's 2019 concurrence letter and the SLC-20 TM as well as a 2020 concurrence letter to
28 the Florida State Clearinghouse.

29 Regarding Tribal cultural resources at SLC-20 and noted previously, the Seminole Tribe of Florida
30 and Seminole Nation of Oklahoma verbally stated in 2011 that they have no TCPs on CCAFS.
31 (45 SW CRM personal communication to W. Puckett, September 2019). The 45 SW updated its
32 ICRMP in 2015, which also stated that no TCPs are present at CCAFS. Therefore, no TCPs are
33 expected to be adversely affected by the Proposed Action.

34 In summary, **a negligible adverse to beneficial impact** to cultural resources is expected from the
35 Proposed Action.

36 **4.4.2 No-Action Alternative**

37 Under the No Action Alternative, the reuse of SLC-20 and launch of OLVs would not be
38 implemented. Therefore, no impacts to cultural resources would occur.

4.5 AIR QUALITY

The ROI for air quality includes all of CCAFS and Brevard County. The air-quality impacts analyzed are those that occur at altitudes of 914 m (3,000 feet) or less, where NAAQS would be applicable. USEPA has accepted this height as the nominal height of the atmospheric mixing layer for assessing contributions from launch emissions to ground-level ambient-air quality under the Clean Air Act (CAA) (USEPA 1992). Brevard County is in attainment for all criteria pollutants; therefore, the General Conformity rule does not apply. For this EA, impacts to air quality would be considered significant if the Proposed Action resulted in one or more of the NAAQS being exceeded (FAA Order 1050.1F), or increased the frequency or severity of any such existing violations. Further, with respect to stationary sources, air emissions would be considered minor if the Proposed Action did not exceed an increase of 250 tons per year of any criteria pollutant (e.g., CO). USEPA uses this value in its New Source Review standards as an indication for impact analysis for new source stationary sources in areas that are in attainment with the NAAQS. USEPA does not have a similar regulatory threshold for mobile sources such as launch vehicles.

Air emissions from the Proposed Action would result from construction activities, pre-launch site operations, and launch operations from SLC-20.

4.5.1 Proposed Action

This section discusses the expected air-quality impacts from criteria pollutants, hazardous air pollutants (HAPs), and GHG-emissions from the Proposed Action. The CEQ-issued NEPA guidance for considering the effects of climate change and GHG emissions was withdrawn on March 28, 2017. CEQ subsequently issued draft guidance on this topic in 2019 (CEQ 2019). There are currently no accepted methods of determining significance applicable to commercial space launch projects given the small percentage of emissions they contribute. There is a considerable amount of ongoing scientific research to improve understanding of global climate change and FAA guidance will evolve as the science matures or if new federal requirements are established.

4.5.1.1 Construction

Construction-related impacts to air quality would occur from minor increases in particulate matter (PM) due to facility renovations, limited demolition, clearing, grading, movement of construction vehicles, and short-term generator use. Fossil-fueled vehicles and equipment would release carbon dioxide (CO₂), carbon monoxide (CO), nitrous oxide (NO_x), and hydrocarbons into the ambient air during the approximately 18 months of construction. These releases of air pollutants would be relatively minor and are not expected to result in any exceedance for any of the criteria pollutants listed in the NAAQS. Therefore, there would be **negligible adverse impacts** to air quality resulting from construction activities under the Proposed Action.

4.5.1.2 Operations

Airspace closures associated with launches would result in additional aircraft emissions primarily from aircraft being re-routed and subsequently expending additional fuel. However, emissions from aircraft being re-routed would occur above 3,000 feet (914 m) (the mixing layer) where NAAQS would not be applicable; therefore, no impact to air quality would occur from aircraft re-routing from airspace closures.

1 With regards to departure delays, airspace-related impacts could increase up to a maximum of
2 24 times per year; however, given that Brevard County is in attainment for all criteria pollutants,
3 only a negligible amount of emissions would be generated from any aircraft departure delays
4 associated with launches at CCAFS and KSC. Therefore, any air emissions increase from departure
5 delays are not expected to result in an exceedance of a National Ambient Air Quality Standard
6 for any criteria pollutant. Emissions from aircraft being re-routed would occur above 3,000 feet
7 (914 m) (the mixing layer) and thus would not affect ambient air quality. Therefore, airspace
8 closures associated with launches are **not expected to result in significant air quality impacts**.

9 Daily operations and prelaunch activities, such as ground support operations and refueling
10 operations, are expected to generate PM, volatile organic compounds (VOCs), NO_x, sulfur oxides
11 (SO_x), HAPs, CO₂, and CO from a variety of sources including on-site traffic, mobile equipment
12 emissions, surface-coating applications, ground-support equipment, maintenance painting, *de*
13 *minimis* fugitive emissions from liquid fuels storage and transfer, and diesel fuel use. The
14 relatively small emissions associated with ground support operations or refueling operations
15 would have **negligible impacts** to air quality, especially given Brevard County is in attainment for
16 all criteria pollutants.

17 With regards to engine testing, static-fire tests may be conducted at the launch site, where the
18 vehicle is fully fueled and the engine ignited and run for up to 5 seconds as a thorough test of all
19 systems. Static-fire tests may be discontinued as the program matures. In addition, two-stage
20 acceptance testing would occur at SLC-20 approximately once or twice per month. Stage 1 would
21 occur with four Reaver engines for 30 seconds, and Stage 2 would occur with one lighting engine
22 for 60 seconds for each test. This limited testing would also have little impacts in an area that
23 presently meets air quality standards. No NAAQS exceedances during operations are expected
24 and **minor adverse impacts** to existing air emissions on CCAFS would occur from the
25 implementation of the Proposed Action.

26 **4.5.1.3 Launch Vehicles**

27 The launch vehicles are considered mobile sources and are not subject to air-permitting
28 requirements. The Concept A and B vehicles use RP-1 and LOX as propellants; additionally,
29 Concept B variants 2 and 3 use RP-1, LOX, and LCH₄. The primary emission products from these
30 propellants include CO₂, CO, water vapor, and small amounts of NO_x and PM. Nearly all the
31 emitted CO oxidizes rapidly to CO₂ during afterburn in the exhaust plume, which would then be
32 dispersed in the atmosphere and have no impact on air quality. The only pollutant not converted
33 is NO_x (FAA 2020a).

34 The proposed engines to be used at SLC-20 under the real property transfer are currently evolving
35 and the “envelope concept” is applied in this EA. The envelope concept facilitates the
36 environmental analysis process by providing a threshold, below which, if not exceeded under a
37 worst-case scenario for the Proposed Action due to previous NEPA analysis of similar engines,
38 further in-depth NEPA analysis is not needed. For the purposes of this EA, the analysis
39 documented by the FAA (2020a) for the SpaceX Falcon and Falcon Heavy Program is used as the
40 envelope concept and is hereby incorporated by reference.

1 Under the Proposed Action, the maximum propellant scenario involving LOX/RP-1 for Concept A
2 or Concept B is the Beta Variant 1 Combined Vehicle with a maximum propellant quantity of
3 435,000 lbs (197,312 kg). In FAA (2020a), it was documented that the Falcon 9 and Falcon Heavy
4 launch vehicles use Merlin engines and the propellants for both are LOX and RP-1. The combined
5 total propellant for the Falcon 9 engine is 1,135,925 lbs (515,247 kg), and the combined total
6 propellant for the Falcon Heavy is 2,937,950 lbs (1,332,632 kg) (FAA 2020a).

7 In FAA (2020a), air emissions were calculated for all 9 engines for the Falcon 9 and 27 engines for
8 the Falcon Heavy. Since the Falcon liquid engines use RP-1 and LOX, the analysis documented in
9 FAA (2020a) is hereby incorporated by reference as it is considered a comparable approach for
10 estimating the potential impacts to air quality from the proposed Concept A and B vehicles. The
11 launch of the Falcon 9 would be expected to reach the upper limit of the mixing area (i.e., 3,000
12 feet (914 m)) within 23 seconds, and the Falcon Heaving within 21 seconds (FAA 2020a). As stated
13 previously, since nearly all the emitted CO oxidizes rapidly to CO₂ during afterburn in the exhaust
14 plume, the only pollutant not converted is NO_x. For the maximum launch frequency of 60 Falcon
15 9 launches per year, the Falcon 9 would emit approximately 6.5 tons of NO_x per year. Further,
16 for the maximum launch frequency of 10 Falcon Heavy launches per year, the Falcon Heavy would
17 emit approximately 3.0 tons of NO_x per year (FAA 2020a). Therefore, the NO_x emissions from a
18 combined 70 Falcon 9 and Falcon Heavy launches would be less than 10 tons per year. In addition
19 to the air emission estimates documented in FAA (2020a), launch vehicles would accelerate
20 rapidly and the high temperatures of the exhaust products will cause their air emissions to rise
21 quickly and disperse with the prevailing winds. Since the potential NO_x emissions from the Merlin
22 engines is less than 10 tons per year, it is reasonable to assume NO_x emissions from the Concept
23 A and B engines would be less than 10 tons per year. Therefore, operation of launch vehicles is
24 expected to have a minor adverse impact on air quality.

29 4.5.2 No-Action Alternative

30 Under the No Action Alternative, neither Concept A nor Concept B would be implemented and
31 no new construction would occur to support them and no launch operations would occur.
32 Accordingly, **no impacts** to air quality would occur under the No Action Alternative.

33 4.6 CLIMATE

34 4.6.1 Proposed Action

35 There are currently no quantities or thresholds of GHG emissions established by USAF that would
36 be considered *significant* relating to potential impacts to human health or the environment.
37 According to FAA (2015), *There are no significance thresholds for aviation or commercial space*
38 *launch GHG emissions, and it is not currently useful for the NEPA analysis to attempt to link*
39 *specific climate impacts to the proposed action or alternative(s) given the small percentage of*
40 *emissions aviation and commercial space launch projects contribute.* Furthermore, in June 2019,
41 CEQ issued a revised draft memorandum for National Environmental Policy Act Guidance on
42 Consideration of Greenhouse Gas Emissions. (This new draft replaced the previously issued final
43 guidance issued August 1, 2016.) This new guidance states:

1 *Under CEQ regulations and the ‘rule of reason’ that bounds all NEPA analysis,*
2 *impacts of a proposed action should be discussed in proportion to their*
3 *significance, and there should only be brief discussion of issues that are not*
4 *significant. As with all NEPA analyses, the rule of reason permits agencies to use*
5 *their expertise and experience to decide how and to what degree to analyze*
6 *particular effects. Agencies preparing NEPA analyses need not give greater*
7 *consideration to potential effects from GHG emissions than to other potential*
8 *effects on the human environment” (CEQ 2019).*

9 Emissions of GHGs and Ozone Depleting Substances (ODS) are of concern in the upper
10 atmosphere. The stratosphere begins just above the troposphere and extends to 31 miles (50 km)
11 high and contains the ozone layer. The mesosphere starts above the stratosphere and extends
12 to 53 miles (985 km) high. The ionosphere stretches from about 30 miles (48 km) above the
13 Earth’s surface to the edge of space at about 600 miles (965 km). The potential emissions that
14 may affect global climate change directly include CO₂, oxygen (H₂O), and carbon particles (a
15 component of PM). In addition, CO and NO_x can influence the creation and destruction of GHGs.

16 According to the United Nations 2018 Quadrennial Global Ozone Assessment, rocket launches
17 have a small effect (much less than 0.1 percent) on total stratospheric ozone (World
18 Meteorological Organization [WMO] 2018). The contribution of emissions from implementation
19 of the Proposed Action would be similar to those documented in other recent NEPA documents.
20 Specifically, the emissions would be small and are considered having a negligible impact on global
21 climate change.

22 Airspace closures associated with launches would result in additional aircraft emissions mainly
23 from aircraft being re-routed and expending more fuel. These emissions include carbon dioxide
24 (CO₂), which is a GHG. Based on Space Florida’s proposal, airspace-related impacts could increase
25 up to a maximum of 24 times per year. The amount of time that affected aircraft spend being re-
26 routed would be short-term. In addition, the number of aircraft that would be impacted per
27 launch would not be expected to produce additional emissions that would have a notable impact
28 on climate. Therefore, the increases in GHGs caused by short-term airspace closures during
29 launches is not expected to result in significant climate-related impacts.

30 Using the envelope concept discussed in Section 4.5, with regards to GHG emissions associated
31 with launches, FAA (2020a) estimated the amount of GHG emissions generated from a maximum
32 of 60 Falcon 9 and 10 Falcon Heavy launches per year is 34,839 metric tons of CO₂e. The total
33 GHG emissions are a fraction of global and U.S. CO₂e emissions. The propulsion systems used by
34 the Falcon 9 and Falcon Heavy emit a variety of gases and particles directly into the stratosphere,
35 including CO₂, water vapor, NO_x, and soot (carbon). Moreover, a large fraction of these emissions
36 is chemically inert and do not affect ozone levels directly. Other low reactive emissions, such as
37 H₂O, have an impact on ozone globally since they react with ozone destroying gases known as
38 radicals. A small fraction of rocket engine emissions are highly reactive radical compounds that
39 attack and deplete ozone in the plume wake immediately following launch. Particulate emissions,
40 such as carbon (soot), may also be reactive in enabling important reactions that would not
41 proceed otherwise. These emissions are a small fraction of the total emissions and are below the
42 CO₂e emissions described above.

1 The scientific community is continuing efforts to better understand the impact of aviation
2 emissions on the global atmosphere. The FAA is leading and participating in a number of
3 initiatives intended to clarify the role that commercial aviation plays in GHG emissions and
4 climate. The FAA, with support from the U.S. Global Change Research Program and its
5 participating federal agencies, has developed the Aviation Climate Change Research Initiative in
6 an effort to advance scientific understanding of regional and global climate impacts of aircraft
7 emissions.

8 Given the above guidance by the FAA and CEQ, and the analysis documented in FAA (2020a), the
9 Proposed Action would **result in negligible adverse impact** to climate.

10 **4.6.2 No-Action Alternative**

11 Under the No Action Alternative, the reuse of SLC-20 and launch of OLVs would not be
12 implemented. Therefore, no impacts to climate would occur.

13 **4.7 HAZARDOUS MATERIALS, HAZARDOUS WASTE, AND SOLID WASTE**

14 Specific to this EA, a project may result in a significant impact from hazardous materials/
15 hazardous waste if it increases the potential for exposure to hazardous materials/waste or
16 increases the likelihood of a hazardous materials release to the environment. Impacts on
17 hazardous materials and waste management would also be considered significant if they resulted
18 in noncompliance with applicable regulatory guidelines or increased the amounts generated
19 beyond available waste management capacity.

20 **4.7.1 Proposed Action**

21 The Proposed Action would not be expected to result in significant impacts due to hazardous
22 materials and solid waste. If contaminated soils are determined to be present at SLC-20, all
23 construction debris, root balls, etc. determined to contain contaminated soils above regulatory
24 thresholds will be retained on site or would be handled and disposed of in accordance with the
25 requirements established by Resource Conservation and Recovery Act (RCRA) and OSHA
26 (Hazardous Materials) and transported in accordance with DOT regulations for shipping
27 hazardous substances. Space Florida's tenant(s) would develop a Hazardous Materials
28 Contingency Plan and develop and implement proper handling procedures for any payloads
29 containing hypergolic fuels or liquid rocket propellant. Changes in quantities of fuel would be
30 addressed by revising required procedures appropriately. All applicable federal, state, and local
31 rules and regulations would continue to be followed for the proper storage, handling, and usage
32 of hazardous materials by Space Florida's tenant(s) launch program. Therefore, **negligible
33 adverse impacts** due to hazardous materials management would occur under the Proposed
34 Action.

35 The approximate quantities of materials that would be used during processing of a routine
36 payload spacecraft would remain the same as for other similar launch vehicles and operations.

37 **Space Vehicle Processing Hazardous Waste Production**

38 The hazardous materials used to process routine payload spacecraft could potentially generate
39 hazardous waste. Space Florida's tenant(s) would conduct operations with hazardous waste in
40 accordance with existing requirements. Class I ODSs would not be allowed to be used in the

1 payload processing facilities. The approximate quantities of materials that would be used during
2 processing of a routine payload mission would remain the same as for other similar launch
3 vehicles.

4 Solid waste would be expected to increase slightly with increased launch activities. The amount
5 of solid waste generated would still be handled under existing collection and disposal operations.
6 Space Florida's tenant(s) would develop a Pollution Prevention Management Plan, in
7 coordination with CCAFS pollution prevention plans and goals, and comply with all federal, state,
8 and local regulations. Space Florida's tenant(s) would track the usage of all Environmental
9 Planning and Community Right-to-Know Act (EPRCA)-listed chemicals and report emissions to the
10 responsible government organization at CCAFS. Therefore, **negligible adverse impacts** due to
11 space vehicle hazardous waste production would occur under the Proposed Action.

12 **4.7.2 No-Action Alternative**

13 Under the No-Action Alternative, the Space Florida launch program would not be implemented;
14 therefore, **no impacts** on hazardous materials or hazardous waste management would occur.

15 **4.8 WATER RESOURCES**

16 Specific to this EA, a project may have a significant impact on water resources if it substantially
17 affects a significant water body, such as an ocean, stream, lake, wetland, or bay; causes
18 substantial flooding or exposes people to reasonably foreseeable hydrologic hazards such as
19 flooding; substantially affects surface or groundwater quality or quantity; or exceeds the existing
20 potable water or wastewater system capacities for CCAFS.

21 This section presents the potential effects to surface-water and groundwater, (including
22 hydrology and water quality), wetlands, and floodplains resulting from implementation of the
23 Proposed Action and the No Action Alternative. The FAA has established the following
24 significance thresholds for water resources:

- 25 • **Surface Waters** – The action would:
 - 26 ○ Exceed water quality standards established by federal, state, local, and tribal regulatory
 - 27 agencies; or
 - 28 ○ Contaminate public drinking water supply such that public health may be adversely
 - 29 affected.
- 30 • **Groundwater** – The action would:
 - 31 ○ Exceed groundwater quality standards established by federal, state, local, and tribal
 - 32 regulatory agencies; or
 - 33 ○ Contaminate an aquifer used for public water supply such that public health may be
 - 34 adversely affected.
- 35 • **Wetlands** – The action would:
 - 36 ○ Adversely affect a wetland's function to protect the quality or quantity of municipal water
 - 37 supplies, including surface waters and sole source and other aquifers;
 - 38 ○ Substantially alter the hydrology needed to sustain the affected wetland system's values
 - 39 and functions or those of a wetland to which it is connected;

- 1 ○ Substantially reduce the affected wetland’s ability to retain floodwaters or storm runoff,
2 thereby threatening public health, safety or welfare (the term welfare includes cultural,
3 recreational, and scientific resources or property important to the public);
- 4 ○ Adversely affect the maintenance of natural systems supporting wildlife and fish habitat
5 or economically important timber, food, or fiber resources of the affected or surrounding
6 wetlands;
- 7 ○ Promote development of secondary activities or services that would cause the
8 circumstances listed above to occur; or
- 9 ○ Be inconsistent with applicable state wetland strategies.
- 10 ● **Floodplains** – The action would cause notable adverse impacts on natural and beneficial
11 floodplain values. Natural and beneficial floodplain values are defined in Paragraph 4.k of
12 DOT Order 5650.2, *Floodplain Management and Protection*.

13 **4.8.1 Proposed Action**

14 **Surface Waters**

15 The engine testing and launch operations associated with the Proposed Action are not expected
16 to have any effect on the IRL and BRL due to distance. While the proposed launch vehicle
17 transportation route does pass over the IRL, no impacts are expected as a result of this activity.

18 The Proposed Action area has been previously disturbed as a result of grading and facility
19 construction. As a result, natural drainage patterns no longer exist. The Proposed Action would
20 not directly impact water resources in or adjacent to SLC-20 or around CCAFS. Only a small
21 0.19-acre man-made upland cut drainage swale exists within the Proposed Action boundary that
22 would likely remain.

23 The Proposed Action site development plan would be designed and require an ERP from the
24 SJRWMD with the 45 SW as co-applicant before construction can commence. A stormwater
25 management system would be required to treat stormwater runoff from new proposed
26 impervious surface construction at the launch site. The construction of new impervious surfaces
27 (buildings, roads, etc.) in association with the Proposed Action renovation and repurpose of the
28 SLC-20 area would require State permits that will require a stormwater management system
29 (SMS) to treat and store stormwater based on the proposed site development. This SMS would
30 store and treat stormwater generated from site improvements and will be operated and
31 maintained by Space Florida or the tenant. The SMS would store and filter much of the suspended
32 solids out of the water percolating into the ground, and biological and chemical processes in the
33 SMS would reduce the amount of contaminants found in runoff and minimize pollutants that
34 infiltrate into the water table. Stormwater would infiltrate into the surficial aquifer and not be
35 discharged to downstream surface waters. In addition, a Stormwater Erosion and Pollution
36 Prevention Plan (SWPPP) would be required to address sedimentation and erosion to protect
37 water quality before, during, and after construction. Since the disturbed area is greater than 1
38 acre, a National Pollutant Discharge Elimination System (NPDES) Stormwater Construction Permit
39 would be required by FDEP and a SWPPP would be implemented. These permit review and
40 issuance processes ensure that the design complies with current and applicable stormwater and
41 wastewater regulations, and is protective of wetlands and surface waters.

1 Under the Proposed Action, launch deluge wastewater generated by engine testing and launch
2 operations would be contained in new, separate deluge (impermeable concrete) basins.
3 Collected water would be tested, then released to the stormwater retention basins or may be
4 reused and pumped back to the storage tank. Any discharge to the ground surface would require
5 an Industrial Waste Water permit from FDEP and require coordination with 45 SW CES/CEIE. A
6 No Exposure Certification for exclusion from NPDES stormwater permitting would also be
7 required. Space Florida would continue discussions with FDEP and pursue all required permitting
8 for stormwater discharge associated with industrial activity. In addition, SJRWMD ERP #75436 is
9 at the proposed location of the Concept A Pad and the Deluge Containment. Coordination with
10 45 SW CES/CEIE would occur to modify the permit as needed. With an approximate deluge basin
11 capacity of 45,000 gallons (170,344 L), inadvertent discharge of deluge wastewater from the
12 basin is highly unlikely before testing and controlled discharge to stormwater retention basins.

13 The intermittent drainage from SLC-20 could be affected by the exhaust cloud that would form
14 near the launch pad at liftoff as a result of the exhaust plume and evaporation and subsequent
15 condensation of deluge water. Since the Concept A and B launch vehicles use only LOX, RP-1, and
16 LNG propellants, the exhaust cloud would consist of steam only and would not contain any
17 significant amounts of hazardous materials. The resulting volume of water condensing from the
18 exhaust cloud is expected to be minimal and temporary. Therefore, the Proposed Action is
19 anticipated to result in **negligible adverse impacts** on surface water quality at SLC-20 and
20 surrounding areas.

21 **Groundwater**

22 Neither the Proposed Action nor the No Action Alternative use groundwater for any purpose.
23 Potable water would be supplied by the existing water distribution systems at CCAFS and the
24 Proposed Action would have **no adverse impacts** on system capacity or groundwater resources.

25 **Wetlands**

26 No USACE or SJRWMD jurisdictional wetlands occur within the Proposed Action site and
27 therefore **no impacts** to this resource category are expected.

28 **Floodplains**

29 No floodplains occur within the Proposed Action site and therefore **no adverse impacts** to this
30 resource category are expected. Furthermore, the Proposed Action would not result in new areas
31 being subject to 100-year floods nor would it result in existing areas subject to 100-year floods
32 becoming more flood-prone.

33 **4.8.2 No-Action Alternative**

34 Under the No-Action Alternative, the reuse of SLC-20 and launch of OLVs would not be
35 implemented. Therefore, **no impacts** on hydrology, water quality, or floodplains would occur.

36 **4.9 GEOLOGY AND SOILS**

37 Specific to this EA, a project may result in a significant geologic impact if it increases the likelihood
38 of, or results in exposure to, foundation instability, land subsidence, or other severe geologic
39 hazards. It may also be considered a significant geologic impact if it results in the loss of soil use

1 for agriculture or habitat, loss of aesthetic value from a unique landform, loss of mineral
2 resources, or causes severe erosion or sedimentation.

3 **4.9.1 Proposed Action**

4 The Proposed Action is not expected to impact geology and soils. No unique geologic features of
5 exceptional interest or mineral resources occur in the Proposed Action area. Contaminated
6 sediments have recently been removed, which is documented in an EBS (GEAR 2019). As a result,
7 **negligible adverse impacts** to geology or soils is expected.

8 Operation of the Proposed Action would not affect geology or soils at or near SLC-20. Therefore,
9 **no adverse impacts** on these resources is expected as a result of the operation of the Proposed
10 Action.

11 **4.9.2 No-Action Alternative**

12 Under the No-Action Alternative, the reuse of SLC-20 and launch of OLVs would not be
13 implemented; therefore, no impacts on geology and soils would occur.

14 **4.10 TRANSPORTATION**

15 This section discusses the projected traffic conditions along roadways that may be affected by
16 the Proposed Action.

17 **4.10.1 Proposed Action**

18 The Proposed Action may impact transportation, and an evaluation of current pavement
19 conditions and related infrastructure should be undertaken to assess any changes to roadway
20 structural capacities before any launch vehicle transports. Since the existing transport routes
21 expected to be used were designed to FDOT design standards, no adverse impacts are expected
22 as transport loads are expected to stay within legal limits. Staying within legal load limits would
23 be achieved by using transport vehicles that distribute points load to those below HS-20 design
24 vehicle loads. KSC provided concurrence stating *there are no issues with the transportation route*
25 *relative to the planned transport and cargo. The vehicle weight and type is within the design*
26 *parameters of the roadway, and in general the vehicle and cargo is typical to those FDOT*
27 *roadways (Appendix G). However, Space Florida tenant(s) would be required to obtain a Permit*
28 *for Overweight/Oversize Roadway Vehicle at KSC* when the Firefly program is ready to begin
29 transporting launch vehicles to SLC-20. Correspondence with CCAFS is also provided in
30 Appendix G.

31 Each transported load would require a slower than posed speed, and in some areas counterflow
32 traffic would need to be blocked and/or re-routed. To reduce any slow-pace traffic effects,
33 vehicle transport would be scheduled in *off-hours* and would avoid peak-flow periods, generally
34 from 6:00 to 9:00 AM and from 3:30 to 5:30 PM. Shipment of these components to CCAFS and to
35 the site would occur no more than 24 times a year. As a result, the Proposed Action would have
36 no significant impacts on traffic in the region.

37 Traffic volume increases for Proposed Action launches would be expected, but initially are
38 expected to be less than that of a Shuttle launch. In addition, Space Florida tenant(s) would
39 continue to coordinate transportation planning through the appropriate 45 SW and NASA KSC

1 channels, including Cape Support and the KSC Center Planning Office and Construction of
2 Facilities office to minimize transportation operational impacts. Therefore, **negligible adverse**
3 **impacts** to transportation are expected as a result of the construction and **minor adverse impacts**
4 as a result of the operation of the Proposed Action.

5 **4.10.2 No-Action Alternative**

6 Under the No-Action Alternative, the reuse of SLC-20 and launch of OLVs would not be
7 implemented. Space Florida tenant(s) would not need to transport equipment from Exploration
8 Park to SLC-20 nor launch their vehicles from SLC-20. Therefore, no impacts on transportation
9 would occur.

10 **4.11 UTILITIES**

11 Utility systems evaluated include water (potable and fire protection), wastewater (collection and
12 treatment), electrical supply, and solid waste. Each utility capability was evaluated on the basis
13 of the ability to provide service to CCAFS and to the individual operational launch pad sites such
14 as SLC-20. Attributes considered include processing, distribution/storage capacities, and related
15 factors, such as average daily consumption and projected peak demand. Historic and projected
16 utility use was determined from records of purveyors, regulatory compliance reports, and the
17 application of generally accepted average growth rates.

18 Specific to this EA, a project may have a significant impact on the water distribution or supply
19 system, wastewater collection or treatment system, solid waste management, and electrical
20 supply system if it substantially affects the capacity of the systems to maintain existing services,
21 substantially affects surface or groundwater quality or quantity, or exceeds the existing potable
22 water or wastewater system capacities for CCAFS. Several state permits may be required based
23 on the final required utility level of service as stated by the July 1, 2020 correspondence with the
24 Florida State Clearinghouse (Appendix H). Proposed Action

25 **Water Distribution and Supply**

26 The potable and non-potable water supply SLC-20 would support the testing of various engines;
27 onsite infrastructure improvements would also be completed to ensure adequate water
28 requirements are met to accommodate up to 45 people. Based on available information,
29 domestic water service to accommodate this demand is estimated to be approximately 1,500 to
30 2,000 (gal/d) (5,678 to 7,570 L/d) during peak launch operations with the full complement of
31 45 people present at the site. However, these demands and the adequacy of existing systems
32 would be confirmed upon design development. Currently, 12-inch onsite combined water and
33 fire protection lines serve the facility. The Space Florida launch program's dependence on the
34 water supply would be relatively small and therefore would have **negligible adverse impact**.

35 **Wastewater Collection or Treatment**

36 The wastewater collection and treatment capabilities for operation at SLC-20 were designed to
37 support portions of the Atlas program. Space Florida would reconnect and rehabilitate SLC-20 to
38 the onsite septic tanks. Wastewater collection and treatment for any launch event would be
39 approximately equal to past events. Based on available information, the domestic sanitary
40 service is estimated to be 1,200 to 1,700 gal/d (4,542 to 6,435 L/d) during peak launch operations

1 with the full complement of 45 people present at the site. However, these demands and the
2 adequacy of existing systems would be confirmed upon design development. Sewer service is
3 provided via four onsite septic systems and drain fields. Initially, minor maintenance and
4 renovation of these septic systems may be required for initial operations. However, if offsite
5 sanitary collection services become available along ICBM Road, an onsite lift station, force main,
6 and sewer service lines may be installed to connect to the offsite system. Any future industrial
7 wastewater permits would be obtained by the commercial launch operator with Space Florida
8 for onsite treatment or USAF for transmission to and treatment at the CCAFS WWTP.

9 Wastewater needs for SLC-20 would have **negligible adverse impact** on available septic tank
10 capabilities or for a future connection to the CCAFS WWTP for the Proposed Action.

11 **Electrical Power**

12 The electrical power capabilities for operation at SLC-20 were designed to support portions of
13 the Atlas program. SLC-20 is currently connected to the electrical supply system. Based on
14 available information, an assumed build-out load of 2,000 to 2,700 kilowatts (kW) would be
15 required for the central pad (Alpha and Beta). Of this load, approximately 750 kW of load would
16 be considered critical load and would be supported with on-site backup diesel-powered
17 generators. This power usage during normal operation and in support of any launch event would
18 be approximately equal or slightly greater than past events.

19 On-site standby power would also be required using standby diesel generators to accommodate
20 critical systems. A minimum of 3 days' worth of diesel fuel storage (3,000 gal/ 11,356 L) would be
21 required to account for extended storm outages. As discussed with CCAFS personnel, needs for
22 SLC-20 would result in a **negligible adverse impact** on available electrical power capabilities for
23 the Proposed Action.

24 **Natural Resources and Energy Supply**

25 As previously stated, launch complexes on CCAFS draw required electrical power from the City of
26 Cocoa. No new energy supply expansion to those existing power sources would be required to
27 support the Proposed Action and thus **negligible adverse impacts** to natural resources are
28 expected from the construction and operation of SLC-20.

29 **Solid Waste Management**

30 Specific to this EA, impacts on solid waste would be considered significant if they resulted in
31 noncompliance with applicable regulatory guidelines or increased the amounts generated
32 beyond available waste management capacities. Operation of the Evolved Expendable Launch
33 Vehicle (EELV) Program was expected to generate approximately 0.3 ton of solid waste per day
34 (USAF 1998). Operation of the Proposed Action is expected to generate less solid waste than the
35 EELV Program. The Proposed Action is not expected to increase solid waste; therefore, the it
36 would generate **negligible adverse impacts** on solid waste. Space Florida would also develop
37 pollution prevention measures and recycling programs that would reduce overall waste.

38 **4.11.1 No-Action Alternative**

39 Under the No-Action Alternative, the reuse of SLC-20 and launch of OLVs would not be
40 implemented; therefore, **no impacts** on utility systems would occur.

1 **4.12 HEALTH AND SAFETY**

2 Any commercial space firm which enters into a Real Property Agreement with Space Florida is
3 responsible for protecting worker health and safety in accordance with OSHA regulations found
4 in 29 CFR 1926, Safety and Health Regulations During Construction. Specific to this EA, a health
5 and safety impact would be considered significant if the Proposed Action created a substantial
6 or potential hazard to personnel or the general public.

7 **4.12.1 Proposed Action**

8 **Construction**

9 On-site facilities will be reviewed for potential hazards at a future date, and Space Florida
10 tenant(s) will work with 45 SW to ensure safety compliance. A project-specific health and safety
11 plan would be developed before any construction activity. In general, health and safety plans
12 identify potential health and safety hazards, fall protection associated with cranes or platforms,
13 electrical hazards, mechanized equipment and hand and power tools risks; define fire and rescue
14 protection and prevention including water safety; outline safety inspections; establish safety
15 equipment requirements such as personal protective equipment, lighting, signs, and barricades;
16 designate materials containment, including handling, storage, use, and disposal processes; and
17 provide necessary training and communication to ensure the safety of construction workers,
18 working personnel, and visitors. In addition, all construction activities would be conducted in
19 accordance with OSHA regulations and the 45 SW safety program. Therefore, implementation of
20 the Proposed Action would have **negligible adverse impacts** to health and safety.

21 **Operations**

22 As described in Section 3.12, AFSPCI 91-701, *Launch and Range Safety Program Policy and*
23 *Requirements*, and AFSPCMAN 91-710, *Range Safety User Requirements Manual*, provide
24 common requirements for all vehicle classes to ensure operations are conducted safely (Eastern
25 and Western Range [EWR] AFSPCMAN 91-710V2, 2017). The Proposed Action launch providers
26 will be compliant with AFSPCMAN 91-710, which specifies that all facilities, including launch
27 complexes, used to store, handle, or process ordnance or propellants shall be properly sited and
28 approved in accordance with DoD quantity distance criteria and explosive safety standards
29 specified in DoD 6055.9-STD and implemented in Air Force Manual 91-201. The range users are
30 required to submit documentation before use, to include an Operations Safety Plan, Danger Area
31 Information Plan, and Facility Emergency Operating Plan.

32 The 45 SW Wing Safety office will review, approve, and monitor all prelaunch and launch
33 operations conducted at SLC-20 under the Proposed Action and will impose safety holds if
34 necessary. The intent of a safety hold is to ensure that there are no hazards that are exposed to
35 the public, launch base, launch area, launch complex and range assets greater than those
36 considered to be acceptable by military regulations, state requirements, or public law. These
37 references include, but are not limited to, 42 USC, Chapter 116 Emergency Planning and
38 Community Right to Know; 29 CFR Part 1910.119, Process Safety Management of Highly
39 Hazardous Chemicals; 40 CFR Part 355, Emergency Planning and Notification; 40 CFR Part 68,
40 Subpart G, Risk Management Plan; and Executive Order 12856, Federal Compliance with Right-
41 to-Know Laws and Pollution Prevention Requirements. (AFSPCMAN 2016)

1 The commercial space firm using SLC-20 will be required to coordinate its planned launch
2 schedule with the 45 SW Wing Safety to ensure proper notification of the FAA to allow air traffic
3 control hazard avoidance as well as coordination with the US Coast Guard for timely notification
4 of ship traffic potentially at risk due to overflight scenarios.

5 Impact debris corridors for launch vehicles would be similar to those regularly established for
6 launch vehicles previously launched from SLC-20 and other CCAFS launch complexes. Debris data
7 developed for other vehicles in compliance with AFSPCMAN 91-710 also satisfies FAA
8 requirements. Impact debris corridors would be established off the coast of Brevard County,
9 Florida to meet security requirements and reduce the hazard to persons and property similar to
10 a launch-related activity. Structure heights of the Proposed Action lightning protection
11 system would be designed to avoid impacts on airfield (Skid Strip [KXMR]) operations.

12 A common safety practice is to establish restricted-access hazard arcs around the facilities where
13 potentially dangerous explosive materials are present. The purpose of defining these safety arcs,
14 known as an Explosive Quantity-Distance Safety Arc, is to separate the hazardous procedures
15 from other operations and from the general public. For example, regarding launch pads and
16 launch vehicles, before a launch vehicle is erected on a launch pad, a hazard arc is calculated
17 based on the potential hazards of that vehicle (e.g., the types and quantities of propellant
18 onboard, rocket reliability, flight trajectory, and types of debris expected if the flight were
19 terminated) is activated around the launch pad. Operational controls (e.g., evacuation areas,
20 temporary road closures) are established within and at the perimeter of the hazard arc to
21 minimize the potential hazards associated with the operations of the launch range. All payload
22 processing and launch facilities used to store, handle, or process ordnance items or propellants
23 must have an Explosive Quantity-Distance Site Plan. Figure 4-4 and Figure 4-5 provide the
24 maximum quantity-distance safety arc for Concept A for the north pad on SLC-20 for Phase 1 and
25 the Concept B safety arc for the refurbished central pad in Phase 2 of the Proposed Action,
26 respectively. These arcs are based on the maximum amount of explosive material used for either
27 concept as provided in Table 2-3.

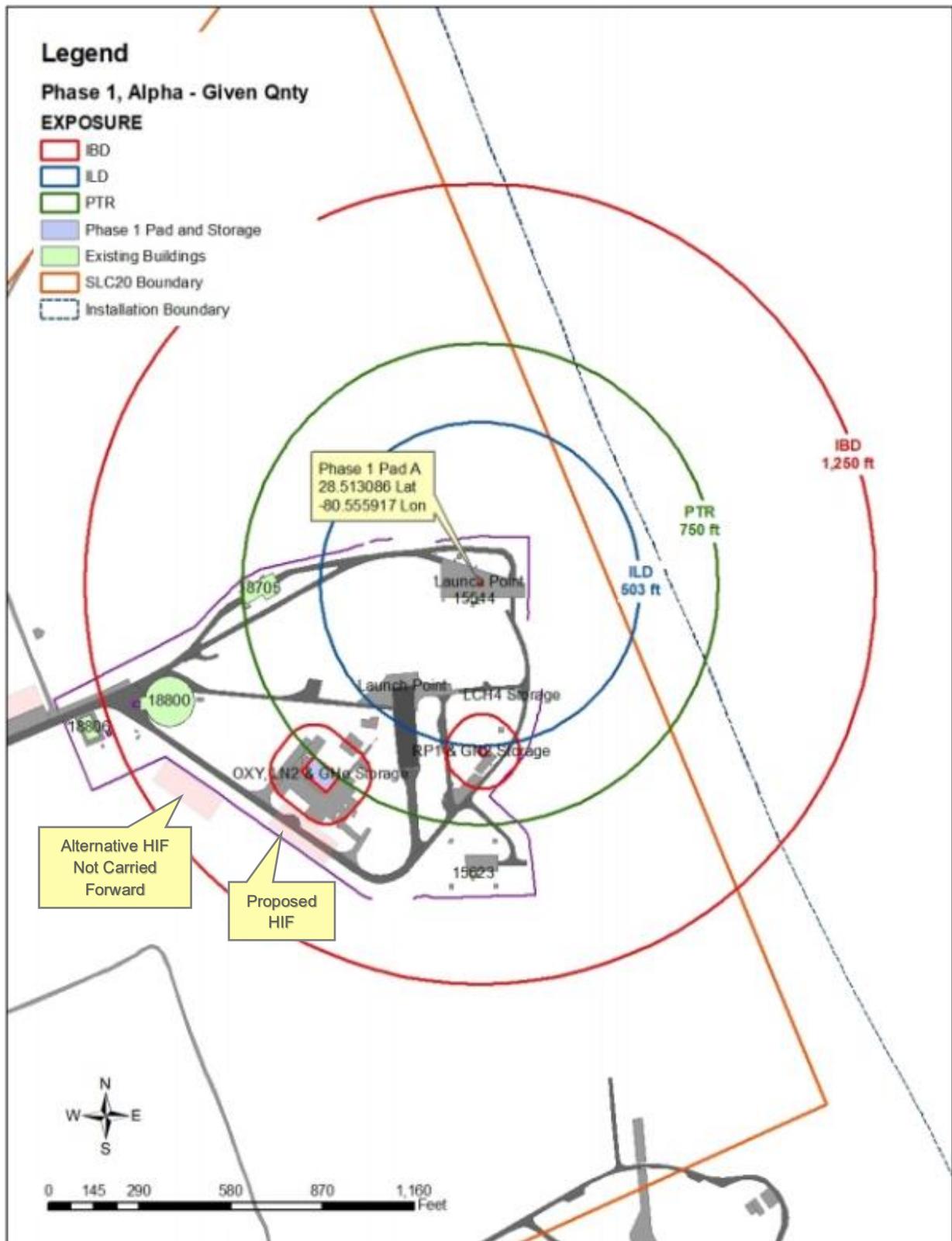
28 All payload and launch programs that use toxic materials must have a Toxic Release Contingency
29 Plan for facilities that use the materials. A Toxic Hazard Assessment must also be prepared for
30 each facility that uses toxic propellants. The Toxic Hazard Assessment identifies the safety areas
31 to be controlled during the storage, handling, and transfer of the toxic propellants. In addition,
32 FAA would conduct a safety review of operations as part of their license application review
33 process.

34 Hazardous materials such as propellant, ordnance, chemicals, and booster/payload components
35 are transported in accordance with FDOT regulations for inter-state shipment of hazardous
36 substances (Title 49 CFR 100–199). Hazardous materials, such as liquid rocket propellant, are
37 transported in specially designed containers to reduce the potential of a mishap should an
38 accident occur. Rocket engine testing or the operation and launch of Concept A or B vehicles will
39 comply with all applicable federal, state, and local safety regulations for storage, use, and transfer
40 of hazardous materials.

41 Flight-related risks for each type of launch vehicle at CCAFS are distinct. The 45 SW Safety Office
42 coordinates all operations, including those from SLC-20, with the FAA, US Coast Guard, and other

1 organizations as required to clear potential hazard areas. If necessary, Notice to Mariners
2 (NOTMARs) and Notice to Airmen (NOTAMs) depicting the hazard areas are published at least
3 24 hours before an operation. A NOTAM is an unclassified notice filed with an aviation authority
4 to alert aircraft pilots of potential hazards along a flight route or at a location that could affect
5 the safety of a given flight by aircraft potentially at risk while in the vicinity of CCAFS.

6 Additionally, the 45 SW regularly distributes electronic notices of launch-related hazard areas
7 that include local watermen, marinas, and marine transportation companies. Risk criteria have
8 been established by CCAFS to protect the public, mission essential and critical operations
9 personnel, and property from risks associated with operations that occur within CCAFS. These
10 criteria are consistent with the National Range Commanders Council guidelines.



1

Figure 4-4 Concept A Vehicle Nominal Siting Map (A-P-T Research, Inc., 2020)

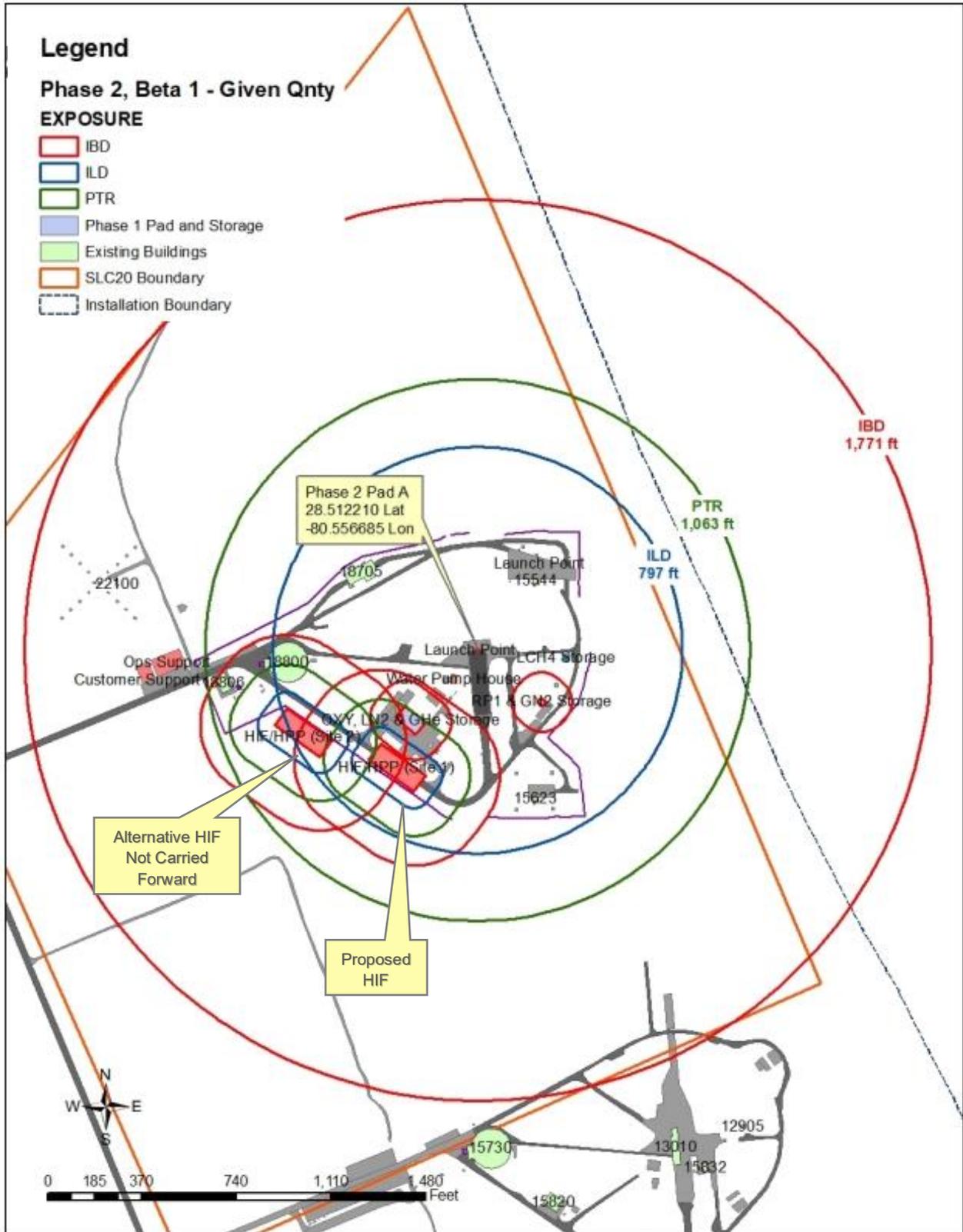


Figure 4-5 Concept B Vehicle Nominal Siting Map (A-P-T Research, Inc. 2020)

Notes: IBD – Inhabited Building Distance; ILD – Intraline Distance; PTR – Public Transportation Route.

1
2

1 A trajectory analysis would be completed before each flight to define the flight safety limits for
2 the launch vehicles at SLC-20 and coordinate that analysis would be coordinated with 45 SW
3 Range Safety for approval. The Proposed Action includes launch vehicles with Flight Termination
4 Systems or Thrust Termination Systems that control the termination by destruction of the vehicle
5 if the flight is deemed erratic or crosses the established destruct boundary. Flight termination
6 boundaries are designed to protect the public and personnel by ensuring that vehicle destruction
7 occurs within a predetermined safety zone.

8 As a safety measure regarding lightning, the SLC-20 launch complex would be designed to include
9 a Lightning Protection System (LPS). Since the Concept B launch vehicle has a height of
10 approximately 140 feet (42.7 m), the actual maximum height of the LPS at SLC-20 is expected be
11 in the 220- to 250-foot (67 to 76 m) range. Since SLC-20 is approximately 14,000 feet (4,267 m)
12 from the Skid Strip (KXMR) and below the height limitations of 350 to 400 feet (107 to 122 m)
13 across, no impacts to the safety requirements for the airfield would occur from the LPS at
14 SLC-20.

15 In summary, **negligible adverse impacts** to human health and safety would be expected from the
16 implementation of the Proposed Action.

17 **4.12.2 No-Action Alternative**

18 Under the No-Action Alternative, the reuse of SLC-20 and launch of OLVs would not be
19 implemented. Therefore, no health and safety impacts would occur.

20 **4.13 SOCIOECONOMICS**

21 Specific to this EA, socioeconomic impacts would be considered significant if they:

- 22 • Substantially altered the location and distribution of the local population.
- 23 • Caused the population to exceed historic growth rates.
- 24 • Decreased jobs so as to substantially raise the regional unemployment rates or reduce
25 income generation.
- 26 • Substantially affected the local housing market and vacancy rates.
- 27 • Resulted in the need for new social services and support facilities.

28 **4.13.1 Proposed Action**

29 The Proposed Action would support the local economy as reconstruction of the SLC-20 launch
30 site would enable other users to assemble, process, test, and launch vehicles for space
31 exploration. The construction phase of this project is expected to generate jobs for the local
32 workforce, along with permanent jobs once construction is complete. Although there may be a
33 slight increase to the local population from the Proposed Action, the growth rate would not be
34 significant. The Proposed Action would not significantly affect the local housing market and
35 would not negatively affect the local economy.

36 Purely social and economic effects are not required to be analyzed under NEPA. Even if NEPA
37 recognizes socioeconomic impacts from re-routing aircraft due to launches, such impacts would
38 be similar to re-routing aircraft for other reasons (e.g., weather issues, runway closures, wildfires,
39 military exercises, and presidential flights). Potential socioeconomic impacts include additional

1 airline operating costs for increased flight distances and times resulting from re-routing aircraft
2 and increased passenger costs as a result of impacted passenger travel, including time lost from
3 delayed flights, flight cancelations, and missed connections. Alternatively, restricting or
4 preventing a launch event would have socioeconomic impacts on Space Florida, the commercial
5 user for SLC-20, commercial payload providers, and consumers of payload services. Operations
6 would not result in the closure of any public airport during the operation nor so severely restrict
7 the use of the surrounding airspace as to prevent access to an airport for an extended period of
8 time. Given existing airspace closures for launches are temporary and the FAA's previous analyses
9 related to the National Airspace System (NAS) have concluded minor or minimal impacts on the
10 NAS from launches, the FAA does not expect airspace closures from Space Florida's proposal
11 would result in significant socioeconomic impacts. Furthermore, local air traffic controls would
12 coordinate with airports and aircraft operators to minimize the effect of the launch operations
13 on airport traffic flows as well as traffic flows in en-route airspace.

14 Therefore, the Proposed Action would generate **no negative socioeconomic impacts** on the
15 region and may generate a **negligible positive impact**.

16 **4.13.2 No-Action Alternative**

17 Under the No-Action Alternative, the reuse of SLC-20 and launch of OLVs would not be
18 implemented. SLC-20 would remain under the control of USAF and would not be used by multiple
19 users for space exploration. No construction would occur, and no jobs would be generated by
20 the reconstruction of the SLC-20. There would be no impact on socioeconomics.

21 **4.14 ENVIRONMENTAL JUSTICE**

22 Specific to this EA, a significant impact to environmental justice would occur if:

- 23 • There was a significant adverse impact to the natural or physical environment or to health
24 that affected a minority or low-income population or children.
- 25 • There was a significant adverse environmental impact on minority or low-income populations
26 or children that appreciably exceeded those on the general population or other comparison
27 group.
- 28 • The risk or rate of environmental hazard exposure by a minority or low-income population
29 was significant and exceeded those by the general population or other comparison group.
- 30 • A health or environmental effect occurred in a minority or low-income population affected
31 by cumulative or multiple adverse exposures from environmental hazards.

32 **4.14.1 Proposed Action**

33 Minority and low-income populations exist in Brevard County; however, the Proposed Action is
34 entirely within the boundaries of the CCAFS. No minority or low-income populations reside within
35 CCAFS, and the Proposed Action is not expected to result in any significant impacts. Therefore,
36 the Proposed Action would not disproportionately affect any minority or low-income population
37 or community. Refurbishment and enhancement of SLC-20 is expected to provide additional
38 rocket launch opportunities. Launch noise generated from the Proposed Action is estimated to
39 be lower than launch noise generated from nearby launch sites at CCAFS that use larger launch
40 vehicles. Space Florida does not expect any adverse impacts on public health and/or the

1 socioeconomic environment would appreciably alter the physical and social structure of the
2 nearby minority or low-income populations or communities. Therefore, the Proposed Action
3 would result in **negligible adverse impacts** to environmental justice.

4 **4.14.2 No-Action Alternative**

5 Under the No-Action Alternative, the reuse of SLC-20 and launch of OLVs would not be
6 implemented. SLC-20 would remain under the control of USAF and would not be used by multiple
7 users for space exploration. Therefore, no environmental justice impacts would occur.

8 **4.15 SECTION 4(f) PROPERTIES**

9 According to FAA Order 1050.1F, impacts to Section 4(f) properties would be significant if the
10 action results in more than a minimal physical use of a Section 4(f) resource or constitutes a
11 “constructive use” based on an FAA determination that the project would substantially impair
12 the Section 4(f) resource. Substantial impairment occurs when the activities, features, or
13 attributes of the resource that contribute to its significance or enjoyment are substantially
14 diminished.

15 **4.15.1 Proposed Action**

16 **Construction**

17 No designated Section 4(f) properties, including public parks, recreation areas, or wildlife refuges,
18 exist within the boundaries of the Proposed Action or CCAFS. The Merritt Island National Wildlife
19 Refuge (MINWR) is adjacent to KSC and CCAFS, and the Canaveral National Seashore is adjacent
20 to KSC and north of CCAFS. MINWR overlaps the northwest portion of KSC and all areas not
21 directly used for NASA operations are managed by MINWR and NPS. The nearest public park,
22 Jetty Park, is about 5 miles south of SLC-20 in the City of Cape Canaveral. Other public parks
23 within an approximate 15-mile (24.1 km) radius of the Proposed Action include Kelly Park, KARS
24 Park, Kings Park, and Manatee Cove Park. As a result, the construction of the Proposed Action
25 would have **no impact** or effect on Section 4(f) properties.

26 **Operation**

27 Section 4(f) properties within an approximately 15-mile radius of SLC-20 would experience
28 temporary operation-related noise as a result of launches. The increased noise level would only
29 last a few minutes and would occur up to 24 times a year under the Proposed Action.

30 All pre-launch operations and effects would occur within or very close to the boundaries of
31 SLC-20. Launch vehicles would be launched from SLC-20 and accelerate over the Atlantic Ocean
32 and away from Section 4(f) lands. The above-referenced Section 4(f) properties have been
33 experiencing operational launch noise from CCAFS and adjacent KSC for decades. Therefore, the
34 FAA has determined the Proposed Action would not substantially diminish the use of the
35 protected activities, features, or attributes of any of the Section 4(f) properties identified, and
36 thus would not result in substantial impairment of the properties. The Proposed Action would
37 not result in a constructive use of these Section 4(f) properties and would not invoke Section 4(f)
38 of the DOT Act. The Proposed Action would **not result in significant impacts** on Section 4(f)
39 properties.

1 **4.15.2 No-Action Alternative**

- 2 Under the No-Action Alternative, the reuse of SLC-20 and launch of OLVs would not be
3 implemented. As a result, no Section 4(f) impacts would occur.

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5.0 CUMULATIVE IMPACTS

5.1 DEFINITION OF CUMULATIVE IMPACTS

The approach taken in the analysis of cumulative impacts in this document follows the objectives of NEPA, CEQ regulations, and CEQ guidance. Cumulative impacts are defined in 40 CFR Section 1508.7 as follows:

The impact on the environment that results from the incremental impact of the action when added to the other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

Cumulative impacts are most likely to arise when a relationship or synergism exists between a proposed action and other actions expected to occur in a similar location or during a similar time period. Actions overlapping with or near the proposed action would be expected to have more potential for a relationship than those more geographically separated. Similarly, relatively concurrent actions would tend to offer a higher potential for cumulative impacts. To identify cumulative impacts, the analysis needs to address the following three fundamental questions:

1. Does a relationship exist such that impacts to affected resource areas by the proposed action might interact with the impacts to resources of past, present, or reasonably foreseeable actions?
2. If so, what would the combined impact be?
3. Are there any potential significant impacts not identified when the proposed action is considered alone?

5.2 ACTIONS AFFECTING RESOURCES OF CONCERN

The overall geographic scope of analysis consists of CCAFS and the immediately surrounding area. The timeframe for the analysis must include the past, present, and future. For most resource areas, the period within the last 5 years at CCAFS marks the past temporal boundary for the cumulative impacts analysis. The future temporal boundary includes the life of the proposed action (i.e., 2020–2025) and other reasonably foreseeable actions within the overall timeframe. The temporal boundary for the present is defined by actions in detailed planning, under construction, or that have been recently initiated. Since the potential effects to resources carried forward in the cumulative impacts analysis may require several years to recover following the end of the Launch Site Operator's License (LSOL), the future temporal boundary is bound by activities that can be reasonably foreseen, as well as the standard FAA license duration, which is approximately 5 years.

The Proposed Action was found to result in no, negligible, or minor direct/indirect adverse impacts to the resource categories analyzed in this EA. Since the direct and/or indirect impacts to these resource areas are localized and temporary and the respective resources are expected to recover within a short period of time, another action would need to occur in the same localized area at the same time for cumulative impacts to be possible.

5.2.1 Past Actions

In accordance with CEQ’s guidance, past actions are relevant and useful in analyzing if the reasonably foreseeable effects of the Proposed Action may have a continuing, additive, and significant relationship to those effects. Table 5-1 provides a list of current and vehicle launches in the past 5 years at KSC and CCAFS.

Table 5-1 Past Vehicle Launches at KSC and CCAFS

Year	Total Number of Launches			
	Delta IV	Atlas V	Falcon 9 (LC 40) and Falcon Heavy (LC 39A)	Total
2014	4	6	6	16
2015	2	8	8	18
2016	3*	7	8	18
2017	1	4	13	18
2018	1	4	15	20
2019	2	-	11	13
Totals	13	29	61	103

Note: * One Delta launch in 2011 was a Delta II 7000.
Sources: 45 SW, 2019; FAA, 2019a; SpaceX, 2019.

5.2.2 Present and Reasonably Foreseeable Actions

Present actions include those actions that are undergoing detailed planning phases, under construction, or that have been recently initiated. Table 5-2 lists the eight active licenses at CCAFS. In addition, Table 5-3 lists the planned vehicle launches at CCAFS.

Figure 5-1 shows the planned future launches and potential future launches.

Table 5-2 Active Commercial Space Transportation Licenses at CCAFS

Company	License Number	Vehicle	Launch Complex	License Expiration
Space Exploration Technologies Corporation (SpaceX)	LLO 19-110 (Rev 1)	Falcon 9	39A	February 14, 2024
United Launch Alliance	LLO 18-113	Atlas IV	37	May 31, 2023
SpaceX	LLO 18-105 (Rev 1)	Falcon 9	40	January 18, 2023
Orbital Sciences Corp	LLO 17-099	Minotaur IV	46	February 9, 2022
Lockheed Martin Commercial Launch Services	LLO 01-064	Atlas V	-	December 13, 2021
Orbital Sciences Corp	LLO 01-059 (Rev 2)	Pegasus	Skid Strip	March 17, 2021
United Launch Alliance	LLS 17-098	Atlas V-401	41	February 1, 2021
SpaceX	LLS 20-119)	Falcon 9 and Dragon-2	39A	January 16, 2021

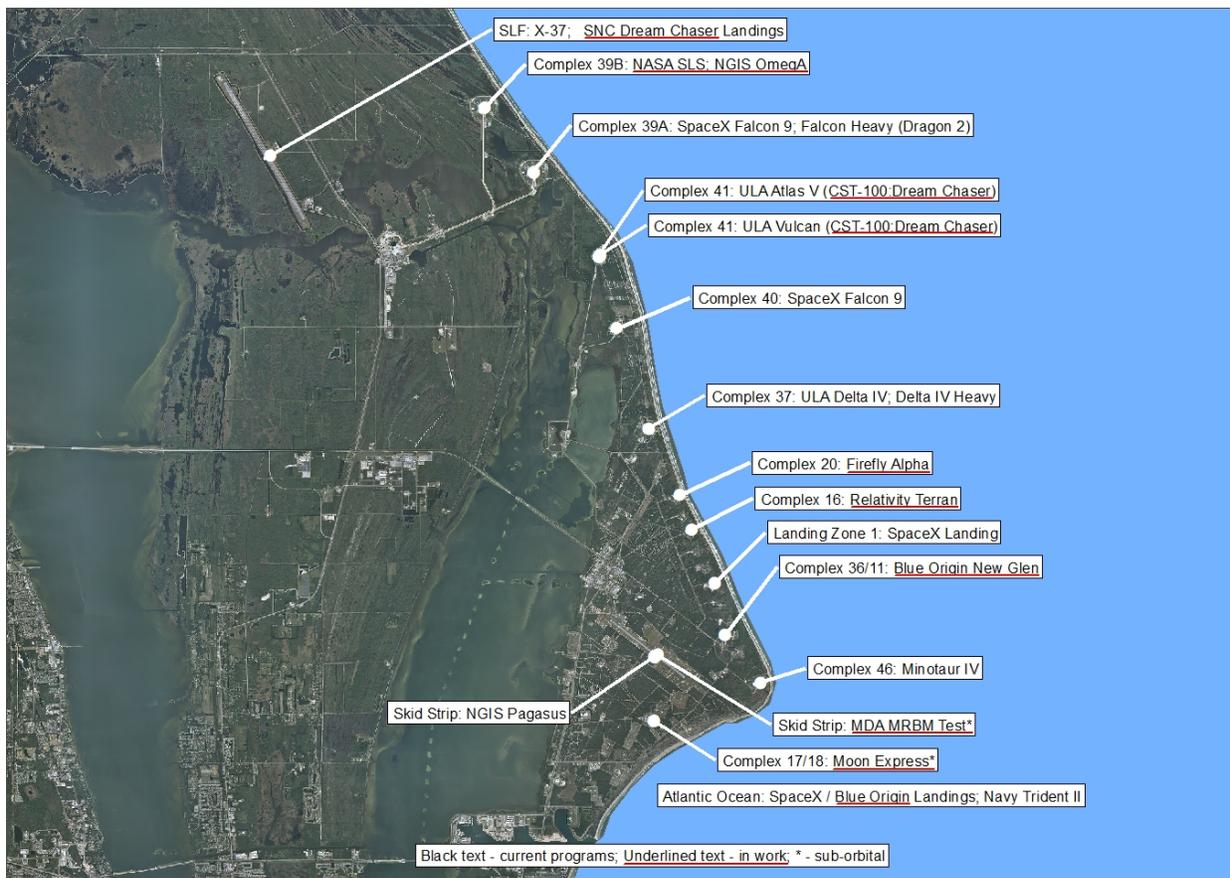
Source: FAA 2019b; FAA 2020b

1 **Table 5-3 Future Planned and Projected Vehicle Launches at CCAFS**

Year	Launch Vehicles (Anticipated Number of Launches)						Total
	Firefly A/B	Delta IV	Vulcan Centaur	Atlas V	Falcon 9 (LC 40), Falcon Heavy (LC 39A), and Starship Super Heavy (LC-39A)	Blue Origin	
2020	24	1	2	6	38	1	72
2021	24	-	8	2	64	4	102
2022	24	-	10	2	64	8	108
2023	24	-	12	2	70	10	118
2024	24	-	14	2	70	12	122
Total Maximum Annual Launches Based on Drive to 48 Goal							522

2 Sources: 45 SW, 2017; 45 SW, 2019; FAA, 2019a; FAA, 2019b; NASA 2019; SpaceNews, 2018; Space Florida, 2018.

3



4 **Figure 5-1 Past and Reasonably Foreseeable Vehicle Launches**

5 **5.3 CUMULATIVE IMPACT ANALYSIS ON RESOURCE AREAS**

6 **5.3.1 Land Use/Visual Resources**

7 The Proposed Action would not result in any significant impacts to land use compatibility since
 8 the Proposed Action site is an existing abandoned launch complex and CCAFS and KSC currently

1 allow space vehicle operations. The Proposed Action would not generate impacts on visual
2 resources locally due to the presence of other launch complexes in the vicinity or regionally
3 (within the flight range) other than a possible short-lived visible vehicle contrail.

4 Cumulative impacts on land use from increased launch vehicle and landing operations at KSC and
5 CCAFS would be minimal since the site is a former launch complex. Development of a
6 manufacturing facility at Exploration Park Phase I will have no effect on land use since the site is
7 already cleared and utilities installed for a development. As a result, the overall cumulative effect
8 of other past, present, and reasonably foreseeable future actions on land use and visual
9 resources is considered negligible. When considered with other past, present, and foreseeable
10 future actions, the Proposed Action would not contribute a noticeable incremental impact.
11 Accordingly, the Proposed Action will not result in a significant impact on land use and visual
12 resources.

13 **5.3.2 Noise**

14 A short-term, small increase in the noise level received in the community from launches resulting
15 from the Proposed Action may occur; however, the event would be similar to other launches and
16 would be a relatively short-term impact. The sonic booms that may occur would be over the
17 ocean, and would not be considered a significant impact. Construction-related noise would be
18 local, short term, and would be managed using OSHA guidance.

19 As a result, the overall cumulative effect when combined with other past, present, and
20 reasonably foreseeable future actions from noise is considered minor and not significant.
21 Additionally, two simultaneous launches in the ROI would never occur. When considered with
22 other past, present, and foreseeable future actions, the Proposed Action would not contribute a
23 noticeable incremental impact.

24 **5.3.3 Biological Resources**

25 The launch event would not be expected to have a significant impact on terrestrial vegetation,
26 wildlife, marine species, or protected wildlife species beyond similar launch activities that occur
27 at CCAFS or KSC. In the event of a mishap down range over the open ocean, impact to wildlife
28 would not be significant given the relatively low density of species within the surface waters of
29 these open ocean areas (USAF 1998).

30 The Proposed Action would primarily occur within a previously cleared and developed former
31 launch complex but would result in clearing of 0.3 acre (0.1 ha) of natural scrub habitat. This
32 habitat would result in a reduction of scrub habitat acreage for future restoration. Space Florida
33 will conduct beach mouse habitat restoration within a portion of the area shown on Figure 4-3.

34 Cumulative impacts on the gopher tortoise are not expected with the Proposed Action. Gopher
35 tortoise burrows to be impacted by ground disturbance or at risk of burrow collapse due to
36 transportation of launch vehicle to pads would be excavated and relocated to a 45 SW-approved
37 recipient site.

38 Cumulative impacts on southeastern beach mice are not expected for the Proposed Action.
39 Although southeastern beach mice are known to occur in the area, no clearing or construction in
40 dune habitat is proposed. Regardless, Space Florida will conduct beach mouse habitat restoration

1 within a portion of the area shown on Figure 4-3. This habitat enhancement will help to provide
2 high quality habitat and a corridor to additional suitable interior habitat.

3 Preparation of and adherence to a LMP and 45 SW lighting policies would minimize impacts to
4 marine turtles. Amber LED lighting would be used to minimize potential adverse impacts on
5 nesting turtles and/or their young. According to Section 3 of the USFWS BO (Appendix C), no
6 known state, local, or private actions are reasonably certain to occur in the action area that would
7 result in cumulative effects to the Florida scrub-jay, southeastern beach mouse, eastern indigo
8 snake, and sea turtles. Additionally, cumulative impacts on American alligator, wood stork, piping
9 plover, and red knot are not expected to occur with the Proposed Action.

10 Mitigation actions discussed in Section 4.3 of this EA and the USFWS BO (Appendix C) would be
11 accomplished to minimize the effect on threatened and endangered species due to construction
12 activities. Impacts from other construction-related actions would not be significant. The numbers
13 of listed species that occur within the former launch complex are low, and loss of 0.3 acre (0.1
14 ha) of native upland scrub habitat would not contribute to the decline of any protected species
15 populations. Loss of scrub habitat would be small and will be mitigated through the enhancement
16 of dune and coastal scrub habitat as previously discussed. Specific to prescribed burning, the 45
17 SW will revise its approach with current and future users and Space Florida to ensure adequate
18 burn windows occur annually to allow 45 SW to meet its habitat management goals agreed to
19 with the resource agencies. Operational controls will be implemented that will provide more
20 assurance that CCAFS will meet its burning goals as part of its land management unit
21 responsibilities. In addition, Space Florida will incorporate language into their tenant lease
22 agreements that references the 45 SW prescribed burn goal, listed species management
23 responsibilities, and resulting annual restrictions (1 to 2 weeks) during a 45 SW predefined
24 period. As part of the lease agreement with Space Florida, the tenants will have a contractual
25 obligation to comply with the specified prescribed burn days schedule by providing adequate
26 protection for their equipment (via containment or filtration systems) or moving sensitive
27 equipment to another location while the prescribed burn days are in force.

28 The overall cumulative effect of other past, present, and reasonably foreseeable future actions
29 on biological resources are considered minor and not significant given the scrub-
30 jay/southeastern beach mouse and sea turtle mitigation measures. When considered with other
31 past, present, and foreseeable future actions, the Proposed Action would not contribute a
32 noticeable incremental impact on biological resources.

33 **5.3.4 Cultural Resources**

34 As stated in Section 4.4.1, no adverse impacts to cultural resources would result from the
35 implementation of the Proposed Action. Therefore, there is no potential for cumulative impacts
36 when considered with other past, present, and reasonably foreseeable actions.

37 **5.3.5 Air Quality**

38 In terms of short-term cumulative impacts, the construction projects proposed under the
39 Proposed Action and other regional projects could produce short-term additive amounts of
40 emissions if they are concurrent. For the reasons stated in Section 4.5.1, the emissions resulting
41 from implementation of the Proposed Action would be minor. Therefore, air emissions from

1 other past, present, and future actions are not expected when considered incrementally with the
2 Proposed Action would not be significant.

3 In terms of long-term cumulative impacts, operational emissions associated with the Proposed
4 Action and other present and reasonably foreseeable projects are expected to be temporary
5 especially considering the launch vehicles would accelerate rapidly and the high temperatures
6 would cause the air emissions to rise and disperse with the prevailing winds. No other long-term
7 emission sources have been identified. Therefore, no significant cumulative impacts to air quality
8 are expected from implementation of the Proposed Action.

9 **5.3.6 Climate**

10 According to the WMO's 2018 Quadrennial Global Ozone Assessment, rocket launches have a
11 small effect (much less than 0.1 percent) on total stratospheric ozone. Overall, future cumulative
12 impacts are dependent on rocket design, launch vehicle sizes, launch rates, spaceport locations,
13 and fuel types. Gaps remain in understanding rocket emissions and their combined chemical,
14 radiative, and dynamical impacts on the global stratosphere and in projections of launch rates;
15 however, cumulative impacts are not expected to be significant.

16 **5.3.7 Hazardous Materials and Hazardous Waste**

17 The Proposed Action would have operations that use products that could contain hazardous
18 materials, including paints, solvents, oils, lubricants, acids, batteries, propellants, ordnance, and
19 chemicals, which are routinely used at CCAFS. Numerous types of hazardous materials are used
20 to support the missions and maintenance operations at CCAFS and KSC. Existing handling and
21 management procedures for hazardous materials, hazardous wastes, and solid wastes generated
22 would continue to be required to limit the potential for impacts. Management of hazardous
23 materials is the responsibility of each individual or organization and is regulated under RCRA
24 (40 CFR 260-280) and Rule 62-730, FAC. Although releases of hazardous materials and wastes can
25 occur in the environment, substantial contamination concerns are not expected as a result of the
26 Proposed Action. Procedures are in place to minimize the release of toxic chemicals into the
27 environment, and rapid emergency response plans are used to ensure that accidental spills would
28 be cleaned up quickly.

29 Land clearing, recontouring, removing, or excavating soils would fall under Land Use Control
30 restrictions; therefore, coordination for any off-site disposal will be required. All soils will be
31 retained within the SWMU boundary and within or close to the contaminated area to prevent
32 the spread of contamination to uncontaminated areas. As a result, the overall cumulative effect
33 when combined with other past, present, and reasonably foreseeable future actions from
34 hazardous materials and waste are not significant. Therefore, the Proposed Action would have a
35 negligible contribution to impacts from hazardous materials and waste.

36 **5.3.8 Water Resources**

37 No USACE or SJRWMD wetlands or floodplains occur within the Proposed Action boundary. As a
38 result, current and future launch events would not have a significant impact on wetlands and
39 floodplains within the Proposed Action boundary or in adjacent areas. Cumulative loss of
40 floodplain function and values in the area may occur due to additional unrelated development

1 (from several projects) in the floodplain. Although floodplains are generally avoided, State and
2 Federal regulations would require on-site compensation of the floodplain loss if construction is
3 permitted in the floodplain.

4 As stated in Section 4.8.1, the construction of new impervious surfaces (buildings, roads, etc.) in
5 association with the Proposed Action renovation and repurpose of the SLC-20 area would require
6 State permits that will require a SMS to treat and store stormwater based on the proposed site
7 development. This SMS would store and treat stormwater generated from site improvements
8 and will be operated and maintained by Space Florida or the tenant. The SMS would store and
9 filter much of the suspended solids out of the water percolating into the ground, and biological
10 and chemical processes in the SMS would reduce the amount of contaminants found in runoff
11 and minimize pollutants that infiltrate into the water table. Stormwater would infiltrate into the
12 surficial aquifer and not be discharged to downstream surface waters. When considered with
13 other past, present, and foreseeable future actions, the Proposed Action would not contribute a
14 noticeable incremental impact on water resources. As a result, the overall cumulative effect
15 when combined with other past, present, and reasonably foreseeable future actions on water
16 resources is not significant.

17 **5.3.9 Geology and Soils**

18 The Proposed Action would not impact geology and soils. Therefore, there is no overall
19 cumulative effect to this resource.

20 **5.3.10 Transportation**

21 The Proposed Action would negligibly increase traffic for CCAFS employees and contractors but
22 not the public since CCAFS is a restricted area. KSC and CCAFS traffic may be affected during
23 transport of launch vehicle stages to SLC-20. However, time of transport would avoid heavy
24 morning and late afternoon traffic.

25 The Proposed Action would not contribute a noticeable incremental impact on transportation.
26 As a result, the overall cumulative effect on transportation is considered negligible when
27 combined with other past, present, and reasonably foreseeable future actions.

28 **5.3.11 Utilities**

29 There would be a low demand for additional electrical power for the Proposed Action and
30 therefore direct cumulative impacts would be negligible.

31 Water for CCAFS and KSC is acquired from the City of Cocoa's municipal potable water
32 distribution system under a long-term agreement, which has over a 37-million-gallon-per-day
33 (MGD) capacity. The City's contract is with the US Government and includes KSC, CCAFS, and
34 Patrick Air Force Base. A total of 6.5 MGD is allocated for all three facilities. Historically, total
35 water consumption by all three facilities has averaged only 3.7 MGD. Current and future actions
36 would require a water supply to successfully function. However, water supply requirements
37 would be minimal compared to available supply.

38 Wastewater from the Proposed Action would be treated with on-site septic system until
39 centralized sewer service lines are installed along ICBM Road. Thus, the CCAFS wastewater plant
40 would not need to accommodate this facility.

1 The Proposed Action would not contribute a noticeable incremental impact on utilities. As a
2 result, the overall cumulative effect when combined with other past, present, and reasonably
3 foreseeable future actions on utilities is considered negligible.

4 **5.3.12 Health and Safety**

5 Similar to all other launch and hazardous operations at CCAFS, the Proposed Action must account
6 for public safety distances and may require road closures. Road closure is not expected for engine
7 test periods. Similar to other launch vehicle providers at CCAFS and KSC who close roads
8 periodically to assure public safety, Space Florida would implement engineering design controls
9 to limit impacts of payload processing such that road closures would be avoided. Coordination
10 would be developed to minimize impact when considered in context with other CCAFS clients.
11 The Proposed Action does not require transportation mitigation measures beyond that of similar
12 launch activities that occur at CCAFS or KSC.

13 Space Florida tenant(s) would follow the existing rigorous USAF launch safety certification
14 process and would be required to gain a launch license from the FAA, both of which would require
15 a detailed public safety risk assessment to assure that safety impacts to the public meet Federal
16 and USAF standards. Public clear distances to be implemented on launch days would be limited
17 to CCAFS. Over time, this impact is expected to be no greater than current launch operations at
18 CCAFS. The Proposed Action would not result in a substantial increase in potential impacts to
19 health and safety of the public.

20 When considered with other past, present, and foreseeable future actions, the Proposed Action
21 does not significantly impact health and safety.

22 **5.3.13 Socioeconomics**

23 Short-term beneficial impacts from the Proposed Action and other similar efforts would occur
24 from past, present, and reasonably foreseeable projects. However, the overall scope of the
25 construction associated with the proposed action is relatively small in scope and short in
26 duration. While there would be an increase in construction spending resulting from a short-term
27 demand for construction and secondary jobs, it is anticipated the regional labor force would
28 absorb the increased demand for direct construction and associated secondary jobs.
29 Furthermore, construction spending, as well as additional taxes would accrue to federal, state,
30 and local governments as a result of the increased construction activities; however, these would
31 be minor and temporary.

32 Long-term cumulative impacts are associated with the Proposed Action and other similar efforts
33 from present and reasonably foreseeable projects as a result in an increase of space tourism.
34 According to Visit Florida (2019), more than 126 million tourists visited Florida in 2018, an
35 increase of 7.2 percent over 2017. Specific to Brevard County, tourism is a \$2.1 billion-a-year
36 industry and is responsible for 26,000 jobs (Florida Today 2019). As part of Brevard County's
37 2019-2020 proposed plan, efforts are underway to grown tourism further. The beneficial
38 cumulative impacts associated with the Proposed Action and other past, present, and future
39 actions would not be significant as plans are in place to ensure the proper infrastructure exists
40 to accommodate the increase. Therefore, the beneficial socioeconomic impact from other past,

1 present, and future actions when considered incrementally with the Proposed Action would not
2 be significant.

3 **5.3.14 Environmental Justice**

4 The Proposed Action would not result in disproportionate impacts to minority or low-income
5 populations or communities. The operations at SLC-20 would be consistent with historical and
6 current launch noise. Therefore, there would be no significant cumulative impacts to
7 Environmental Justice as a result of implementing the Proposed Action.

8 **5.3.15 Section 4(f) Properties**

9 No designated Section 4(f) properties, including public parks, recreation areas, or wildlife refuges,
10 exist within the boundaries of the Proposed Action or CCAFS. The MINWR is adjacent to KSC and
11 CCAFS, and the Canaveral National Seashore is adjacent to KSC and north of CCAFS. The nearest
12 public park, Jetty Park, is about 5 miles (8.0 km) south of SLC-20 in the City of Cape Canaveral.
13 Other public parks within an approximate 15-mile (24.1 km) radius of the Proposed Action include
14 Kelly Park, KARS Park, Kings Park, and Manatee Cove Park.

15 As stated in Section 4.15, the construction of the Proposed Action would have no impact or effect
16 on Section 4(f) properties. Section 4(f) properties within an approximately 15-mile radius of SLC-
17 20 would experience temporary operation-related noise as a result of launches. The increased
18 noise level would only last a few minutes and would occur up to 24 times a year under the
19 Proposed Action. As a result, the Proposed Action would not substantially diminish use of the
20 protected activities, features, or attributes of any of the Section 4(f) properties identified, and
21 thus would not result in substantial impairment of the properties. Therefore, the Proposed Action
22 would not be considered a constructive use of these Section 4(f) properties, would not invoke
23 Section 4(f) of the DOT Act, and thus would result in negligible adverse impacts. When combined
24 with other past, presents, and future actions at CCAFS, the Proposed Action would result in added
25 operational launch noise, since noise has been historically associated with launches from CCAFS
26 and adjacent KSC. The additional noise from operation of SLC-20 is not expected to result in a
27 significant adverse cumulative impact since the launches would accelerate over the Atlantic
28 Ocean and away from these properties.

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APPENDIX A

Exploration Park Phase I Record of Environmental Consideration

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APPENDIX B
BRRC Noise Report

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APPENDIX C
USFWS Biological Opinion

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APPENDIX D
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APPENDIX E
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APPENDIX F
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APPENDIX G

Transportation Concurrence Correspondence

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APPENDIX H

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Florida State Clearinghouse Correspondence

